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Openness in ICT4D: Critical Reflections on Future Directions

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p. 794

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CONFERENCE THEME

OPENNESS IN ICT4D: CRITICAL REFLECTIONS ON FUTURE DIRECTIONS

Various discourses around "openness" are present in the domain of ICT and development studies. An initial discourse in this area related to open source software and open standards, and how these can strengthen public information systems in developing countries. In recent times, we read about "open data" which involve governments placing relevant data in the public domain, and which may or may not require to be supported by open software. Open development is a more overarching theme being positioned as a theory of development, focusing on understanding how information-networked activities are carried out, in what circumstances and to what benefit. This openness discourse continues to unfold in a political-technical environment of increasingly centralized computing (cloud), cyber-crime, cyber-terrorism and increasingly comprehensive surveillance.

The conference theme of "Openness in ICT4D: Critical reflections on future directions" will seek to critically discuss different facets of open and openness, whether they represent a hype or reality, what promises they hold for creating a better world, and what are the challenges we face in achieving the promised potential. To do this we welcome contributions from a wide range of perspectives, discussing for example potential tensions between open source and open data, the role of actors like the open society initiative in promoting openness as a value, and positive and negative freedoms.

KEYNOTE SPEAKERS

Keynote I

Niall Hayes, Lancaster University, UK

GOVERNING IMPACT IN THE INTERNATIONAL DEVELOPMENT SECTOR

Abstract
This talk reports on an in-depth case study of a donor driven impact assessment initiative being conducted in India. The UK based donor is a philanthropist that funds a number of different NGOs. We focus on how they have piloted a new impact assessment methodology with one of the NGOs they fund that seeks to improve the livelihoods of Indian farmers. We draw on Foucault's ideas on governmentality and the related ideas on calculative practice and technologies of governance to inform our discussion. The central position this paper adopts is that we need to shift our attention from what impact assessment is supposed to be (methodologies for producing evidence, or measures, of change or impact) to what is does or enacts—that is, as technologies of governance, which are also performative. As technologies of governance, we will argue that they are also enacting a certain understanding of what impact is, how it is measured, who donors are, what beneficiaries are, and much more. We will suggest that what seem to be apparently mundane and routine practices are in fact powerful regimes of governance that have many performative outcomes constitutive of what is understood to be legitimate 'development work' as such. We will suggest that this has four important implications for the international development sector. First impact assessment brings with it many of the assumptions of a marketplace and configures NGOs as an implementer of the donors funding. Second, that an impact assessment form of governance creates a very unequal position where beneficiaries are ever more powerless and donors and NGOs are increasingly powerful. Third that as technologies of governance, impact assessment methodologies translate the interests of donors across the development network. Fourth, that a specific cadre of audit expertise becomes valued in the development sector at the expense of direct work with beneficiaries.

Biography
Niall Hayes is a Reader in Information and Organisation in the Department of Organisation, Work and Technology at Lancaster University. He is the Director of the Centre for the Study of Technology and Organisation. He has published in journals such as Organization Studies, Human Relations, Information and Organization, Journal of Information Technology and New Technology, Work and Employment. He is an Associate Editor for Information Systems Journal and is on the Editorial Advisory Board for New, Technology, Work and Employment. He has edited several special issues relating to international development and information technology. His research sits on the boundaries between information systems, organization studies and development studies. His research interests relate to the social and organisational implications arising from the introduction and use of information systems in organisations. His specific research domains are fourfold: knowledge management, electronic government, plagiarism detection systems and information and communication technology in developing countries and for development.

Keynote II

Ineke Buskens, Research For the Future and GRACE Network Leader, South Africa

OPENNESS IN ICT4D: A FINGER POINTING TO THE MOON?
OR CAN IT BE MORE?
AND HOW?

Abstract
According to thinkers like economic historian Deirdre McCloskey, the Great Enrichment (the period of exponential economic growth in Europe from the 1800's onwards) was inspired and fuelled by a change in values and ideas: the bourgeoisie was given the liberty to trade and invent and was admired for doing this. In conjunction, new values such as for instance honesty supported these freedoms and made them possible and socially respectable. When ideas and values can free human beings to become innovative and create such wealth, then they should be taken seriously by economists. Fortunately they are.

The openness revolution in the field of Information Communication Technology could very well be similar in magnitude to the new ideas of honest trade and technological invention seen in Europe in the 1800's. Contributions seen in open initiatives from Wikipedia to the Health Information Systems Programme are momentous and on-going with their market value surpassing those of comparable remunerated activities and proprietary franchises. It would thus be good for scholars and practitioners of ICT4D to take ideas and values into their orbit of study when endeavouring to understand openness and its implications for the field and for society.

Openness in colloquial inter personal communication evokes images of frankness, inclusion, even intimacy and vulnerability, resonating with the very foundation for genuine dialogue and human community. The concept of open society speaks to the dream of holding totalitarian state power at bay by emphasizing transparency and citizens' capacity for independent and critical thinking. Openness discourses in the context of ICT and development evoke images of freedom, particularly of the freedom to create in collaboration, unrestrained by market forces and government regulation, and contribute to development efforts in sustainable and empowering ways, often 'from the bottom up'. A shift in economic values marks many of the discourses: from self-interest to collaboration, from personal greed to caring for the commons, from scarcity to non-zerosum thinking.

We have to realize however that the mainstream economic logic and reality still exists and that the new open thinking, being and acting in ICT4D is embedded in a neo-liberal economic paradigm that seems to have increased financialisation of ever more aspects of human, social and planetary life. A money economy can never be a valid reflection of all the transactions between people and the planet that comprise and support human and social life: much caring work, mostly done by women and socially disadvantaged groups such as immigrants is either unpaid or underpaid and apart from certain ecologically motivated groups, the voice of our planet has remained mute for most of us. Drawing the money net tighter might not only squeeze the vulnerable, it might become life-threatening to us all.

Openness discourses, practices and collaborations take place in complex force fields of divergent knowledge and power interests, where the local and the global interact in ever more intricate ways and where arguments are made by admonishing and shaming next to the more rational and egalitarian forms of argument and persuasion.

Embodied as and embedded in the very same technology that expands the power of the powerful to control, dominate and exploit, it is possible that openness discourses, practices and collaborations may be co-opted in agendas that could evolve into the actual antithesis of the promise that gave birth to their emergence and popularity and which induced the initial 'buy-in' of its proponents. Such is the power of 'conceptual bewitching' especially in a context of structural power relations: since 'open' carries such undeniable positive connotations, it can be argued that using the word 'open' will inevitably inspire human beings to open up to whatever it is that is said or written after the 'open': whether it is open government data or open networks.

How to protect freedom in the form of openness discourses, practices and collaborations in the field of ICT4D is however a tricky question: the very same regulations or policies intended to protect could become a hindrance to further emergence of sought-after technical and social innovations. When practices become an end in themselves and conceptualizations take the focus away from actual lived experiences, it is easy to miss how the values prevalent in a specific context will define the actual meaning and outcome of an act, regardless of its original intention.

In this light I want to suggest that protecting openness in ICT4D would have to be done by the openness actors as part of their daily openness work: linking the unfolding manifestation and impact of a specific form of openness to the original intentionality and make their observations and reflections part of common conversation. Intentionality as a human mental capacity and an explanatory force is under used and under explored - various reasons could be suggested for this – yet making intentionality part and parcel of openness discourse, would open up the normative space that can facilitate the expression and sharing of the values that have accompanied the emergence and adoption of openness in ICT4D.

I thus want to argue for the need to turn the gaze away, for a bit, from openness discourses, practices and collaborations to us, the scholars, students and practitioners of open ICT4D. To take our gaze away from the moon, relax our arm whose finger is pointing to its mesmerizing reflection lighting up the surrounding darkness, and acknowledge the fact that the moon can only reveal itself to us so clearly because the sun shines on it. It is difficult to gaze into the sun - it is admittedly easier to study its reflections, impacts and effects on the moon. We are however the sun, the moon and the finger pointing to the moon, engaged simultaneously in transmitting light and in the act of pointing attention away from that very same act. Including the original source of sunlight into the equation will facilitate our understanding of what is happening and enhance our influence on what kind of light and shadows the moon will reflect.

Such critical reflexivity in thinking and talking will need practice. To keep linking intention and effect pertaining to openness discourses, practices and collaborations requires a form of purpose-aligned observation and reflection that is akin to the kind of research thinking that characterizes action research in the social sciences and possibly agile design in Information Technology. It also requires an attitude of thoughtfulness or mindfulness that is cultivated by a research attitude whereby actors not only systematically search for patterns in the environment but also question their own thoughts, emotions and intentions in relation to that environment and its actors, so that, when so desired, they can adapt these and their acts in response.

Using examples from the second phase of the work of the GRACE Network (Gender Research in Africa and the Middle East into ICT for Empowerment; 2008 – 2014; grace-network.net), I will show how purpose-aligned intentionality and thoughtfulness can be practiced, developed and enhanced within ICT4D projects: 'thinking our doing' and 'being

our writing' enabled us not only to detect where thoughtlessness contributed to the casual evil of disempowerment through unquestioned gendered thought, practice and collaboration but also how to counter act it by creating social innovations and contributing to transformed lived realities. Whilst the GRACE projects did not aim to explore or showcase open ICT4D discourse, practice or collaborations, GRACE itself as a network is an experiment in networked innovation that has open sharing, collaboration and discourse at the centre of its being, doing, writing and acting. I hope that the learning to be shared can be transferred to other contexts in Open ICT4D and point towards viable future directions that can contribute to keep openness in ICT4D open in line with a better world for all.

PANEL

STUDENT PUBLICATION STRATEGIES

Robert Davison, City University of Hong Kong

PhD students who aim for academic careers, where they will need to engage in scholarly research, should expect to start publishing papers early. Conferences, such as the IFIP WG 9.4 conference, are excellent starting places, but PhD students must also focus their efforts on the academic journals in their field. This may seem a daunting task, given high rejection rates that can negatively affect even the brightest of scholars, full professors included! Nevertheless, we all believe that PhD students must prepare for journal publication long before they submit and defend their thesis. Many universities which might be interested in hiring these newly minted PhDs would look for evidence of research ability. One of the clearest signals of this ability can be evidenced in journal papers. This implies that waiting until after graduation before embarking on submitting papers to journals may be leaving things much too late: few such journal submissions are accepted in less than a year, and many journals are so thorough (and slow) that the whole process can take several years.

In this panel, we bring together five international experts from different parts of the world, who are familiar with different academic traditions and who each are competent in different contexts and traditions, to offer the best of their advice to PhD students (and other junior academics who may be interested). We plan this as an open session: each of the five panelists will offer a quick set of ideas from their own perspective about how PhD students should go about developing a publishing strategy or about other issues related to this core theme. This should occupy no more than half the time allocated to the panel. The remainder of the time will be for the audience to engage with the panelists on the panel theme, as well as any other topic of interest to audience members that is related to the publication process.

The five panelists are themselves experienced in ICT4D research. All are experienced authors and PhD supervisors. They also include journal editors, conference organisers and internationally renowned scholars. The four panelists are:

Antonio Diaz Andrade: AUT University, New Zealand: antonio.diaz@aut.ac.nz

Julian Bass, Robert Gordon University, Scotland, UK: jb@julianbass.co.uk

Wallace Chigona, University of Cape Town, South Africa: wallace.chigona@uct.ac.za

Robert Davison: City University of Hong Kong, Hong Kong: isrobert@cityu.edu.hk

In the following paragraphs, the panelists briefly explain the issues that they intend to cover in their presentation.

Antonio Díaz Andrade will share his experience on the publication process from his own PhD work in the area of information and communication technology for development (ICT4D). From what used to be a somewhat undervalued area, ICT4D has been gaining recognition in the information systems field. Antonio will reflect on his journey from publishing in specialised journals to targeting mainstream ones.

Julian Bass will describe five golden rules for successful student publishing. Rule one publish early, publish often. Rule two collect initial data with a view to producing a first paper, rather than collecting a full data set and attempting to publish at some later stage. Rule three, initial

papers should be expanded into journal length article submissions (Bass, 2014). Rule four, papers should have an authentic scientific narrative. Rule five, pay attention to scientific writing (such as scientific English, paper formatting, referencing, spelling and grammar).

Wallace will reflect on the dilemma which authors from development countries face in deciding between publishing in local outlets and publishing in internationally respected journals. He will also reflect on challenges writers from developing countries face in trying to break into international journals. One of the challenges authors face is to make their work, which is often based on local case studies, appeal to an international audience.

Robert Davison, the coordinator of this panel, will reflect on his role as a journal editor in this domain (Electronic Journal of Information Systems in Developing Countries) and highlight some of the critical success factors and critical failure factors associated with submissions to the EJISDC. These will cover topics that are relevant to PhD students, notably with respect to: research motivation, literature review, methodology, data analysis, practical and theoretical contributions, references (Davison, 2012; . He will provide examples of papers that were accepted and rejected in order to illustrate how papers are assessed by editors.

References

Bass, J.M. (2014) Special Issue Introduction. Electronic Journal of Information Systems in Developing Countries 62, 0, 1–3: http://www.ejisdc.org/ojs2/index.php/ejisdc/article/view/1331/508

Davison, R.M. (2012) Editorial, Information Systems Journal, 22, 6, 407-409 http://onlinelibrary.wiley.com/doi/10.1111/isj.12003/pdf

Davison, R.M. (2013) Editorial, Information Systems Journal, 23, 5, 377-379 http://onlinelibrary.wiley.com/doi/10.1111/isj.12028/pdf

Davison, R.M. (2014) Editorial, Information Systems Journal, 24, 3, 203-205 http://onlinelibrary.wiley.com/doi/10.1111/isj.12035/pdf

TABLE OF CONTENTS FOR TRACKS AND PAPERS

THEMES, INSIGHTS AND AGENDAS FOR ICT4D RESEARCH AND PRACTICE

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Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

1

THE USE OF INFORMATION SYSTEMS IN INDONESIA'S LAND MANAGEMENT

Fathul Wahid, University of Agder, Norway, and Universitas Islam Indonesia, Yogyakarta, Indonesia

Øystein Sæbø and Bjørn Furuholt, University of Agder, Norway

Abstract: This study explores how the idea of developing effective land management has been translated into the Indonesian context. We specifically investigate how information systems (IS) have been contextually adapted to support this idea. Through an interpretive case study approach, benefiting from various sources of data, we frame this study using within the concept of idea translation from Scandinavian-type institutional theory. We find that IS use in institutionalising the idea of developing effective land management has undergone a series of contextualised translation processes. These are influenced by legal, social, technical, political and organisational factors (i.e. editing rules). Several insights for practice are also presented.

1. INTRODUCTION

Appropriate land management using modern land information systems (LIS) is a basic infrastructure for economic and social development and environmental management, particularly in developing countries (Arko-Adjei, 2006; Huber, Mithöfer, Schär, Harvey, & Mukasa, 2008; Silva, 2007). In general, these countries, including Indonesia, have to deal with serious challenges to manage their land adequately. These challenges include an unclear distribution of responsibilities between the government agencies involved (Bennett, Rajabifard, Williamson, & Wallace, 2012), conflicting legal arrangements between national and tribal/*adat*/customary laws; (Bakker & Moniaga, 2010), and a lack of transparent systems (Chawla & Bhatnagar, 2004). This situation can lead to conflicts and disputes over land (Arko-Adjei, 2006) and uncontrolled land use and conversion (Firman, 2004).

The use of information systems (IS) in this area is believed to remedy these problems to a large extent and is considered useful for land-use planning, land management and conflict minimisation (McIntyre & Associates Pty Ltd., 2008). Hence, many countries have developed LIS to assist them in managing their land more effectively (Barrett, Sahay, & Walsham, 2001; Karikari, Stillwell, & Carver, 2005; Mooketsi & Leonard, 2013). Indonesia also adopted IS to support its land management in 1997. However, the aforementioned problems remain unresolved (Bakker & Moniaga, 2010; Firman, 2004). The number of reported disputes and conflicts over land is high. In 2007 the Indonesian Land Agency (BPN) recorded more than 7,000 cases of land conflict covering almost 608,000 hectares of land (Winoto, 2009), and in 2013, the number was still over 4,000 cases (BPN, 2013a). One possible reason for this is that, until 2013, only around 45% of land parcels under private ownership had been formally registered (BPN, 2013a); this percentage equals 5% of Indonesia's land area (Yusuf, 2011). Given these considerations, it is clear that the effectiveness of IS-use needs to be better understood. Against this backdrop, we

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

2

attempt to address the following question: *What is the role of IS in Indonesia's land management*?

In order to answer this question, we conducted an interpretive case study with a special focus on BPN's use of IS, and employed the concept of idea translation introduced by Scandinavian-flavoured institutional theory to frame our interpretation of the findings (Czarniawska & Sevón, 1996). In doing so, we expect to come to a better understanding of the context, which will in turn enable us to further identify IS's impact and areas of improvement, along with challenges which could arise.

The rest of the paper is structured as follows. Section 2 presents the theoretical framework. Section 3 explains the research method, and in Section 4, we present our findings, which are discussed in Section 5. Finally, in Section 6 we conclude by summarising findings and contributions.

2. IDEA TRANSLATION: A THEORETICAL FRAMEWORK

In this study, we employed the Scandinavian institutional theory as an analytical lens. This specific instance of institutional theory equips us with a vocabulary to explain how an idea, in this case building an effective land registration system with the help of IS, is translated into the Indonesian context. Our data indicated that the use of IS in Indonesia's land management varied over time. We contend that different contextual considerations have been taken into account at each time. Our focus is more on better understanding how the same idea has been translated into different organisational practices, rather than explaining why the practices tend to be similar. Thus, the use of Scandinavian institutional theory fits better than common neo-institutional theory, which amongst other things pays attention to organisational isomorphism (DiMaggio & Powell, 1983). Another theory, such as actor network theory (ANT) may be a reasonable alternative if we want to trace or follow the interrelations amongst the involved actors during the implementation process of a specific solution through various stages, namely problematisation, interessement, enrolment and mobilisation (Stanforth, 2006). However, we opted not to use ANT, because instead of focussing on the actors and their relationships in this study, we wanted to pay attention on the idea of building effective land management, which is translated over time. However, the Scandinavian institutional theory has adopted the concept of translation introduced in ANT (Czarniawska & Joerges, 1996). In the following, we briefly explain the main concepts of the theory.

According to Sahlin and Wedlin (2008), Scandinavian institutional research have 'primarily come to highlight the dynamic aspect of circulating ideas; how and why ideas become wide-spread, how they are translated as they flow and with what organisational consequences' (p. 219). Answers to these questions are needed in order to explain the process of translating an idea into a certain setting. As stated above, organisations do not operate in a vacuum, and an idea that is picked up can be adopted and incorporated into organisational practice. When an idea is adopted, however, it does not always work as planned, and in many cases, it may then be decoupled from the organisation's ongoing activities (Brunsson & Olsen, 1993; Meyer & Rowan, 1977). In order to work in its new setting, the idea requires a process of translation (Sahlin-Andersson, 1996). In this study, the main idea under investigation is the development of effective land management.

The concept of circulating ideas (i.e. imitation, translation and editing) can be used to explain why differences appear in implementation even if organisations have adopted similar ideas. David and Bitektine (2009) argue that recent developments amongst institutional researchers indicate a shift in their attention from similarity to diversity. Moreover, Sahlin and Wedlin (2008) point out that imitation is the major mechanism through which organisations become more exposed to ideas and come to adopt them. To differentiate between this and the diffusion which occurs among a number of passive recipients, Sevón (1996) defines imitation 'as a

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

3

process in which something is created and transformed by chains of translators' (p. 51). He explains that the drive for imitation comes from the imitators themselves as the result of their conceptions of situations, as well as from the analogical reasoning by which these conceptions are combined. Similarly, Sahlin and Wedlin (2008) argue that to imitate involves not just copying, but also changing and innovating. One of the motivations for imitation is to become similar to other organisations, especially successful ones that can provide best practices (Haveman, 1993).
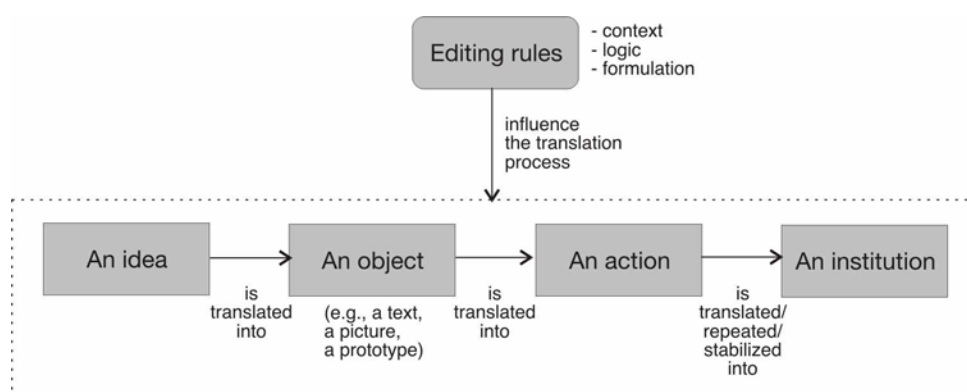

Figure 1. The Process of Idea Translation
Source: Czarniawska and Joerges (1996).

The translation process is described by Czarniawska and Joerges (1996) as involving the four following stages: idea, object, action and institution (see Figure 1). In a particular context, organisational actors select an idea amongst a collection of circulating ideas. The circulating ideas are dis-embedded from their original setting before being re-embedded into the new one (Czarniawska & Joerges, 1996). Once an idea is adopted, it will be subsequently transformed into an object. The objectification process makes the idea tangible. According to Czarniawska and Joerges (1996), the easiest way to objectify ideas is to turn them into linguistic artefacts such as labels and metaphors. An idea can then be translated into an object (e.g. a text, model, prototype, perception or concept), and can subsequently be realised. In this way, an object is translated into an action. Finally, it may emerge as an institution if the action is regularly repeated over time and is taken for granted.

On the other hand, the process of translating an idea is in fact constrained by the editing rules that are often implicitly inherent within an organisation (Sahlin & Wedlin, 2008). In general, the editing rules concern three factors, namely context, logic and formulation (Sahlin-Andersson, 1996). Different settings may follow a variable set of idea editing rules. Ideas may be contextualised to consider aspects of time, space and scale. New types of logic or explanations can be accepted and/or formulated for example as prototypes used to attract attention. From the perspective of information and communication technologies for development (ICT4D), the editing rules may lead to local improvisation in the idea's translation (Heeks, 2002).

3. RESEARCH METHODS

Our study can be best described as an interpretive case study, focusing on BPN's use of various IS. A case study is appropriate, since the problem under investigation is practice-based, the actors' experiences are important and the context of action is critical (Benbasat, Goldstein, & Mead, 1987). In choosing this approach, 'our knowledge of reality is gained only through social constructions such as language, consciousness, shared meanings, documents, tools and other artefacts' (Klein and Myers, 1999 p. 69). In this study, we positioned ourselves as 'outside researchers' with low level of involvement (Walsham, 1995).

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

4

We based the study on various sources of data. First, we conducted a series of interviews and discussions, both formal and informal, involving seven informants. The informants included actors related to land use and management at various levels – key players at the city/district (one informant), provincial (one) and national (one) levels of BPN's offices, as well as operators at the city (three), notary (one) and land broker (one) levels. When possible, the interviews were recorded, and the main points which emerged were taken as notes. We involved informants from various levels to validate the data and to avoid elite biases (Myers & Newman, 2007).

Second, we also benefited from secondary data sources available from websites, published reports, related articles, news in mass media and publicly available recorded interviews with key players. We also carried out observations at three BPN offices – in the city of Yogyakarta, the district of Bantul and the special province of Yogyakarta. Most of the data were available in Indonesian. Using multiple sources of evidence ensured the data's validity (Yin, 2009).

The data were analysed based on the concept of idea translation. In making sense of the data, we adopted a temporal bracketing strategy. The concepts were used as the temporal brackets (see Figure 1), as they come into existence sequentially: They develop from an idea, through a concept and an action, to an institution. The temporal bracketing strategy is a classic example of a perspective which involves mutual shaping (Langley, 1999). The mutual influences of context and process are difficult to capture simultaneously; hence, it is easier to analyse them in a sequential method by temporally 'bracketing' them together. The decomposition of data into successive periods allows us to examine the way in which actions in one period lead to changes in the context which will affect action in subsequent periods. This strategy fits well with a nonlinear dynamic perspective on organisational processes (Langley, 1999).

4. FINDINGS

4.1. The Land Administration System

Indonesia, comprised of around 17,000 islands, has an area of some 1.9 million square kilometres supporting a population of more than 225 million people. During the 350-year period before its independence in 1945, Indonesia was constantly under some form of colonial rule. Land law was dualistic, representing Western-style systems – to meet the interest of colonial governments – and traditional unwritten laws based on customary rights to land which exist in Indonesia's diverse cultural groups. This dualism in land law was expected to end in 1960 with the enactment of the Basic Agrarian Law. This national law recognises traditional concepts and institutions, while at the same time, providing for the registration of individual rights to land. Within this framework, Indonesia operates a complex system of land management (Heryani & Grant, 2004).

The legal issues are even more complex, as land administration is managed under two national government agencies, namely BPN and the Ministry of Forestry (MoF). These government agencies refer to different laws in determining land borders under their jurisdiction (Humas Setkab, 2013). To some extent, this policy leads to conflicts and power struggles between officials in charge of land management and administration in Indonesia (Bakker & Moniaga, 2010; Humas Setkab, 2013). In an interview, a director of the national BPN office in Jakarta even described the relationship between BPN and MoF to be 'like cats and dogs'; he stated that these conflicts result in 'improper use of land, and as a result, the economy of Indonesia is suffering'.

The MoF is responsible for managing forest land, which accounts for around two-thirds of all land in Indonesia; even on this forest land, different stakeholders (e.g. the Ministry of Energy and Mineral Resources) follow different laws than those followed by the MoF, while the local government uses yet another law (Humas Setkab, 2013). The rest of the land is under BPN's management. The director of the national BPN office asserted, 'There are 13 laws related to land

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

5

which are not "harmonised", either horizontally among the laws or vertically with their references, namely the constitution'.

Until 2013 only 45 million parcels of land had been formally registered in 430 cities or districts out of more than 100 million land parcels (BPN, 2013a). In 1981, BPN launched a flagship programme, the Proyek Operasi Nasional Agraria (PRONA) scheme, which offered block registration to selected communities categorised as disadvantaged. These included communities of farmers, fishermen, transmigrants, owners of small-scale businesses and other low income groups (BPN, 2014a).

In 2013, BPN targeted over 800,000 registered land parcels, but as of June of that year, fewer than 300,000 parcels had been registered through the PRONA scheme. A head of division at the provincial office of BPN asserted the following:

> There are several possible reasons why landowners are not interested in certifying their lands. They perceive the process to be complicated... Then it is about registration costs they need to pay... They also consider the length of time needed. But it is all only their perception.

Despite some local response to the opportunity for low-cost land registration, findings from another study indicated that political manipulation and corrupt practices restricted the PRONA scheme's effectiveness (Warren & Lucas, 2013). That study also revealed that to many Indonesians, land registration is too expensive, cumbersome and unnecessary.

4.2. Land Conflicts

Registered land parcels stimulate an active land market. Often, land registration takes place in order to sell land, when 'legal certainty' is required (Warren & Lucas, 2013), especially in urban areas; between 2011 and 2013, there were more than 2.3 million transactions. In addition, unregistered ownership may contribute to conflicts over land. Kristiansen and Sulistiawati (2014) found that in eastern Indonesia, the vast majority of respondents indicated that the main motivation for land registration is to avoid potential conflicts over land in the future.

By September 2013 more than 4,000 land conflicts had been reported, with varying degrees of problems, while less than half of them had been resolved (BPN, 2013a). The highest frequency of land conflicts was evident in the provinces of Bali, West Java, Central Java, West Sumatera and South Sulawesi, with 300–500 cases in each area. In newly developed provinces, like North Maluku, Riau Islands and the Bangka Belitung Islands, conflicts numbered only around 10 in this year.

Land conflict happens for various reasons such as: (1) illegal occupancy, (2) border disputes, (3) inheritance disputes, (4) multiple sales, (5) double certificates, (6) surrogate certificates, (7) false transaction letters, (8) border mispointings, (9) overlapping borders and (10) court decisions (BPN 2013b). LIS will be useful to minimise conflicts by eliminating some of these factors (McIntyre & Associates Pty Ltd., 2008). Therefore, in a national coordination meeting in 2013, BPN's head asserted the importance of having an integrated LIS which links textual and spatial land data to allow spatial planning that supports development. He emphasised that '"no map, no plan" and "no map, no certificate" [policy] is a must... No more registration for unmapped land' (Bhumi Bhakti, 2013, p. 8).

4.3 Information System Use in Land Management

The use of IS in land management was initiated in 1997 through an initiative called Land Office Computerisation (KKP). The main objectives of the initiative include digitising land data, developing proper land management, improving the quality of services, improving the competencies of human resources and standardising land data to facilitate information

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

6

interchange. Table 1 summarises the important milestones of IS implementation and BPN's related flagship programmes. Details of some innovations are described in detail below.

Year	*Important milestones*
1997	- BPN introduced the KKP initiative in 12 of BPN's city/district offices located in eight provinces. - Attention was paid to a textual land database and stand-alone systems. - BPN established the Workgroup for Technology Transfer.
1981	- BPN launched the PRONA scheme, which offered block registration to selected disadvantaged communities.
2002	- KKP was expanded to other offices. - A spatial land database was introduced, although this was still separate from the textual database.
2003	- A presidential decree calling on BPN to develop a national LIS was enacted.
2004	- BPN launched the Land Management and Policy Development Project to develop a National LIS, sponsored by the World Bank. - BPN launched a land registration programme for farmers.
2006	- BPN digitised maps of 70% of the registered land parcels in the province of DKI Jakarta. - BPN launched LARASITA, a mobile land titling service to serve remote areas.
2007	- LARASITA became a national programme and was operated by 30 BPN offices at the city/district level. - A presidential decree was issued to support the development of a national spatial data network. - BPN developed the National Land Policy Framework (NLPF), which set the priorities for the development of the National LIS. - BPN launched a land registration programme for fishermen.
2008	- KKP and LARASITA were implemented in 124 BPN offices distributed throughout all provinces, with the support of laptops, a modified van, a motorcycle and measurement equipment.
2009	- LARASITA used a boat to reach scattered small islands. The pilot project was conducted in Kepulauan Seribu.
2010	- KKP and LARASITA were implemented in 430 BPN offices. - BPN launched a land registration programme for low-income groups. - BPN adopted the Land Administration Domain Model (ISO-19152).
2011	- A law concerning geospatial information was enacted and provided legal support for the 'One Map Policy' initiative. - BIG started implementing the National Spatial Data Infrastructure (NSDI).
2013	- BPN launched an Android-based mobile application 'BPN Goes Mobile', facilitating access to information on various services. - BPN introduced several service innovations – 'quick service', 'open Saturdays' and 'seven-minute service'. - Up to mid-August, data on 32 (out of 44.5) million land parcels were digitised. - Information about the location, dimension and legality of 19.8 million of land parcels were available.
2014	- BPN launched the SMS-based land information '2409' centre.
	Indonesian acronyms used in the table: **BPN**: *Badan Pertanahan Nasional* (the National Land Agency) **KKP**: *Komputerisasi Kantor Pertanahan* (Land Office Computerisation) **PRONA**: *Proyek Operasi Nasional Agraria*; a scheme, which offered block registration to selected disadvantaged communities **LARASITA**: *Layanan Rakyat untuk Sertipikasi Pertanahan* (Land Titling Service) **BIG**: *Badan Informasi Geospasial* (the Geospatial Information Agency)

Table 1. The history of IS implementation in BPN
Sources: Interviews, Africa (2013), BPN (2013a), BPN (2014a), Laarakker and Windanaya (2010), Winoto (2009).

In 2004, BPN started to formulate a strategy for a national LIS under the Land Management and Policy Development Project sponsored by the World Bank. The national LIS was expected to

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

7

cover cadastral mapping, a database of land assets, textual and spatial data serving land registration and an inventory of land tenure and ownership (Heryani & Grant, 2004). Further, in 2007, BPN developed the National Land Policy Framework (NLPF), part of which involved policies to accelerate land titling and develop spatial planning capacity at city/district level BPN offices (Laarakker & Windanaya, 2010).

In 2006, after a successful pilot project in one BPN's district office, the LARASITA was launched. LARASITA provides services to remote areas through mobile land offices (a modified van or boat, see Figure 2), equipped with laptops connected to the main databases in local BPN offices, using an Internet connection through a virtual private network. In 2007, LARASITA became a national programme, and it has been expanding gradually. Up to the end of 2010, the KKP and LARASITA systems had been implemented in 430 BPN offices at the city and district level (see Figure 3). BPN subsequently further developed Geo-KKP, a web-based system that connects textual and spatial land data (Bhumi Bhakti, 2013).

Figure 2. LARASITA in Action
Source: http://www.bpn.go.id/Program-Prioritas/LARASITA.
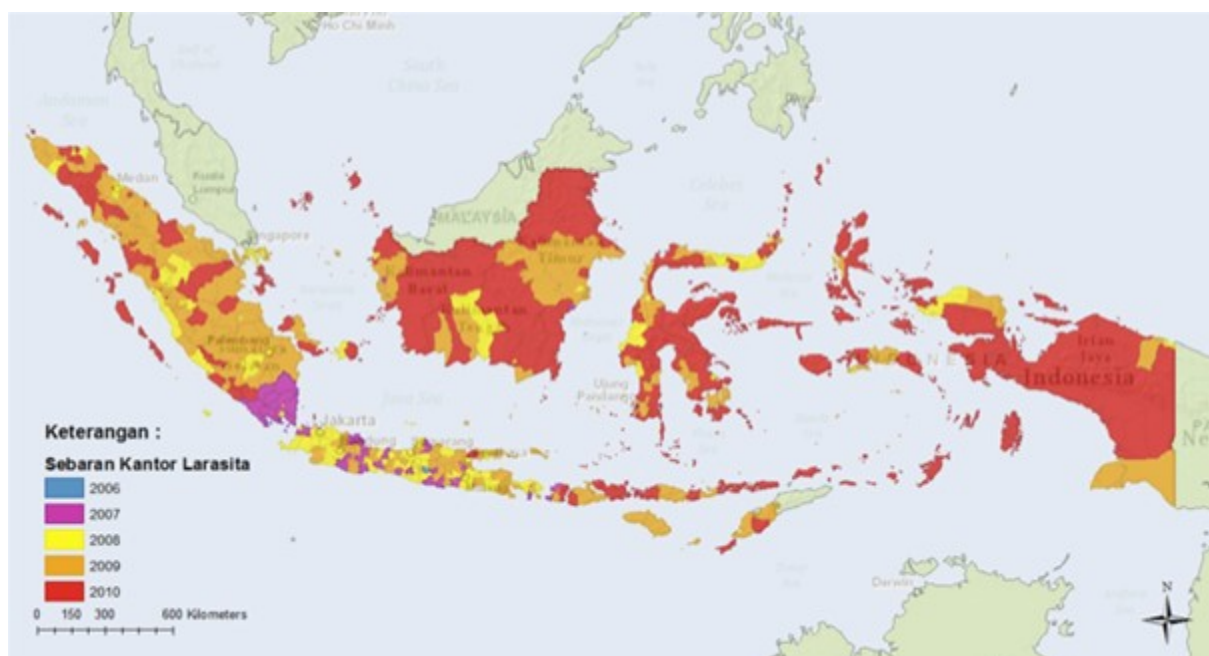
Figure 3. Service Areas of LARASITA from 2006 to 2010
Source: http://www.bpn.go.id/Program-Prioritas/LARASITA.

A law concerning geospatial information was enacted in 2011, providing legal support for the 'One Map Policy' initiative, coordinated by BIG. In the same year, BIG started implementing the National Spatial Data Infrastructure (NSDI). BIG aims to integrate thematic geospatial

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

8

information developed by various government agencies, to avoid different and often overlapping geospatial data and maps being used, maps that may cause conflicts (Humas Setkab, 2013). BIG expects to produce an integrated map, as asserted by the head of BIG: 'By implementing an NSDI, we can help facilitate good governance in many agencies. It will support more efficient administration, especially in eliminating duplicate sets of the same data, thereby allowing agencies to reduce the cost of producing maps' (Africa, 2013).

Today, BIG is still in an early stage, focusing on the involvement of government agencies in various working groups responsible for specific areas, such as small islands, mangrove mapping, water resources, coastal and sea resources and agricultural land resources. A series of national meetings are being conducted to discuss and agree on the integration of geospatial information at both the policy and technical levels. The ultimate goal of the 'One Map Policy' or NSDI is to produce 'one reference, one standard, one database and one geo-portal' (BIG, 2014).

5. DISCUSSION

The use of IS in this context cannot be separated from the idea of building effective land management, which is useful for social stability, economic development and environmental management (Huber et al., 2008; Silva, 2007). From an operational perspective, effective land administration may lead to various developmental effects, such as better spatial planning, improved public services and conflict minimisation. This idea is obviously imported from practices in developed countries using sophisticated cadastre systems, where the main objective is to support an active land market by permitting land to be bought, sold, leased or mortgaged (Huber et al., 2008). However, in Indonesia, customary law needs to be accommodated, making it necessary to adjust the introduction of modern land management. Failing to take into consideration customary laws – which are deeply rooted in various cultural groups – may create conflict (Kristiansen & Sulistiawati, 2014). The number of conflicts reported by BPN has been criticised by the Consortium for Agrarian Reform (KPA) (2013), as it does not represent land conflicts which have broad social impacts. In 2013, KPA recorded 369 land conflicts involving around 1.3 million hectares of land and affecting 140 000 families. Because of these conflicts, 21 people died, 30 were shot (injured), 239 were sent to jail and another 130 were prosecuted. The magnitude of conflicts has been escalating since over the past five years in terms of quantity (314% increase) and the area involved (861%), as well as the number of people affected (1,744%) (Consortium for Agrarian Reform, 2013).

Before being embedded into a new setting, the imported idea needs to be translated into an object in order to make it more tangible (Czarniawska & Joerges, 1996). Through the objectification process, the idea is translated into a modern LIS, which is useful for effective land management (Barrett et al., 2001; Karikari et al., 2005; Mooketsi & Leonard, 2013). In Indonesia, the concepts of the various initiatives discussed above represent objectified translations of the idea of developing effective land management. This objectification is in general specific to the Indonesian context. For example, the concept of LARASITA is quite a context-specific solution, as it was designed to reach previously disconnected communities.

These concepts are then translated into actions, exemplified by the implementation of the initiatives. The translation process from an object into an action takes place through iterative processes (cf. Wahid, 2013). Several examples can be given. First, KKP, which was developed in 1997 as a stand-alone system and focused on textual land data, was then improved as Geo-KKP, a web-based system facilitating textual and spatial land data linkup. Second, LARASITA also exemplifies an action resulting from a multi-round translation process. When launched in 2006, LARASITA used radio-wave communication and bulky equipment. It had only a limited coverage area due to connectivity problems. Subsequently, Internet technology was adopted to broaden the service areas and to increase connections' reliability. Today, LARASITA uses a modified van equipped with laptops connected to the Internet as its basis, and in addition, uses motorcycles and a boat to reach remote areas. Third, NSDI has been implemented gradually by

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

9

integrating thematic geospatial information developed by many different government agencies (Africa, 2013).

Next, these actions are institutionalised and become part of everyday business processes, being used by 430 BPN offices at the city or district level throughout Indonesia. Some other programmes are still in the process of being institutionalised. An action becomes institutionalised when it is generally accepted without debate by the actors involved, is widely adopted and exhibits permanence (Tolbert & Zucker, 1983), and when its existence is no longer dependent upon powerful actors (Avgerou, 2000).

The translation process from one form to another is influenced by various editing rules (Sahlin-Andersson, 1996). The literature on IS in developing countries suggests that local adaptation or improvisation is one way to increase the success rate of any IS implementation (Heeks, 2002). In this study, we identified several local editing rules. First, from a legal perspective, conflicting laws, including customary law not accommodated in the national LIS's implementation, hinder the development of effective land management. How well the LIS is embedded legally within the existing laws is important for a successful implementation. A study in India suggests that without necessary changes in property rights systems, the impact of IS adoption in land management will remain marginal (Deininger & Goyal, 2010).

Second, socially, the acceleration of land titling through various schemes has not had as much response from the public as expected. The public, and even the notaries, still perceive the land registration process as too costly, time-consuming and complicated. The success of LIS implementation depends on society's attitude as a whole, and particularly that of the communities in which the systems are located (Zevenbergen, 2002).

Third, technically, some innovations are made to eliminate the drawbacks of previously used technology. For instance, KKP was first developed as a stand-alone system focussing only on textual land data, and was then further developed as a web-based system facilitating textual and spatial data linkups. Recently, SMS-based land information service has been introduced. We argue that the advancement of relevant technology and the contextual demands influence the choice of technologies.

Fourth, politically, BPN and BIG are the agencies being responsible for developing effective land management. Both of these agencies are legally secured with presidential decrees related to undertaking their duties, including making policies. Without this legitimacy, their efforts would face political burdens, as the 'sectorial ego' of many government agencies would need to be taken into account. The system's legitimacy in the eyes of different actors is influential in making LIS implementation successful (Zevenbergen, 2002).

Fifth, organisationally, to make the idea of developing effective land management happen, BPN has set bureaucratic reform high on the agenda (BPN, 2014b). BPN officers' readiness is quite influential in this context, which may create contradictions arising from the interaction between old and new practices (Sahay & Walsham, 1996).

In Figure 4, below, we summarise the idea translation process described in this section using the model from Czarniawska and Joerges (1996) illustrated in Figure 1.
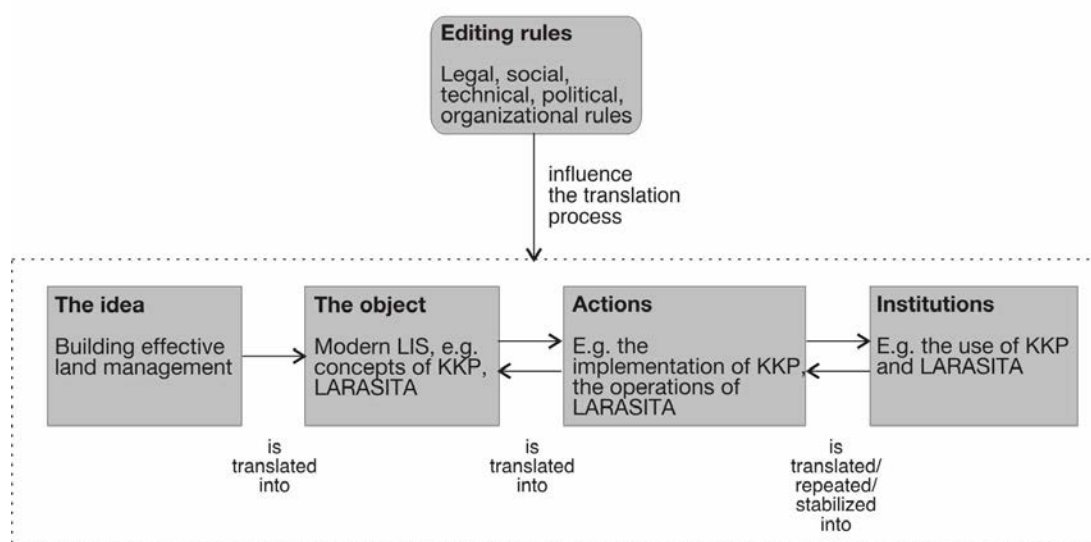
Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

10

Figure 4. The Process of Idea Translation in Land Management in Indonesia

The above findings provide insights for practice. First, building effective LIS is not about adopting best practice from developed countries as-is; instead, it should consider contextual aspects, including customary law (cf. Heeks, 2002). In this context, Benjamin et al. (2007) suggested that 'best practice' is a politically neutered concept which should be replaced by a more rigorous one that considers the imbalance of power and control embodied by LIS. Second, a gradual implementation strategy seems to be appropriate within this context, for a multiple-round translation process to occur. In the context of IS use, sufficient attention should be paid to the development of IS and the contextual changes over time. Third, LIS to support effective land management does not merely involve technical and legal issues, but is also intertwined with other social, political and organisational factors. Interventions made by the government to foster effective use of LIS need to address such factors. Otherwise, the use of LIS may result in top-down policies, which underplay, or even neglect, local specificity around land. It is important to take the above insights into consideration when building effective land management. Otherwise, the potential land-related conflicts remain substantially unresolved and the implementation of LIS can lead to an even more uneven relation between the elites (the large player in the land markets) and the common people (cf. Benjamin et al., 2007).

6. CONCLUSION

In this paper, we presented an overview of IS use in Indonesia's land management. We analysed our findings using the concept of idea translation. The idea under investigation was developing effective land management, which has been translated into various innovations in Indonesia. Innovations have been introduced not only to improve back-office systems, but also to develop a better interface for the provision of quality public services. Many innovations supporting the development of effective land management are heavily dependent on IS, which have been translated into the local context by considering various types of editing rules (legal, social, technical, political and organisational) through iterative translation processes.

We offered four main contributions. First, we described the current outlook of IS adoption in Indonesia's LIS. Second, we identified various empirical issues which have emerged during the IS implementation process that need to be dealt with, and are largely context-specific. Third, we interpreted the findings using a concept from Scandinavian-flavoured institutional theory (i.e. idea translation; Czarniawska & Sevón, 1996); this represented an alternative analytical lens providing a nuanced explanation of IS adoption in a specific context (cf. Heeks, 2002). Fourth, we highlighted several insights for practice. In short, an appropriate implementation strategy is

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

11

needed, and building effective land management in general and successful LIS in particular should consider contextual specificity.

As a baseline study, this paper focuses on IS solutions implemented to support land management and land related services in Indonesia. Considering the huge disparity between various areas in Indonesia, our future research will further investigate how policies, and IS- based solutions are translated to better understanding contextual factors, which may further affect ideas translated into various contexts.

REFERENCES

Africa, C. (2013). Indonesia's one map journey. Retrieved September 5, 2014, from http://www.futuregov.asia/articles/2013/sep/30/indonesias-one-map-journey/

Arko-Adjei, A. (2006). *A conceptual approach for enhancing customary land management: Case from Ghana*. Paper presented at the 5th FIG Regional Conference: Promoting Land Administration and Good Governance, Accra, Ghana.

Avgerou, C. (2000). IT and organizational change: An institutionalist perspective. *Information Technology and People, 13*(4), 234-262.

Bakker, L., & Moniaga, S. (2010). The space between: Land claims and the law in Indonesia. *Asian Journal of Social Science, 38*(2), 187-203.

Barrett, M., Sahay, S., & Walsham, G. (2001). Information technology and social transformation: GIS for forestry management in India. *The Information Society, 17*(1), 5-20.

Benbasat, I., Goldstein, D. K., & Mead, M. (1987). The case research strategy in studies of information systems. *MIS Quarterly, 11*(3), 369-386.

Benjamin, S., Bhuvaneswari, R., Rajan, P., & Manjunatha. (2007). Bhoomi: 'E-governance', or, an anti-politics machine necessary to globalize Bangalore? *CASUM-m working paper*. Retrieved from https://casumm.files.wordpress.com/2008/09/bhoomi-e-governance.pdf

Bennett, R., Rajabifard, A., Williamson, I., & Wallace, J. (2012). On the need for national land administration infrastructures. *Land Use Policy, 29*(1), 208-219.

Bhumi Bhakti. (2013). Reformasi birokrasi di BPN RI. *Bhumi Bhakti,* 6-9 (Bureaucratic reforms at the National Land Agency).

BIG. (2014). BIG selenggarakan Rakortek IGT sebagai tindak lanjut Rakornas IG tahun 2014. Retrieved September 10, 2014, from http://www.big.go.id/berita-surta/show/big-selenggarakan-rakortek-igt-sebagai-tindak-lanjut-rakornas-ig-tahun-2014 (BIG held a technical coordination meeting on thematic geospatial information to follow up the national coordination meeting on geospatial information in 2014).

BPN. (2013a). Jumlah bidang tanah bersertifikat per tahun. Retrieved August 28, 2014, from http://www.bpn.go.id/Publikasi/Data-Pertanahan/Kasus-Pertanahan/Nasional   (The number of certified lands by year).

BPN. (2013b). Penanganan kasus pertanahan. Retrieved August 28, 2014, from http://www.bpn.go.id/Program-Prioritas/Penanganan-Kasus-Pertanahan (Land conflicts handling).

BPN. (2014a). Sekilas program legalisasi aset BPN-RI. Retrieved August 28, 2014, from http://www.bpn.go.id/Program-Prioritas/Legalisasi-Aset (Asset legalization program at the National Land Agency at a glance).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

12

BPN. (2014b). Sekilas reformasi birokrasi Badan Pertanahan Nasional RI. Retrieved September 11, 2014, from http://www.bpn.go.id/Program-Prioritas/Reformasi-Birokrasi (Bureaucratic reforms at the National Land Agency at a glance).

Brunsson, N., & Olsen, J. P. (1993). *The Reforming Organization*. London: Routledge.

Chawla, R., & Bhatnagar, S. (2004). *Online delivery of land titles to rural farmers in Karnataka, India*. Paper presented at the Scaling Up Poverty Reduction: A Global Learning Process and Conference, Shanghai.

Consortium for Agrarian Reform. (2013). Warisan buruk masalah agraria di bawah kekuasaan SBY. *Laporan Akhir Tahun 2013 Konsorsium Pembaruan Agraria*. Retrieved from http://www.kpa.or.id/wp-content/uploads/2011/11/Laporan-Akhir-Tahun-2013-KPA_final-release-19-Des.pdf

Czarniawska, B., & Joerges, B. (1996). Travel of ideas. In B. Czarniawska & G. Sevón (Eds.), *Translating Organizational Change* (pp. 13-48). Berlin: Walter de Gruyter.

Czarniawska, B., & Sevón, G. (1996). Introduction. In B. Czarniawska & G. Sevón (Eds.), *Translating Organizational Change* (pp. 1-12). Berlin: Walter de Gruyter.

David, R. J., & Bitektine, A. B. (2009). The deinstitutionalization of institutional theory?: Exploring divergent agendas in institutional research. In D. Buchanan & A. Bryman (Eds.), *The SAGE Handbook of Organizational Research Methods* (pp. 160-175). London: Sage.

Deininger, K., & Goyal, A. (2010). Going digital: credit effects of land registry computerization in India. *World Bank Policy Research Working Paper*. Retrieved from http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2010/03/29/000158349_20100329110509/Rendered/PDF/WPS5244.pdf

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review, 48*(2), 147-160.

Firman, T. (2004). Major issues in Indonesia's urban land development. *Land Use Policy, 21*(4), 347-355.

Haveman, H. A. (1993). Follow the leader: Mimetic isomorphism and entry into new markets. *Administrative Science Quarterly, 38*(4), 593-627.

Heeks, R. (2002). Information systems and developing countries: Failure, success and local improvisations. *The Information Society, 18*, 101-112.

Heryani, E., & Grant, C. (2004). *Land administration in Indonesia*. Paper presented at the 3rd FIG Regional Conference, Jakarta.

Huber, M., Mithöfer, K., Schär, P., Harvey, F., & Mukasa, O. (2008). *Universal land registry to support independent economic development in Tanzania*. Paper presented at the The Tenth GSDI Conference, St. Augustine, Trinidad

Humas Setkab. (2013). Redam konflik penguasaan lahan, Badan Informasi Geospasial susun satu peta dasar. Retrieved August 29, 2014, from http://www.setkab.go.id/berita-8452-redam-konflik-penguasaan-lahan-badan-informasi-geospasial-susun-satu-peta-dasar.html (Reducing land conflicts, the Geospatial Information Agency makes a basemap).

Karikari, I., Stillwell, J., & Carver, S. (2005). The application of GIS in the lands sector of a developing country: Challenges facing land administrators in Ghana. *International Journal of Geographical Information Science, 19*(3), 343-362.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

13

Klein, H. K., & Myers, M. D. (1999). A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly, 23*(1), 67-93.

Kristiansen, S., & Sulistiawati, L. Y. (2014). *Traditions, land rights and local welfare creation: Studies from Eastern Indonesia*. Working paper.

Laarakker, P., & Windanaya, S. (2010). *Land information challenges in Indonesia*. Paper presented at the The GSDI 12 World Conference, Singapore.

Langley, A. (1999). Strategies for theorizing from process data. *Academy of Management Review, 24*(4), 691-710.

McIntyre, M., & Associates Pty Ltd. (2008). Review of land information systems for land administration, land-use planning and management *The Land Management and Conflict Minimisation Project (LMCM), Sub-project Report 3.2*. Suva, Fiji: The Pacific Islands Forum Secretariat.

Meyer, J. W., & Rowan, B. (1977). Institutional organizations: Formal structure as myth and ceremony. *American Journal of Sociology, 83*, 340-463.

Mooketsi, B. E., & Leonard, M. (2013). Factors influencing the usage of the tribal land information management systems for land management and administration: The case of Mogoditshane subordinate land-board. *The Electronic Journal of Information Systems in Developing Countries, 59*(5), 1-17.

Myers, M. D., & Newman, M. (2007). The qualitative interview in IS research: Examining the craft. *Information and Organization, 17*, 2-26.

Sahay, S., & Walsham, G. (1996). Implementation of GIS in India: Organizational issues and implications. *International Journal of Geographical Information Systems, 10*(4), 385-404.

Sahlin, K., & Wedlin, L. (2008). Circulating ideas: Imitation, translating and editing. In R. Greenwood, C. Oliver, R. Suddaby & K. Sahlin (Eds.), *The SAGE Handbook of Organizational Institutionalism* (pp. 218-242). Los Angeles: Sage.

Sahlin-Andersson, K. (1996). Imitating by editing success: The construction of organizational fields. In B. Czarnlawska & G. Sevon (Eds.), *Translating Organizational Change* (pp. 69-92). Berlin: Walter de Gruyter.

Sevón, G. (1996). Organizational imitation in identity transformation. In B. Czarniawska & G. Sevón (Eds.), *Translating Organizational Change* (pp. 49-67). Berlin: Walter de Gruyter.

Silva, L. (2007). Institutionalization does not occur by decree: Institutional obstacles in implementing a land administration system in a developing country. *Information Technology for Development, 13*(1), 27-48.

Stanforth, C. (2006). Using Actor-Network Theory to analyze e-government implementation in developing countries. *Information Technologies and International Development, 3*(3), 35-60.

Tolbert, P. S., & Zucker, L. G. (1983). Institutional sources of change in the formal structure of organizations: The diffusion of civil service reform, 1880-1935. *Administrative Science Quarterly, 28*, 22-39.

Wahid, F. (2013). Translating the idea of the eGovernment one-stop shop in Indonesia. In M. Khabib, E. J. Neuhold, A. M. Tjoa, E. Weippl & I. You (Eds.), *Information & Communication Technology-EurAsia Conference* (pp. 1-10). Berlin: Springer.

Walsham, G. (1995). Interpretive case studies in IS research: Nature and method. *European Journal of Information Systems, 4*, 74-81.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

14

Warren, C., & Lucas, A. (2013). Indonesia's land title program (LAP) - The market solution? In A. Lucas & C. Warren (Eds.), *Land for The People: The State and Agrarian Conflict in Indonesia* (pp. 93-113). Ohio: Ohio University Press.

Winoto, J. (2009). *Taking land policy and administration in Indonesia to the next stage and National Land Agency's strategic plan*. Paper presented at the Workshop in International Federation of Surveyors' Forum, Washington DC.

Yin, R. K. (2009). *Case Study Research: Design and Methods*. California: Sage.

Yusuf, H. (2011). *Land administration system in Indonesia*. Paper presented at the Pre-17th AVA Congress, Siem Reap, Cambodia.

Zevenbergen, J. (2002). *Systems of Land Registration: Aspects and Effects*. Delft, The Netherlands: Netherlands Geodetic Commission.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

15

PARTICIPATION IN ICT DEVELOPMENT INTERVENTIONS: WHO AND HOW?

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Abstract: The aim of participatory development (PD) in the context of using Information and Communication Technologies (ICT) for development (ICT4D) is to empower underprivileged communities and disadvantaged segments of the stakeholders. The literature on ICT4D is replete with empirical evidence showing ICT interventions often fail because they are initiated from without, with no involvement from the affected (Heeks, 2002). Clearly, the principles and concepts of PD are relevant to ICT4D. However, we should not consider PD a panacea but must understand the caveats and processes by which PD happens. Questions we must ask ourselves include the following: What are the various challenges in PD; who are the relevant stakeholders; why and how do actors enroll in the project; and how do we create sustainable ICT4D projects through PD? To understand these research questions, we present a case analysis of a project in Nepal called the Nepal Wireless Networking Project (NWNP). Drawing on our findings and the specific initiatives that they enabled–telemedicine, education and jobs–we propose that the key participants in the NWNP were activist actors and the affected and that activists drew upon existing social capital to enroll the affected through a process explained by Actor Network Theory (ANT). In the process, they built other forms of social capital, which in turn extended the benefits of PD to several mountain villages.

Keywords: Participatory Development (PD), Actor Network Theory (ANT), Social Capital (SC), ICT4D, Nepal.

1. INTRODUCTION

Understanding the processes by which Information and Communication Technologies (ICT) might foster socioeconomic development is a challenge. The complexity becomes manifold when accounting for the actors involved. Participatory development (PD), which focuses on the inclusion of local actors in the development process, is clearly relevant to using ICT for development (ICT4D). The PD approach addresses the need to understand contextual issues like socio-cultural values, local knowledge systems, and the implicit and explicit rules that aren't always obvious to outside observers (Winschiers-Theophilus et al., 2010). That said, implementing PD can result in new challenges to fostering participation, including creating awareness of mutual cultural dependency in order to fund ICT projects in developing countries (Winschiers-Theophilus et al., 2010).

PD is introduced to empower and involve communities and embedded collective actions in development projects. More research is needed to determine how best to do so (Botes & Van Rensburg, 2000) and to understand the influence of the following issues on projects: the power differences between host communities and designers, cultural and linguistic barriers, PD-technique incompatibilities, uncertainty based on participants' having different social, educational, and cultural backgrounds, vast geographical distances, low literacy levels, and poor

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

16

information infrastructures (Oyugi et al., 2008). Moreover, whereas standard usability evaluation is based on Western biases, more research is needed to develop PD approaches that address contextual issues in other parts of the world (Winschiers-Theophilus et al., 2010). PD processes within the use of ICT4D are criticized for having naïve, romantic notions of a "common purpose and [the] common good" (Botes & Van Rensburg, 2000), and underestimating the importance of cross-cultural matters (Winschiers-Theophilus et al., 2010). A typical scenario entails divergent participatory approaches and values among developers and users. Because an important focus in PD interactions is mutual learning to create shared understanding between various participants, PD projects should be based on an interpretative approach that fully accounts for socio-economic, cultural, and political contexts (ibid).

PD is important for the success of any ICT4D project. However, there are some caveats. A wide range of issues can hinder and constrain the promotion of PD, including those arising from institutional, socio-cultural, technical, and logistical factors (Botes & Van Rensburg, 2000). Botes and van Rensburg (2000) identify nine obstacles and impediments, or *plagues'* prohibiting the promotion of PD processes within ICT4D projects. These plagues are introduced to guide our discussion and demonstrate the added value of introducing its theoretical lens within the context of PD.

In this paper, we present an example case, the Nepal Wireless Networking Project (NWNP), to illustrate how a mountain community succeeded in mitigating these plagues. To understand how these plagues emerge and how they influence each other, we have applied actor-network theory (ANT) and the concept of social capital (SC) from an epistemological perspective. In doing so, this paper contributes to a deeper understanding of the plagues in PD, especially in the context of ICT4D, and suggests possible solutions based on identifying relevant actors. We also describe how various actors engage, create shared understanding, and consequently, activate/reinforce social capital, and how they thereafter mobilize social capital to promote collective action vis-à-vis socioeconomic development, as demonstrated in findings from the NWNP.

Table 1: Nine plagues to PD projects (Botes & Van Rensburg, 2000)

No.	Plague	Description
(1)	*Paternalistic role of development professionals*	Outsiders, who often dominate the PD project with preconceived ideas of what they want to achieve, initiate most projects.
(2)	*Inhibiting and prescriptive role of the state*	PD projects often advocate for and maintain existing power structures, putting less emphasis on improving the lives of citizens.
(3)	*Over-reporting development successes*	By overemphasising successes, PD projects fail to learn lessons on how to overcome pitfalls and constraints.
(4)	*Selective participation*	Projects tend to address and include the more resourceful groups in local communities, running the risk of buying support from select groups in host societies.
(5)	*Hard-issue biases*	PD projects often focuses more on issues related to technological, financial, physical, and material concerns, than on soft issues related to community involvement, decision-making procedures, social contracts, and empowerment
(6)	*Conflicting interest groups within end-beneficiary communities*	PD projects provide limited, scarce resources, and this can lead to conflicts between prioritized and non-prioritized groups.
(7)	*Gate-keeping by local elites*	Dominant groups can thwart attempts to engage directly with beneficiaries so that they can maintain control in host communities.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

17

(8)	*Excessive pressures for immediate results*	In seeking quick, visible results, benefactors end up prioritizing end products over process factors, such as participant perspectives.
(9)	*Lack of public interest in involvement*	Community members might not be interested in participating, due to a lack of competence, earlier (disappointing) experiences, or a lack of culture understanding of how to engage in decision-making processes.

2. THEORETICAL PREMISES

In the following section we briefly introduce SC and ANT and explain their relevance in understanding PD practices. By doing so we hope to relate participant approaches and theories to ICT4D initiatives.

2.1. Social capital

SC and PD are both based on the idea that involvement and participation can have positive consequences for individuals and communities. Coined by Hanifan in 1916 (Huysman & Wulf, 2004), SC focuses on "the norms and networks that facilitate collective action" (Woolcook, 2001, p. 70) and is used as a lens through which to explore goodwill, fellowship, sympathy, and social interaction among individuals and groups in a social unit. By emphasizing the resources embedded in social networks, it is an appropriate perspective from which to explore a community and its collective level of development (Ibrahim, 2006; Putnam, 2000) and, in particular, the effect of ICT intervention in the rural portions of a developing country (Díaz, Andrade & Urquhart, 2009). SC has three different forms: bonding, bridging, and linking (see Thapa et al., 2012, for a more thorough discussion).

Previous studies show that ICT promotes interaction among community participants who help to generate and maintain the trust, acceptance, and orientation necessary for successful cooperation (Syrjänen & Kuutti, 2004) and extend existing community networking through improved transparency and participation (Rohde, 2004). Such studies illustrate the importance of social capital in participant approaches as well. Social capital describes the benefits of different forms of social networks that can promote collective action in PD and lead to socioeconomic development.

2.2. Actor Network Theory

The major reason for incorporating ANT into this paper is to understand the process whereby social networks of aligned interests are created and maintained. ANT describes the process and explores how focal actors identify relevant actors, align their interests, enlist them, and mobilize networks (Latour, 2005). The basic premise of ANT posits that both human beings and non-human objects are actors or *actants* and that social, technical, conceptual, and textual elements fit together in a process of *heterogeneous engineering* (Callon, 1997). ANT can be used as a theory *or* as a sense-making tool. As a theory it explores the ontology of networking; as Cordella & Shaikh have stated: "ANT tracks the process before the box actually gets closed, rather than opening the black-box to study the process." (2006, pp. 8). In this paper, we apply the ANT translation process, as described in Callon (1997), as a data-analysis method. We show, through this analysis, that ANT is helpful in understanding how various plagues in PD can be addressed through the interplay of various actors and social networks in the form of SC.

2.3. Relevance of ANT and SC for PD

Participatory development advocates empowerment through involvement (Botes & Van Rensburg, 2000). A main challenge in PD is identifying key actors, enrolling them by creating shared understanding, and finally, mobilizing them for community development. The social capital lens can aid in understanding how participation among actors occurs and how this, in turn, leads to collective action (Thapa et al., 2012). Social capital's core element is the social-relations network, which is characterized by norms of trust and reciprocity (Adler & Kwon,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

18

2002). And yet, the social capital lens does not answer some questions, such as who the central actors *are*. Nor does it explain *how* those actors go about building social networks. Moreover, social capital can take tangible and intangible forms, as is the case with physical-resource exchanges and emotional bonding. Intangible social capital is difficult to map without observation. Social capital like as actors' networks and behaviors therein are intangible, and we must therefore trace the networks among them.

One possible theoretical lens with which to examine these issues is ANT (Walsham, 1997). ANT helps to explain who the central actors are and how they enlist other actors into networks. It can also provide a lens through which to understand the processes of establishing facts of and definitions for intangible social capital. More specifically, ANT analyses how the processes, controversies, and negotiations leading to the formation of social capital progress. Furthermore, recent studies in ICT4D have used ANT as an analytical lens through which to explore socio-technical phenomena in developing countries (Andrade & Urquhart, 2010; Thapa, 2011). A major focus of ANT, as in PD, is the exploration of processes whereby relatively stable networks of aligned interests are created and maintained or, alternatively, determining why such networks fail to establish themselves. ANT suggests that successful social networks of aligned interests are created through the enlistment of actors and the translation of their interests so that they are willing to participate in particular modes of thinking and acting that maintain the network (Callon, 1986). We therefore propose that SC and ANT are complementary lenses through which to understand the enlistment process for PD participants—which process promotes collective action and consequently builds collective and individual capabilities (Thapa et al., 2012).

3. RESEARCH METHODS

We conducted an interpretive case study to understand the local context of and observe the interactions among various actors, as well as to examine these factors' consequences for SC-building and development processes. Around 60 interviews were conducted in villages and one was conducted with the wireless project's team leader. Interviews ranged from 20 to 60 minutes and focused on understanding the state of the community's development and how its interaction with ICT might lead to the formation and extension of bonding, bridging, and linking SC. For this reason, we queried different social groups and institutions in the studied villages. The data were transcribed, coded, and categorized. Categorization was determined on the basis of the nine plagues discussed above, and thereafter, we used ANT translation phases and the lens of SC to trace relationships among the various categories. Throughout the project, data comparisons were performed to reveal connections between different categories and interview codes. Our data analysis was mainly focused on the various aspects of PD, such as who the project's main actors were, how they built and mobilized their social capital, and consequently, how they addressed challenges. Our findings are summarized in Table 2.

4. CASE ANALYSIS

The process of developing the NWNP started with *problematisation*. In this phase, the project's main actor (i.e., Pun) was exploring answers to the following questions: What problems needs to be solved; who are the relevant actors; how can one arrive at an obligatory passage point (OPP)[1]? It was sometime in 1989 when Pun realized that villages in mountainous regions are geographically, politically, and economically isolated from his country's mainstream development. As ANT suggests, a focal actor, Pun, played an important role in the network-formation process. The idea of introducing Internet services in a mountain village was conceived of in Pun's mind when he started teaching at Nangi high school, after having returned from the U.S. in 1997 (he had previously received a scholarship to pursue his bachelor's and master's degrees in the U.S.). While living in the U.S., Pun identified the potential information technology

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[1] In this context, a mediator or intermediary

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

19

had to connect isolated villages with the outside world and, at the same time, its possibilities for creating development opportunities.

In 1997, he initiated personal correspondence with an Australian school and succeeded in acquiring four used computers. These computers were installed in the Nangi School to teach basic computer skills. Later, the school received some additional donated computers. However, there were still no telephone and Internet connections in the village. It became apparent that it would be impossible for Pun to accomplish his goals alone; consequently, he began seeking out other like-minded actors. In doing so, in 2001, he e-mailed the British Broadcasting Corporation (BBC). In his e-mail he asked for ideas on how to connect remote mountain villages to the outside world. The publication of his e-mail received an unexpectedly overwhelming response (according to Pun). As a result, volunteers from Europe and the United States came to Nangi and helped Pun set up a wireless station consisting of TV-dish antennas and basic Wi-Fi equipment. Pun, along with the volunteers (mainly graduate students from the U.S. and Europe), also started a micro-hydro project to provide electricity to the tele-center in the villages of Nangi and Tikot. These early successes led Pun and his fellow villagers to extend their SC into other schools, and to national and international volunteers and organizations like Open Learning Exchange (OLE)[2] Nepal, Kathmandu Model Hospital (KMH)[3], and thamel.com[4]. This extended SC promoted collaboration on many projects, such as distance education, telemedicine, and eBusiness. The installation of wireless services has since enhanced communication among these actors. As we can see the important issues at this stage involved the promotion of social norms and trust within and between various distant communities. Furthermore, it was also important to define the roles and responsibilities of various actors in the network according to their individual and social interests. And Pun, as the main facilitator, made himself an obligatory passage point for the entire process.

In the *interessement* phase, actors involved in a network negotiate and consolidate their roles and responsibilities and, furthermore, install a *balancing device,* a common platform in this context. For instance, OLE focused on developing educational content, KMH focused on introducing telemedicine services, and thamel.com focused on introducing eBusiness services. Likewise, all the actors involved in this initiative acknowledged the central role of the NWNP in fostering their individual and social interests. In 2003, the NWNP officially registered as an NGO. This was one of the most challenging phases in the development of the NWNP, as all sociotechnical interaction, retraction, and consolidation happened at this stage. In the *enrollment phase*, all the involved actors had to accept the roles that were defined for them during the interessement. Furthermore, Pun also established formal and informal norms among various national and international actors that bound them according to the roles attributed to them. Gradually, the NWNP's network started to expand into other parts of the world. Volunteers from several countries started donating computer parts, Wi-Fi equipment, and their skills to these mountain villages.

The *mobilization* phase investigates whether the main actor or actors in the project adequately represent the communities of interest. The team leader successfully identified and enlisted (or, at least, tried to enlist) relevant actors from different communities, activists, and institutions into the NWNP. So far, the NWNP's network of wireless projects has connected people across 175 villages, and the extended social capital it has created has begun enhancing mutual benefits to the organization's various involved partners. In the long run, then, the NWNP's activities might lead to socioeconomic development for the mountain communities the organization aids.

Meanwhile, PD principles guide the aim of improving education for school children. The NWNP is partnered with Open Learning Exchange (OLE) Nepal; an NGO based in the U.S. and Kathmandu, to develop educational content for children living in the isolated villages the NWNP

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[2] http://www.olenepal.org/, another ICT4D project in Nepal
[3] This organization is actively involved in implementing telemedicine services to the rural and remote areas of Nepal
[4] One of the most successful online business organizations in Nepal

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

20

serves. This content development is driven by experts in pedagogy (teachers) and implemented in local schools through local teachers with the help of parents, local politicians, and administrators. Likewise, a PD approach is evident in attempts to bring quality healthcare to Nepal's remote villages using telemedicine services. Every morning, village women responsible for health care services consult with doctors from Nepal's main hospitals using videoconferencing tools. They discuss patients and common diseases and learn from their peers in other communities. A variety of actors participated in the initiation, implementation, and operation of this telemedicine initiative, including the project's initiator, Suraj Dhittal (chief surgeon at Kathmandu Model Hospital and president of the Nepal Telemedicine Association), doctors from urban hospitals, local health workers, and local societies like the Mothers Society (*Amah Samoh* in Nepali).

Based on the findings reflected in the table, we will now turn to analyzing the NWNP with regards to participant development (PD) through our two theoretical lenses (ANT and SC).

ANT relates to the identification and enlistment of key actors, and these are also key activities in PD. Key actors' familiarity with the local context must be identified, and thereafter, they must be enlisted to achieve common objectives and mobilized to pursue the end goal (i.e., development). As the example of the NWNP shows, it is not one actor who makes a project possible; in Nangi, it was a collective of actors. Here, when we say *actors*, we should not forget the mediating role of technical actors as well. For example, the NWNP could not have even gotten started if Pun's e-mail had not have played a mediating role in reaching out to foreign volunteers through the BBC. ANT can provide an analytical lens for understanding such *hybrid communities* of socio-technical arrangements in participant development. If we reflect on the above tables this analytical lens can help us understand plagues 1, 2, 4, 5, 6, and 7. Botes et al. (2000) lists the same plagues but didn't describe the process by which they plagues can be comprehend—how such plagues emerge and how they interact.

Table 2: Findings from this case study

No.	Plagues	Findings from the NWNP	Lessons learned
(1)	*Paternalistic role of development professionals*	Mahabir Pun, the initiator of the NWNP, is a member of the community who spent years discussing what villagers needed. Pun later brought in external resources to help realize the project.	Unlike most ICT4D projects, the NWNP was initiated by an insider, a community member who really knew what was needed. However, the insider approach might create difficulties when scaling a project to other villages without an insider *champion*, as the NWNP has less experience with PD projects initiated externally.
(2)	*Inhibiting and prescriptive role of the state*	The NWNP project was initially not facilitated by any external participants, but is championed and facilitated within the community by Mahabir Pun. External facilitators where later included when needed.	The NWNP's internal facilitation and inclusion of internal and external participants is important to note. External facilitators were only included after the villagers where consulted and became active participants in the process; hence, external facilitators where never in a position to empower themselves on behalf of community-based facilitators.
(3)	*Over-reporting development successes*	The NWNP is seen (and communicated) as a successful project based on its experiences with the first two villages it became active in. Negative consequences in these villages (if they exist) have not been reported. Nor have any challenging situations that might have arisen in new villages since the NWNP began scaling up its activities.	Being dominated by internal stakeholders from the aided communities, the NWNP's focus has been on success, neither on challenges nor negative consequences. As external stakeholders gain more influence, more emphasis might be placed on less successful outcomes to gain greater insight into how to improve NWNP projects.
(4)	*Selective participation*	Mothers groups, religious groups, schoolteachers, and village committees (local authorities) have all been included in the NWNP's projects. The identification of these groups was based on local knowledge.	Indigenous groups had very limited knowledge on the potential benefits of ICT; hence, these groups were less involved in designing the ICT infrastructure. They do, however, play important roles as evangelists for the services provided. Local knowledge is needed to identify interest groups that should be included. Since (to our knowledge) no formal identification process has taken place, some interest groups might have been unintentionally excluded, even though the small size and social transparency of these villages minimizes such possibilities.
(5)	*Hard-issue bias*	The NWNP focused on identifying needs and developing trust (soft elements) from its very inception. While implementing services, focus was drawn more toward fixing computers and	Due to the lack of IT competence within the aided villages, the initiator, Pun, was easily preoccupied with elements related to hard issues, such as infrastructure, at the expense of training and project championing, both of which are needed. The absence of

Proceedings of the 13^(th) International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

21

		infrastructure (hard elements), to get the system up and running, with less emphasis on training and managing expectation awareness.	IT competence is a major challenge for the NWNP.
(6)	*Conflicting interest groups within end-beneficiary communities*	The NWNP project actively included various community groups, such as Aama Samoh, a mothers group, in the aided villages to increase awareness among villagers about healthcare, education, and in particular, women's roles in community development. These groups were included to identify what was needed and to develop trust among villagers.	Projects initiated within the communities themselves naturally respect the inclusion of indigenous groups as part of their projects.
(7)	*Gate-keeping local elites*	Although community groups and individuals where invited to discuss the NWNP's projects, all major decisions were heavily influenced by Mahabir Pun, without formal co-decision processes being promoted. The decisions made have strong support due to Pun's high legitimacy within the community. Highly respected persons, such as schoolmasters, the leaders of village committees, and IT-literate persons, might have more influence than others.	With the presence of strong, highly respected champions, co-decision-making processes should be carefully considered to avoid such champions' having too much influence. However, in an ICT-illiterate society, co-design-making processes should be carefully considered to avoid uninformed decisions' being made. Highly respected individuals and groups have to be included to legitimise projects within societies. Successful outcomes are dependent on their responsiveness to alternative interests.
(8)	*Excessive pressures for immediate results*	The NWNP's development took a long time, from initiation to launch, and it took even longer for it to improve services. Community members really had time to learn and participate throughout the process.	Lessons learned from the long-lasting process of developing services in the first two villages might not prove valuable when scaling, as expectations are that services should be up and running more quickly. Hence, in the future the NWNP runs the risk of focusing on the end-product at the expense of the process.
(9)	*Lack of public interest in becoming involved*	Services provided through the NWNP address general needs in education, healthcare, and income generation. Hence, benefits should be distributed equally among those in the most need of such services, as long as they are aware of the services provided and competent in utilizing them.	PD projects within local societies should focus on common needs and public services like healthcare, education, and government issues. Such services are common goods and equally important for all members of a given society.

Moreover, in previous literature on PD, the roles of technical actors are undermined, and this is important to consider; in the context of PD, an assemblage of human and technical actors will be completely different than if we remove technical actors from the picture completely.

Likewise, SC and PD are related in several ways. Collectives of heterogeneous actors are useless in the context of PD until collective action is taken. Furthermore, the sustainability of collectives is another issue. Previous studies suggest "trust, norms of mutual reciprocity, and social networking," or *Social Capital*, can be one lens through which to understand how social networks can be mobilized to promote collective action, and at the same time, it can make collectives more sustainable. It is also important to understand the structure of PD; after all, PD participation can take place among community members (bonding), between communities (bridging), and beyond communities (weak ties). In the case of the NWNP, different forms of social capital (or sociotechnical capital) promoted collective action that led to improved accessibilities in healthcare and education. As mentioned earlier, technical actors play an important role in PD and in maintaining and creating social capital. Analyzing PD with SC can provide a deeper understanding of plagues 4, 6, 8, and 9. Finally, by combining both lenses (ANT and SC) we discover the true nature of developmental success or failure with regards to PD (plague 3). Such a lens can reveal who a project's main actors are, how they are enlisted, and how they comprise the projects social capital and address PD challenges.

5. IMPLICATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

Our findings show that actor-network theory and social capital theory can help to understand PD in the context of ICT4D projects. Key actors in the studied organization were the NWNP's founder, Mahabir Pun, and the activists behind OLE and telemedicine. Equally important were the affected villagers, local health workers, and the local village societies, all of whom participated at various levels in developing and implementing the NWNP's projects. Clearly, as an initiative that emerged from the efforts of one actor, Pun, then took on a life of its own and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

22

grew in an organic manner, the NWNP exemplifies an organization for which the term *PD* should be viewed in a much broader sense than as mere *participation*. This view is not new; PD has a long history of implementation in areas like community development. For example, the British government requires that all community-development projects involve members of the affected community. However, as we mentioned earlier, PD application should enhance an understanding of who a project's participants are, what the purpose of PD is, who will benefit, and how the proposed participation and development will be sustainable in the context of ICT4D. The present study's implications for practical applications and suggestions for further research (related to the nine mentioned in this paper plagues) are explained in Table 3:

Table 3: Implications for practice and further research

No.	Plagues	Practical implications	Further research
(1)	*Paternalistic role of development professionals*	Pay careful attention to the less successful parts of the projects, especially when the main stakeholders place a strong emphasis on succeeding. A more balanced view of the benefits and challenges can help in managing users' expectations of what can be achieved by introducing the project.	Focus is needed on the less successful and negative consequences of apparently successful projects. How might one manage user expectations within ICT4D projects?
(2)	*Inhibiting and prescriptive role of the state*	Arrange for external participants to stay longer so they can familiarize themselves with the local culture.	What is the consequence of cultural clashes between various actors?
(3)	*Over-reporting development successes*	Existing community groups should be included in the process. Discussions of the end-product might be avoided early on to keep from alienating illiterate group members.	How might one include indigenous individuals and groups that are ICT-illiterate?
(4)	*Selective participation*	The involvement of local leaders and respected interest groups should be highly appreciated. These groups should be included very early on to spread awareness of the potential benefits of projects to the affected societies, to avoid these leaders' misusing their power.	How might one balance the influence of internal and external groups to avoid their dominating external groups?
(5)	*Hard-issue bias*	Local knowledge is needed to identify interest groups. Outsider-led projects need to carefully consider whom to approach when initiating new projects. Legitimate and influential stakeholders should be identified in the early stages of a project.	What kind of process is needed to identify and include a cross-section of interest groups?
(6)	*Conflicting interest groups within end-beneficiary communities*	The insider champions' role is crucial to success. To scale a project up, the initiator's role needs careful attentions, as it role might shift from an insider to an outsider.	The role of insiders and outsiders should be further elaborated on. How might one scale up PD processes that allow for up-scaling?
(7)	*Gate-keeping local elites*	Advocate insider-led initiatives to address awareness on indigenous groups. Pay attention to the risk of narrow-minded and pre-defined ideas on whom to include, to avoid unintentionally excluding some indigenous groups.	How might one identify and include the less visible indigenous villagers?
(8)	*Excessive pressures for immediate results*	Internal facilitation throughout a project is an important element in gaining the trust and engagement of community members. Internal facilitation allows for external facilitators as well, as long as the process is anchored within the affected community.	What characterises facilitator roles in ICT4D projects? How and when should external facilitators be included?
(9)	*Lack of public interest in becoming involved*	Although co-decision making is a valid (and useful) idea, such processes need to be managed carefully to avoid less informed decisions' being made. Decisions made by a strong and respected internal champion should be carefully reviewed by others to avoid too much emphasis on the champion's ideas.	How and when might one include co-decision making in ICT-illiterate societies? How might one manage and control a strong (and legitimate) champion within ICT4D projects?

6. REFERENCES

Adler, Paul S., & Kwon, Seok-Woo. (2002). Social Capital: Prospects for a New Concept. *The Academy of Management Review, 27*(1), 17-40.

Andrade, Antonio Díaz, & Urquhart, Cathy. (2010). The affordances of actor network theory in ICT for development research. *Information Technology & People, 23*(4), 352-374.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

23

Botes, Lucius, & Van Rensburg, Dingie. (2000). Community participation in development: nine plagues and twelve commandments. *Community Development Journal, 35*(1), 41-58.

Callon, Michel. (1986). Some elements of a sociology of translation: domestication of the scallops and fisherman of St. Brieuc Bay. In J. Law (Ed.), *Power, Action and Belief: a new sociology of knowledge?* (pp. 196-233). Routledge, London.

Callon, Michel. (1997). Actor-network theory - the market test, actor network and after workshop: Keele University.

Cordella, Antonio, & Shaikh, Maha. (2006). *From Epistemology to Ontology: Challenging the Constructed'truth'of ANT*: Department of Information Systems, London School of Economics and Political Science.

Díaz" Andrade, Antonio, & Urquhart, Cathy (2009). The value of extended networks:Social Capital in an ICT intervention in rural Peru. *Information Technology for Development, 15*(2), 108-132.

Heeks, Richard. (2002). Information systems and developing countries : Failure , success , and local improvisations. *The Information Society, 18*(2), 101-112.

Huysman, Marleen, & Wulf, Volker. (2004). *Social capital and information technology*. Cambridge, MA: MIT Press.

Ibrahim, Solava S. (2006). From individual to collective capabilities : the Capability Approach as a conceptual framework for self - help. *Journal of Human Development, 7*(3), 397-416.

Latour, Bruno (2005). *Reassembling the social, an introduction to actor-network theory*: Oxford University Press.

Oyugi, Cecilia, Nocera, Jose Abdelnour, Dunckley, Lynne, & Dray, Susan. (2008). *The challenges for participanty design in the developing world*. Paper presented at the Proceedings of the Tenth Anniversary Conference on Participatory Design 2008.

Putnam, Robert" (2000). *Bowling Alone - The Collapse and Revival of American Community New*: New York: Simon & Schuster.

Rohde, Markus (2004). Find What Binds: Building social Capital in an Iranian NGO Community System. In M. Huysman & V. Wulf (Eds.), *Social capital and information technology* (pp. 75-111): Cambridge, MA: MIT Press.

Syrjänen, Anna-Liisa, & Kuutti, Kari. (2004). Trust, Acceptance, and Alignment: The Role of IT in Redirecting a Community. In M. Huysman & V. Wulf (Eds.), *Social capital and information technology* (pp. 21-50): Cambridge, MA: MIT Press.

Thapa, Devinder. (2011). The role of ICT actors and networks in development: The case study of a wireless project in Nepal. *The Electronic Journal of Information Systems in Developing Countries, 49*.

Thapa, Devinder, Sein, Maung K, & Sæbø, Øystein. (2012). Building collective capabilities through ICT in a mountain region of Nepal: where social capital leads to collective action. *Information Technology for Development, 18*(1), 5-22.

Walsham, Geoff. (1997). Actor-Network Theory and IS research: Current status and future prospects. In A. S. Lee, J. Liebenau & J. I. DeGross (Eds.), *Information systems and qualitative research* (pp. 466-480). London: Chapman and Hall.

Winschiers-Theophilus, Heike, Chivuno-Kuria, Shilumbe, Kapuire, Gereon Koch, Bidwell, Nicola J, & Blake, Edwin. (2010). *Being participated: a community approach*. Paper presented at the Proceedings of the 11th Biennial Participatory Design Conference.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

24

Woolcook, Michael. (2001). The place of social capital in understanding social and economic outcomes. *ISUMA Canadian Journal of Policy Research, 2*(1), 11-17.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

25

A GENRE ANALYSIS OF E-PARTICIPATION: THE CASE OF LOKPAL MOVEMENT FOR ENACTMENT OF ANTI-CORRUPTION BILL IN INDIA

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Abstract: This paper aims to analyze genre taxonomy for an e-participation ecosystem. Democratic-genres and their production rules are outlined from the extant of literature. The contents created online from a citizen movement in India for enactment of an anti-corruption bill (Lokpal ombudsman) were taken to test the production of various sub-genres in this ecosystem. The genre analysis has been done in a 5W1H framework. Boundaries of earlier genre studies are often limited to individual democratic forums. Present study captures multiple sub-genres and explains the relationships in this ecosystem.

Keywords: e-participation, genre analysis, democracy, Lokpal, India.

1. INTRODUCTION

The Internet is increasingly a serious tool for political dissemination by citizens. A genre ecology framework can explain citizen communicative events in this public sphere. However, discussions on the genre lens are inadequate to represent the hybrid nature of this ecosystem. Further, little research explores the influencing factors of citizens' e-participation. This paper discusses a citizens' movement to bring some conceptual clarity to e-democracy ecosystem.

E-participation can be observed as written or speech discourses through electronic means by stakeholders with a goal of influencing policies. These discourses differ among democracy models producing genres. Applying genre analysis is useful in communication analysis, especially when multiple artifacts are predominant. The presence of multiple democratic theories and demand for multiple levels and forms of democratic participation make genre analysis useful in e-participation research (Päivärinta and Sæbø 2008). Before applying genre systems, identifying underlying theories that provide better understanding about the inter-relationships among democracy, ICTs and citizen participation is necessary. To the best of our knowledge very less genre studies exists in e-participation domain.

Demand for such research is also due to the complex nature of e-participation. For example, the Egyptian revolution was the result of decades of social unrest; a 'dialectic relationship' between online and offline political action exists (Aouragh and Alexander 2011). Even the Arab spring transitions occur under various regimes (Norris 2011), and thus e-participant influencing patterns vary. Similarly, the cause of the UK riot includes unemployment and income inequity (Hughes 2011); unequal distribution of money or power is due to failure of mechanisms for tackling corruption (Patel 2011). India also witnessed series of anti-corruption movement that include the online activities of 'India Against Corruption' (IAC) team led by Anna Hazare for enactment of a strong Lokpal (people ombudsman). It is essential to assess such movements since between 2008 and 2010, India's political participation (scoring 4.44/10 in 2010 and 5.56/10 in 2008) and democracy ranking (40/167 in 2010 and 35/167 in 2008) demonstrates a decline (EIU 2010).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

26

Research question:

In the light of above, the following question was raided: What are the structural, spatial, functional and temporal characteristics of e-participation ecosystem?

Genre analysis is helpful in explaining the structural, spatial, functional and temporal characteristics of the genre taxonomy of the e-participation eco-system (Päivärinta and Sæbø, 2008; Yoshioka et al., 2001). Multiple approaches exist for genre analysis. For example, the Multidimensional analysis (MDA) and the Keyword approach (Xiao and Mcenery, 2005). However, Information Systems (IS) researchers including Yates and Orlikowski (1992, 2002) say that the Five Ws and one H question (5W1H) framework is helpful while analyzing largescale communicative events that have multiple artifacts. Hence, genre analysis has been carried out using the Five Ws and one H question (5W1H) framework (Päivärinta & Sæbø, 2008, p. 60-61). Here, why components are helpful for revealing the purpose, what element provide insight about communicative content, who elements identify stakeholders, where elements reveal spatial expectations, when elements provide temporal measures and the how element shows how communication interrelates (Päivärinta and Sæbø 2008).

The structural aspects have been identified by emphasizing the importance of different structures. (1) Why various structures are important for the e-participation eco-system and what are the differences in these communicative structures? (2) How different are the communicative structures in e-participation ecosystems? (3) Whether or not initiators driven e-participation ecosystem structure influences e-participation? The spatial aspects are identified by assessing (4) Where does e-participation occur most?. The functional aspects are identified by examining (5) Who e-participate? and what Influences e-participation?, and the temporal aspects are explained by (6) When do people become reluctant to participate?.

Research objective:

To get answers to the above questions, following objectives are set:

i) To analyze the e-participation eco-system with the help of a case study on citizens' participation for an anti-corruption (Lokpal/ Ombudsman) bill, it results in an explanation of the genre taxonomy of e-participation ecosystem.

ii) To bring out recommendations for improving citizens' e-participation in India.

For investigation, this study undertakes the case of citizen movements for enactment of an anticorruption (Lokpal) bill in India. In this movement, citizens participated through multiple ICT enabled democratic forums.

The paper is organized as follows introduction part discusses objective and importance of this study, next this study explain the theoretical framework of e-participation. This section outlines genre ecology and production rules. Section 3 provides case background of this study. Section 4 explains methodology of this study. Section 5 provides analysis and discussions and Section 6 provides concluding remarks.

2. THEORETICAL FRAMEWORK

This section describes genre theory, ecology for e-participation and the genre production rule.

2.1. Genre ecology for e-participation

Ecology frameworks are adopted widely when analyzing large-scale communicative events with multiple artifacts (Päivärinta and Sæbø 2008; Yoshioka et al. 2001). Here, genre means a type or class, a category used to classify discourse by form, technique or content. It is a term for grouping texts, representing how writers use language to respond to recurring situations (Hyland, 2004). It includes a set of communicative events the members of which share some set of communicative purpose (Swales 1990. The genre ecology framework is promising in

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

27

technical communication research due to its interpretive structure, contingency and stability (Yates and Orlikowski, 2002). In an e-participation context, genre ecology helps explain how mass eparticipants convey a message through ICTs networks collaboratively. Since e-participation ecology is decentralized, each participant creates his/her own events supporting or opposing such demands for particular issues. Over time, mediating events are synchronized and standardized according to participants' offline activities (Spinuzzi 2002).

For successful e-participation projects, synchronization should takes place at multiple stages. For example, the influence of non-technology factors, diversity of the field, multiple democracy models and accommodating non-governmental initiatives (Jensen, 2003; Macintosh et al. 2009). To further explain this phenomenon, e-participation involves multiple stakeholder and initiatives that are influenced by participants online and offline activities and have to succeed less political support. (Heeks and Bailur 2007; Mahrer and Krimmer 2005). Further, difficulties regarding democracy is that its theories are fragmented (Dahl 1956). A universally accepted theory for edemocracy is missing (Norris 2010).

Classification of communicative events through ICT-enabled participation forums can give shape to comprehensive e-democracy models (Ergazakis et al. 2011; Päivärinta and Sæbø 2006). For example, in the monitorial democracy model, the type of communication is pleading from the governed to the governor for actions to eliminate injustice; on social networking sites, it is informal communication between like minds by building communities. Blogs, discussion forums and comments on articles in the newspaper are rational communication expressing individual views developed on social issues. Repositories like wikis or encyclopedic communication are from experts sharing knowledge on a domain. Communication during general elections consists of individual political action or social preference, influencing larger populations. Transactional service involves flow of money in the form of donations to contribute to democratic communications. Table 1 summarizes these sub-genres of democratic participation and their existence in pre- and post-Internet media.

Sub-genres of democratic participation	Offline media	ICT-enabled media
Community genre	Peer group, business club, franchise, household, neighborhood etc.	e-communities, e-districts etc.
Deliberative genre	Plenary sessions, group discussions, news discussions, campaigns	Blogs, e-discussions e-news etc.
Partisan genre	Political party meetings, government orders.	e-mail, e-consultation etc.
Competitive-elitist genre	Ballot voting.	e-voting
Opinion polling genre	Voice vote, sense of parliament.	m-voting, e-polling.
Business genre	Donations, sponsorship.	e-business
Knowledge sharing	Encyclopedia.	e-repositories
Monitorial genre	Petitions.	e-petition

Table 1. Genres of democratic participation and its pre and post-Internet media

Above e-participation opportunities is result of implicit and explicit efforts by citizens and government agencies. For example, Partisan and liberal democracies emphasize invisible citizen involvement; direct and deliberative democracies emphasize a visible role of the citizen (Päivärinta and Sæbø, 2006). Further, online communities, discussions groups, chat rooms and blogs enable citizens to initiate participation without much government intervention. Along these lines two main entity —citizen and government—are identified as prominent in efforts for an edemocracy (Sæbø et al., 2011; Coleman, 2005).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

28

2.2. Genre rules for democratic participation

The e-democracy models discussed above explain how democratic governments hear and evaluate citizens. Both governments and citizen activists provide efforts to channelize the online presence of citizens toward democratic participation. Government agencies dominate some areas, for example, in the Indian context of e-voting where government initiates provision for authentic information about government policies. Citizens send e-mail, blog and start discussions to voice opinions. The rules of sub-genres of democratic participation are provided in Table 2.

Pragmatic classification	
Citizen-initiated	Substance: Public disclose. Communications reflecting individual, governance and technology influence Form: Formal or informal communication. May be emotional
Government initiated	Substance: Toward citizens. Communications reflecting opportunity for establishing legitimacy and trust in producer Form: Formal communications; time bound and has legal validity
Thematic classification	
Community genre	Substance: Exchange of information among the interest groups with objective of social or personal empowerment Form: Informal and community oriented, presence of regional language
Deliberative genre	Substance: Multiple views over a subject, supportive references including hyperlinks; subject change over time Form: Lengthy, rational arguments, formal or non-formal language
Partisan genre	Substance: Exchange of views over a subject Form: Explaining context and solution in formal language
Competitiveelitist genre	Substance: Multiple choice with single Form: Multiple options with choice for a single entity
Opinion polling genre	Substance: A question followed by yes or no, or pre-defined format for choice over a single subject. Closed or open for public Form: Direct language, less crowed
Business genre	Substance: Use of numbers and currency, acknowledgements Form: Formal language, procedural
Knowledgesharing genre	Substance: Vast information over a single subject; reference to related contents Form: Structured, sequence of events, formal langue
Monitorial genre	Substance: emotional, information about grievance, single subject expressing community strength Form: pleading, polite, legal components and formal writing, structured with feedback provisions.

Table 2. Rules of sub-genres of democratic participation

However, two-way communication that enables citizens direct intervention leave some of these areas isolated and unheard or unattended by either party. For example, higher levels of eparticipation often attract less citizen intervention (Reddick 2011). It is essential to discuss more to identify what influences citizen online democratic participation and what are the rules for producing these sub-genres. Hence, for better explanation of these rules, theories that explains citizen participation in e-democracy participation is worth consulting. In this direction citizen choice, ability and mobilization factors are often examined (Verba et al., 1995). Factors influencing initial level of e-participation, i.e. the adoption are essential to consider (Shareef et al., 2011). Detailed review of influencing theories of e-participation and derived factors have

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

29

been provided by the authors elsewhere (see -). It is identified that existing works are often limited to certain e-participation forums. Less works attempt to capture the presence of multiple theories influencing e-participation. Thus genre taxonomy of for an e-participation eco-system is still underdeveloped.

3. THE CASE OF CITIZEN E-PARTICIPATION FOR ANTI-CORRUPTION (LOKPAL) BILL

To enable governance that ensures an anti-corruption mechanism in public functionaries, the government of India introduced a version of Lokpal (Ombudsman) bill in June 2011. Efforts to establish Lokpal began in 1966 with the first genre of Lokpal introduced in the fourth Lok Sabha in 1968. However, enactment of the bill was not successful even after seven attempts (Panchu, 2011). In the fifteenth Lok Sabha, the government of India decided to hold consultation with civil society groups interested in the process. An activist group named India Against Corruption (IAC) insisted on improvement in the government Lokpal bill, enabling it as an effective anticorruption mechanism. This was followed by introduction of various versions of the Lokpal bill including a draft from the National Campaign for Peoples' Right to Information (NCPRI) addressing the limitations of government introduced in the original version.

The dissatisfaction that arose due to corruptive functions of democratic functionaries triggered communicative events forming multiple genres in both offline and ICT-enabled media. IAC channeled such expressions through various offline and online events. The web-portal of IAC includes multiple genres to mediate such communicative actions in the form of information provision, signing petitions, SMS, and deliberations, including donating to the democratic movement. E-participation also occurred outside of IAC initiatives. For example, the news genre reported a rise in viewership, followed by blog posting, e-mail circulation and SMS communication through web-enabled facilities like 160by2.com and Way2Sms. The government initiated public consultation over the Lokpal bill, also offering a participatory option for citizens.

4. DATA AND METHODOLOGY

E-democracy initiatives over the Lokpal issue came from multiple stakeholders including individuals, activists and government agencies. The discourse considered in this study is the one available online. Services selected for data collection were restricted to those e-democracy forums initiated by recognized activist groups or agencies. These services are categorized broadly into the eleven e-democracy forums under consideration in this study. This consists of Community building, Deliberative, Partisan, Polling, Knowledge building, and Transactional in nature (Alathur et al. 2011).

Data was used for the case development. These secondary data was collected from the content created by citizens, in recognized web-pages about the Lokpal movement. The criteria for recognized web-pages include official web-pages initiated by India Against Corruption (IAC) activists and government institutions and relevant web-pages which often top-ranked when multiple combination of key word searches were carried out using Google. In addition, the broadcasting and pages that are often reported by national newspapers and TV channels in relation to the Lokpal movement has also been taken as the criteria for page selection. From social networking media, this study consulted only the official Facebook page of India Against Corruption (IAC). IAC activist and parliamentarian twitter pages were consulted for remarks related to this issue. The blogs examined by this study were initiated either by activist groups or online newspaper media. The justification for keyword searches used for identifying data sources can be as follows: Scholars report the possible bias seen in Google search towards Google products, but also acknowledge its dominant status and the accuracy of Google ranking (Robles, 2010). In India, the less adequate content censoring mechanisms in social networking sites is often criticized by government agencies (eGov, 2012) and this reflects the adequate opportunity available to collect divergent content.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

30

5. ANALYSIS AND DISCUSSIONS

In this section, results of content analysis are structured under structural, spatial, functional and temporal characteristics of ecosystems. Further discussions and implications are provided.

5.1. Analysis

5.1.1. Structural Characteristics

The structural aspects have been identified by emphasizing the importance of different structures. (1) Why various structures are important for the e-participation eco-system and what are the differences in these communicative structures. (2) How different are the communicative structures in e-participation ecosystems and (3) Whether or not initiators driven e-participation eco-system structure influences e-participation?

Why are various structures important for the e-participation eco-system?

It is important to have various e-participation areas. To quote a Lok Sabha MP's Twitter comment: "Since so many of u have asked 4 my views on LokPal, & I couldn't do justice to it in 140 characters, here are my thoughts [link embedded to his webpage]" (Tharoor 2011). Demand for multiple e-participation opportunities are expressed in various discourse statements. For example, "… people who vote do so because they have no other option." [e-discussion participator, screen name] (India-Forums 2011a). This expression reveals the demand for alternative forms of democratic participation opportunities that compensate for the drawbacks of other forums. This view is emphasized in other discussion forums on Lokpal; for example: "…unelected and elected argument do not work…you know this is very disturbing argument that you must fight election…the election process is so flowered …the supremacy of elected is somewhat compromised…you have to context election is very very unfair… can you justify everything, that you win election, can you deny people every space that they not contested in election…" [IBNLive Discussion board, members] (IBNLive 2011). The importance of electronization of various democratic platforms is reflected in blog posts: "The present revolution was thus important to acquaint the government with the power of the masses. At the same time, the revolution was important for the masses to believe that they could still make the government act on issues critical to the nation's interests" [Blogger, name] (Sinha, 2011). Thus, production of multiple sub-genres in e-democracy ecosystems is crucial for electing and informing representatives.

How different are the communicative structures in e-participation ecosystems?

There was a presence of partisan democracy (sub-genre) in the Lokpal case. For example, the Indian government solicited public feedback on the Lokpal Bill on August 20, 2011. Content expected in this e-consolation initiative was in a specific format communicated in English or Hindi within 15 days. Participants interested in the process were provided with two e-mail addresses for communications with the government.

Citizens held the perception that such e-consultation forums should be initiated from government agencies. For example, only 16 members liked the Facebook page of the Lokpal bill, and the public consultation webpage received less participation with only 2047 comments since April 2011. Responses in these citizen initiatives do not follow any format. Comments either show individual perceptions of corruption or scattered solutions for preventing corruption. There was also a flow of e-mail among citizens and groups irrespective of the primary objective of those groups. Irrespective of any moderator resistance, the e-mail groups witness e-mail requests asking members to write to government authorities.

Initiatives calling for opinion polling were also present in the Lokpal genre. For example, some public opinion polls initiated by various e-news forums sought polling on "Should Parliament accept Jan Lokpal Bill as drafted by Team Anna?," and "Do you think Lokpal bill will stop

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

31

corruption in India?" (India Study Channel 2011) . These polls reflect the status of offline events in the country on each poll day. Interested citizens can also poll their opinion through mobile devices. The presence of mobile initiates was visible in the Lokpal genre. To quote one participant's comment: "…25 Crore Indian people have to support Jan Lokpal. Give Your Support and call. Your call will be disconnected after one ring and your Number Registered Automatically. You Will Get Confirming SMS..." [Participant with nick name] (India-forums. 2011a).

Business transactional services underwent genre analysis to understand consumer opinion concerning products and services. The Lokpal genre included this sub-genre in terms of donations. To quote an activist leader, "A number of people have contributed money to the Anna movement. There is complete transparency from our side. Our receipts and expenditure are transparent. But we have no mechanism to go into the antecedents of our donors. And donations are streaming in, making it impossible to keep track." (The Hindu 2011b). The sub-genre for this e-democracy system invites participation in e-repositories. For example, the Wikipedia page of the Jan Lokpal Bill (Wiki, 2011) has a trustworthiness rating of 4.5/5, objective of 4.1/5, completeness of 4.4/5 and well written of 4.2/5 as of August 29, 2011. There was supporting and opposing calls for participation events on various deliberative sub-genres.

The Hindu reports (2011a) Facebook account created for "Support Anna Hazare fast against Corruption" attracted 1.45 Lakh/Million likes, and the Facebook page "I hate Anna Hazare" was liked by 4,137 users. Deliberations on blogs discuss that the call for e-participation differs from geographic contexts. To quote one blog: "…Anna revolution can be counted as one amongst the many uprisings happening all across the globe, especially in the Arab countries. Everywhere the common man has found a collective voice. The methodology used is however different. The one in India is soaked in the Gandhian philosophy of non-violence…" [Blogger, name] (Rane, 2011).

5.1.2. Whether initiators driven ecosystem structure influences e-participation?

People who e-participate often initiate various sub-genres. For example, leaders of Lokpal movements had undertaken various democratic movements in the past. Leaders of the Right to Information (RTI) movement were involved actively in recent citizen movements. To quote one citizen who was part of a discussion group from August 2008 onward in her 1975th post: "I am not sure how many people follow the current affairs... But if some of you do, i request you all to come poll for your opinion, sign here and share your views…P.S. - I dont want anybody offending anyone, ..- A request to Moderators - Please observe that nothing goes out of hand. My intentions are just to contribute towards a good cause and not start another series of offensive quarrels. And if you find this isn't an appropriate topic to be discussed here, kindly close this thread" [Initiator, nickname] (India-forums, 2011b). Various online petition sites (eg. Care2petitionsite.com, Petition.in, Indianvoice.com, Petitiononline.com, india-forums.com) were analyzed. Results show that calls for deliberation initiatives came from both users and cite administrators.

Result show that the as per the targeted signatures vs. received response, e-participation was less in the discussion forums. Further, the responses are from 20-200 words for user created forums and respondents prefer to use nick names and hide their profile pictures. But for Admin created forum word count was 20-600 words and respondents often gives their names and location. As stated earlier, governments start various initiatives to incorporate citizen viewpoints on the Lokpal bill. For example, the standing committee initiated consultation on the Lokpal bill.

Activists are cautionary, ensuring the movement is transparent, non-political or directs citizen initiatives. One national newspaper reports, "the...(foreign hands or private companies) does not involve itself in what is taking place in the world's largest democracy and neither has it any such

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

32

intention." (The Hindu 2011c). These views suggest there was resistance to recognizing initiators other than government and citizens when it comes to democracy.

5.1.3. Spatial Characteristics

Where does e-participation occur most?

Activists use mobile devices for democratic participation. For example, the IAC webpage claims the organization received 1.3 Million missed calls as of August 15, 2011. The Hindu reports (The Hindu 2011b) on activists in this group: "In March, we sent out two crore SMS messages and got 50,000 missed calls. Then we targeted the 50,000 callers, asking if they would like to enroll as volunteers for IAC. Initially 13 people responded. We sent two more rounds of messages to the 50,000 callers. And in just one week, the number of volunteers swelled to 800". One report said: "way2sms (a text messaging service provider) observed in last 5 days (during Jan-Lokpal Bill movement) close to 3 million people using the word 'Anna Hazare' in their messages." The IndiaACor Facebook page reports to be the fastest growing Facebook page, and is mainly used for rapid information dissemination which is supported by media flash messages." (Kattakayam 2011).

5.1.4. Functional Characteristics

Who E-participate?

Discussions on Lokpal emphasized that e-participation for Lokpal is primarily from middle class Indians. To quote from a discussion: "This campaign has triggered public debate against corruption…this is the movement of middle class revolution…the nature of this middle class is very different from before the economic reforms, before the economic reforms this middle class is really developed under the wings of the government and the state, this middle class is developed under the economic liberalization and globalization…" [Discussion members, NDTV 2011].

What Influences E-participation?

In the case of offline participation, issue awareness may not influence citizen engagement. To quote a blog: "…many supporting movement don't have the slightest clue about the specifics of the bill…call to fight 'corruption' with a 'fast' is working wonderfully in mobilizing people…when people see something good happening, they instantly want to become a part of it. Even when there is an illusion of something good, we would want to be a part of it. I guess this happens because all of us want to be a part of the 'greater good'; to say 'I was there'… In fact, many may not fully understand ..'Fight Against Corruption' and its implications, but the knowledge that it may result in something good is causing this frenzy…" [Blogger, name] (Choudhury 2011). Shows participants are mobilized by the value systems they possess; participating in the anti-corruption movement is for moral responsibility and social good.

IAC social networking sites often receive posts with hyperlinks to corresponding WebPages sharing media reporting concerning events. Hyperlinks to web pages disclose e-participant knowledge about the issue and intent to share such information acquired.

E-participants tend to mask their profile pictures, indicating concerns about privacy during eparticipation. E-participant concerning information authenticity is shared on these webpages. Requesting information authenticity, an e-participant posted, "Authentic Fact matters…why don't you do some research about its authenticity so that it looks credible at least…at least you can provide some authentic links…" E-participants post either to reveal corruption to express dissatisfaction with the government or provide support for activists.

Activist-initiated IAC movements tried to build up concerns over the issue and gain confidence. As stated earlier, initiators had a previous leadership record of accomplishment, supporting the finding that initiator expertise influences e-democracy participation. Citizen movements related

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

33

to Lokpal indicate restrictions for citizen participation increases support for activists (Swati 2011). Transparency influences e-participation in Lokpal issues. For example, the Right to Information (RTI) act fueled the anti-corruption movement; the defense minister stated it was a "transparency revolution" (Indian Express 2011a).

In March 2011, the core working group of IAC held a meeting with the prime minister and were assured of incorporation in Lokpal bill discussions (Indian Express 2011b). Thus, IAC leaders established communication with the government and conveyed a message to participants that their voices would be heard. This suggests participants were influenced by the transferability of opinions on Lokpal.

5.1.5. Temporal Characteristics
When: do people become reluctant to participate?

Lokpal also reflects concerns about little participation impact and the reluctance for participation. To quote an e-participant after the 12-day fast by Anna Hazare: "Nothing concrete has been achieved …for which he is fighting." [IAC Facebook post, author name]. Similar concerns were voiced in a blog: "..It is difficult to see how the Jan Lokpal Bill can ever see light of day…" [Blogger, name] (Bhattacharya 2011). Both remarks reflect demand for government efforts to accommodate e-participation to ensure trust in government; trust is an ingredient for democratic participation.

5.2. Discussions
Result of the 5W1H analysis carried out on case is summarized Table 3. Results indicate that individual, governance and technology characteristics influence e-democracy participation.

	Findings from secondary data	**Remarks**
Structural characteristics		
Why various structures are important for e-participation eco-system?	Lokpal issue witnessed citizen participation in multiple sub-genres. However, elitist form was absent.	In Indian context elitist form of genre is considered important. However multiple genres in practice are often not simultaneously present during movements.
How different are the communicative structures in e-participation ecosystems?	The consultation sub-genre calls participation in fixed period. The activists call for participation either to show their strength or to gain support for them.	The sub-genres differ in the expected completeness and quality of communication. The objective of the content creations also found to vary. For example, community genre includes mixed substance, whereas repository genre prefers sorting.
Whether initiators driven e-participation eco-system structure influences e-participation?	The initiatives are reported from government, media, activists, and citizens. Resistance was observed to acknowledge medias and vendors presence in democratic movements.	Common agreed class for e-democracy efforts consists of citizens and government agencies. The cross initiatives are observed in Lokpal genre and the implicit presences of vendors are possible but ess successful.
Spatial characteristics		
Where does e-	The highly active participants are reportedly less in spite of	Medias including mobile devices and community forums found to receive

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

34

participation occur most?	mobilization efforts using SMS in Lokpal. The community genres witnessed more participation.	eparticipation. The recognized genre communitarian are however received high actively participation.
Functional characteristics		
Who e-participate?	The Lokpal analysis explains that the middle class who participated most belongs to corporate sector and are distant from government.	The middle class who found participate most belongs to non-political orientation and away from government agencies
What influences e-participation?	The Lokpal genre indicates the value systems contribute for genre production. The participants also possess certain privacy concerns, and their voice got transferred.	The individual class consisting of value systems contributes for genre production. The privacy concerns and technology factors does have a relations with genre production.
Temporal characteristics		
When are people reluctant to participate?	Demand for an anti-corruption bill triggered genre creations. However, fear of effectiveness of such genres and distrust among stakeholders can hinder the genre production.	The mobilization efforts and capability for effective communication can create genre. The technology factors support such genre creation. The absence of such substance declines the chance for genre production.

Table 3. Summarizing genre analysis

Results suggest multiple genres are essential for encouraging higher e-participation. The Lokpal case shows that the IAC web portal attempts to incorporate multiple sub-genres in terms of donation forums, social networking sites and mobile support. An e-repository like Wikipedia also includes Lokpal-related posts that receive good rating from users.

This study identified that e-participants belong to the middle class. These classes are distant from the government since many members were working with private industry. Thus, the democratic genre should be broad enough to accommodate various strands with multiple subgenres. This finding support Sitapati (2011) argument that the Lokpal participates belongs to middle class of multiple strands.

These sub-genre structures differ based on (1) the nature of e-participation calls for these services, (2) the structure of communication taking place and (3) who initiate e-democracy. For example, e-participation in Lokpal is a spontaneous, middle-class movement; government initiatives to introduce the Lokpal bill can be traced to 1966. The standing committee initiating consultation activities enjoys formal communication structures; for citizen initiatives, the individual voice is less identifiable even though it flows in a similar direction. This finding support Emigh and Herring (2005) study that suggest even in a web encyclopedia, discourse is not uniform.

Results emphasize two types of stakeholders by considering the nature of e-democracy initiative structure, its growth and the legal accountability of these services. It identifies that the two entities form explicit sub-genre relationships. The Lokpal case indicates resistance to accommodate vendors as stakeholders between the communicative events of government and citizens in democracy. Further, the Lokpal is an implicit connection of vendors, for example, in the case of 160by2 and Way2Sms, enabling free SMS campaigns. Thus, analysis shows that the structural characteristics of e-democracy ecosystems differ even though they are complements. The Lokpal genre suggests converging phenomena of these sub-types. For example, to facilitate

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

35

e-participation, the IAC web portal includes links to social networking sites and informative content.

Considering the functional characteristics of the genre ecology, results shows e-participants differ from offline participants; diversity is higher offline. The Lokpal case indicates participants voice opinions for an anti-corruption bill. Thus, social goodness is concern with shared eparticipation factors. IAC activist leaders established a communication link with the government and spread the message that participant voices are communicated during policy decisions. This improved their chance of achieving e-participation. The Lokpal case shows that e-participants share a concern about the effectiveness of the anti-corruption movement carried out by them.

Implications

By examining the structural, spatial, functional and temporal characteristics of e-democracy participation from multiple data sources, this study provides of factors influencing e-participation, that helpful to initiators for delivering successful efforts for e-participation. This study explained the possible resistance for vendors as stakeholder group for democratic movements. It identified possible ownership paradigm and thus power structure in the e-democracy efforts does influence e-participation. These imply policies to give legal support and inclusion status for citizen e-democracy efforts. Further, to enhance participation, e-democracy efforts should be user-friendly and ensure participant security and privacy. Hinders of e-participation includes the less effectiveness of initiatives thus policies to ensure right for satisfaction/effectiveness of voiced concerns are important.

Few studies report on the influencing factors of e-participation, present study attempts to explore influencing theories of e-democracy participation and validate it with Lokpal movement. This study identified e-democracy eco-system in a compressive manner that helps researchers to identify importance of multiple sub-genres of e-democracy. To the theory domain this study propose e-democracy models the one which based on pragmatic/initiator view point and one which developed as per democratic communication perspectives. To the literature this study classified the e-participation influencing genres in to individual, governance and technology components.

Considering the limitations of this study, The Lokpal movement can be treated as an unusual online event since there are not many similar predecessors in the Indian context. Lokpal is a unique event that may not mirror other citizen movements. Thus to generalize the results need to be further refined with other context of citizen movements. Further, citizens' movement in Lokpal may differ from other social movements which may not have obtained much popularity.

6. CONCLUSIONS

Based on the literature review an informal e-participation eco-system is depicted. This genre taxonomy is put forward for cross validation using the data analysis of a citizen movement for enactment of anti-corruption (Lokpal/ Ombudsman) bill in India. The e-participation eco-system provided in the present study is promising in this direction because, the ICTs enabled participation eco-system described by Sæbø et al. (2011), Herring et al. (2004), and Yoshioka et al. (2001) was limited to certain genres. The genre production rules and sub-genres of e-participation described in this research can help in better understanding this eco-system. There are less adequate studies that explain genre production rules with the support of thematic and pragmatic sub-genres, especially in an Indian e-participation context.

This study has delineated the structural, spatial, functional and temporal characteristics of the e-participation eco-system. To the best there is less adequate studies explain the eco-system in a citizen-movement from India. Considering the structural aspect, the analysis shows that the production of multiple sub-genres occurs during e-participation. Further, the production of genre

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

36

is initiated by multiple stakeholders, but production rules set by stakeholders other than the citizen and the government face resistance from participants. Cross-initiatives may also be present but reorganization gained by these services was limited. This finding has potential implications because scholars (Coleman, 2005; Dahlgren, 2005) while describing stakeholders, often less adequately differentiate the democratic participation opportunities from other commercial genres.

Considering the spatial aspect, the amount of participation found differs among the services offered and the rules for communicative events differ among the e-participation services. This supports Jayal's (2001) argument that multiple democratic forums are essential to capture adequate inputs through e-participation services. From the functional aspect, In India the middle classes who were away from government agencies were found to participate more through ICTs initiatives. This finding in the Indian context is also echoed by Gowda and Gupta (2010) and Sitapati (2011). Analysis of temporal aspect shows that publicizing participation opportunities are important for improving e-participation. Results also indicate that citizens' perceive that participation may not have much impact. Thus, as argued by Mahrer and Krimmer (2005), Norris (2010), Kardan and Sadeghiani (2011), it is less likely that e-participation initiative getting promotional effort and support for collective decision-making.

7. REFERENCES AND CITATIONS

Aouragh, M., & Alexander, A. (2011). Sense and Nonsense of Facebook Revolutions. *International Journal of Communication Systems*, 5, 1344-1358.

Bhattacharya, T. (2011). Comment: Say goodbye to the Jan Lokpal Bill, IBNLive, 28 August 2011. Retrieved August 29, 2011, from ibnlive.in.com/news/comment-say-goodbye-tothe-jan-lokpal-bill/179230-37-64.html

Choudhury, A. (2011). Lokpal Bill: How the government lost the PR war, Yahoo, Box Populi, August 24, 2011. Retrieved August 28, 2011, from in.news.yahoo.com/blogs/boxpopuli/lokpal-bill-goi-lost-pr-war-093153722.html

Coleman, S. (2005). E-Democracy – What's The Big Idea?, Governance and Information, British Council, Manchester. Retrieved October 3, 2008, from http://www.britishcouncil.org/bc-edemocracy-2.doc

Dahl, R, A., & Tufte, E. R. (1973). Size and Democracy, Stanford University Press, Stanford, California.

Dahlgren, P. (2005). The Internet, Public Spheres, and Political Communication: Dispersion and Deliberation. *Political Communication*, 22 (2), 147-162.

EGov. (2012). Govt sanctions prosecution of Google, Facebook, eGov, January 14, 2012. Retrieved January 21, 2012, from egov.eletsonline.com/2012/01/govt-sanctionsprosecution-of-google-facebook/

EIU. (2010), The Democracy Index 2010: Democracy in retreat, Economist Intelligence Unit. Retrieved November 12, 2011, from www.eiu.com/public/topical_report.aspx?campaignid-demo2010

Emigh, W., & Herring, S.C. (2005). Collaborative Authoring on the Web: A Genre Analysis of Online Encyclopedias. *Proceedings of the 38th Annual Hawaii International Conference System Sciences*, 1-11.

Ergazakis, K., Metaxiotis, E. & Tsitsanis, T. (2011). A State-of-The-Art Review of Applied Forms and Areas, Tools and Technologies for e-Participation. *International Journal of Electronic Government Research*, 7 (1), 1-19.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

37

Gowda, R. & Gupta, H. (2010). Tracking and explaining E-participation in India. In E. Tambouris, A. Macintosh, & O. Glassey (Eds.), *Proceedings of the 2nd IFIP WG 8.5 international conference on Electronic participation, Springer-Verlag, Berlin, Heidelberg, Lecture Notes in Computer Science*, 6229, 66-81.

Heeks, R. B., & Bailur, S. (2007). "Analyzing E-government Research: Perspectives, Philosophies, Theories, Methods, and Practice," *Government Information Quarterly*, (24:2), 243-265.

Herring, S., Scheidt, L., Bonus, S., & Wright, E. (2004). Bridging the gap: A genre analysis of weblogs, *Proceedings of the 37th Annual Hawaii International Conference on System Sciences, IEEE*, 101-111.

Hughes, K. (2011). UK Riots: Reaping the Whirlwind. *Economic & Political Weekly*, XLVI (34), 13-15.

Hyland, K. (2004). Genre and Second Language Writing. Ann Arbor, MI: University of Michigan Press.

IBNLive. (2011). People's power triumph, Anna to end fast. Retrieved August 27, 2011, from ibnlive.in.com/cnnibnvideos/latest/179167.html

India Study Channel. (2011). Opinion Poll: Do you think Lokpal bill will stop corruption in india?, India Study Channel, posted on June 15, 2011. Retrieved August 28, 2011, from www.indiastudy channel.com/polls/30848-Do-you-think-Lokpal-bill-will-stopcorruption-india.aspx

India-forums. (2011a). India's Fight Against Corruption campaign, India-forums, posted on August 25, 2011. Retrieved November 2, 2011, from www.indiaforums.com/forum_posts.asp? TID= 1755963&TPN=21

India-forums. (2011a). India's Fight Against Corruption campaign, India-forums, posted on August 25, 2011. Retrieved November 2, 2011, from www.indiaforums.com/forum_posts.asp? TID= 1755963&TPN=21

Indian Express. (2011a). A transparency revolution is on, but India not ready, says Antony, Indian Express, June 9, 2011. Retrieved August 28, 2011, from www.indianexpress.com/news/A-transparency -revolution-is-on--but-India-not-ready--says-Antony/801275/

Indian Express. (2011b). Govt to consult civil society groups on Lokpal Bill, Indian Express, March 9, 2011. Retrieved August 28, 2011, from www.indianexpress.com/news/govt-toconsult-civil-society-groups-on-lokp/759740/

Jayal, N. G. (2001). Democracy in India. New York: Oxford University Press.

Jensen, J. L. (2003). Public Spheres on the Internet: Anarchic or Government-Sponsored – A Comparison. *Scandinavian Political Studies*, 26(4), 349–374.

Kardan, A. A., & Sadeghiani, A. (2011). Is E-government a Way to E-democracy? A Longitudinal Study of the Iranian Situation. *Government Information Quarterly*, 28(4), 466-473.

Kattakayam, J. (2011), Social networking sites helping Team Anna, The Hindu, New Delhi, August 24, 2011. Retrieved August 25, 2011, from www.thehindu.com/news/cities/Delhi/article2391856.ece

Macintosh, A., Coleman, S., & Schneeberger, A. (2009). eParticipation: The Research Gaps, in A. Macintosh, & E. Tambouris, (eds), *Electronic Participation: Proceedings of First International Conference, ePart 2009, Lecture Notes on Computer Science*, 5694, 1-11.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

38

Mahrer, H., & Krimmer, R. (2005). Towards the enhancement of e-Democracy: Identifying the notion of the 'Middleman paradox'. *Information Systems Journal*, 15 (1), 27–42.

NDTV. (2011). Anna and the great Indian middle class, August 21, 2011. Retrieved August 25, 2011, from www.ndtv.com/video/player/we-the-people/anna-and-the-great-indianmiddle-class/208578

Norris, D. F. (2010). E-government…not e-governance…not-e-democracy: Not now! Not ever?", in T. Janowski, & J. Davies, (Eds.), *Proceedings of the 4th International Conference on the Theory and Practice of Electronic Governance*, Beijing, China, 25-28.

Norris, P. (2011), Muslim support for secular democracy, Conference on Spirited Voices from the Muslim World: Islam, *Democracy and Gender Rights*. The University of Sydney. 1-26

Päivärinta, T., & Sæbø, Ø. (2006). Models of E-Democracy. *Communications of the Association for Information Systems*, 17(1), 818- 840.

Päivärinta, T., & Sæbø. Ø. (2008). The Genre System Lens on E-Democracy. *Scandinavian Journal of Information Systems*, 20(2), 51-82.

Panchu, S. (2011). Opportunities at hand to tackle corruption. *Economics and Political Weekly*, XLVI (17), 10-12

Patel, G. (2011). What We Talk about When We Talk about Corruption. *Economics and Political Weekly*. (46:17), 13-16.

Rane, T. (2011). Anna Hazare and beyond, August 24, 2011, Retrieved August 25, 2011, from ibnlive.in.com/blogs/ truptirane/2228/62647/anna-hazare-and-beyond.html

Reddick, C. G. (2011). Citizen Interaction and E-government: Evidence for the Managerial, Consultative, and Participatory Models. *Transforming Government: People, Process and Policy*, 5 (2), 167-184.

Sæbø, Ø., Flak, L. S., & Sein, M. K. (2011). Understanding The Dynamics in E-Participation Initiatives: Looking Through The Genre and Stakeholder Lenses. *Government Information Quarterly*. 28(3), 416-425.

Shareef, M. A., Kumar, V., Kumar, U., & Dwivedi, Y. K. (2011). e-Government Adoption Model (GAM): Differing service maturity levels. *Government Information Quarterly*, 28 (1), 17-35.

Sinha, T. A. (2011). The Good and the Bad of Anna's revolution, IBNLiveBlogs, August 23, 2011, Retrieved August 25, 2011, from ibnlive.in.com/blogs/tuhinasinha/2850/62645/thegood-and-the-bad-of-annas-revolution.html

Sitapati, V. (2011). What Anna Hazae's Movement and India's New Middle Classes Say About Each Other. *Economics and Political Weekly*, XLVI (30), 39-44.

Spinuzzi, C. (2002). Modeling Genre Ecologies, in K. Haramundanis, & M. Priestley, (Eds.), *Proceedings of the 20th Annual International Conference on Computer Documentation* (SIGDOC '02), 200-207.

Swales, J. (1990). Genre Analysis: English in academic and research settings. Klett Ernst /Schulbuch. *Cambridge University press*, Cambridge, MA.

Swati. (2011). Anna Hazare's Supporters flock to Social Networking Sites to Raise Voice against his Arrest, August 16, 2011. Retrieved August 28, 2011, from www.buzzom.com/2011/08/anna-hazares-supporters-flock-to-social-networking-sites-toraise-voice-against-his-arrest/

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

39

Tharoor, S. (2011), Shashi Tharoor, Twitter, August 23, 2011. Retrieved August 24, 2011, from twitter.com/#!/ShashiTharoor/status/105946542984265728

The Hindu. (2011a). Anna Hazare rules Indian cyberspace, Hyderabad, August 28, 2011. Retrieved August 29, 2011, from www.thehindu.com/news/national/article2406506.ece

The Hindu. (2011b). It is a long journey ahead: Kejriwal, August 31, 2011.Retrieved November 2, 2011, from www.thehindu.com/opinion/lead/article2412658.ece

The Hindu. (2011c). U.S. not behind Anna's agitation, says McCain, New Delhi, August 19, 2011. Retrieved August 20, 2011, from www.thehindu.com/news/article2370255.ece

Verba, S., Schlozman, K. L., & Brady, H. E. (1995). Voice and Equality. Civic Voluntarism in American Politics. *Harvard University Press*, Cambridge, MA.

Wiki. (2011). Jan Lokpal Bill, Wikipedia, Page Rating, Retrieved November 2, 2011, from en.wikipedia.org/wiki/Jan_Lokpal _Bill

Xiao, Z., & Mcenery, A. (2005). Two Approaches to Genre Analysis: Three Genres in Modern American English. *Journal of English Linguistics*, 33(1), 62-82.

Yates, J., and Orlikowski, W. J. (2002). Genre Systems: Structuring Interaction through Communicative Norms. *Journal of Business Communication*, (39:1), 13-35.

Yoshioka, T., Herman, G., Yates, J., & Orlikowski, W. (2001). Genre taxonomy: A Knowledge Repository of Communicative Actions. *ACM Transactions on Information Systems*, 19 (4), 431-456. making.

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Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

40

ACADEMIA'S RESPONSIBILITIES IN COMMUNITY-BASED CO-CREATION EDUCATION – A CRITICAL REVIEW OF TWO CASES IN SOUTH AFRICA AND BOTSWANA

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Abstract: A shortage of local human resources skilled in community development and technology design for ICT4D projects has been a concern. Moreover local tertiary institutes have followed international programmes without any attempt to contextualize their education. In response, individual academics have proposed community-based courses, where students can engage with communities in co-creation activities focused on contextually relevant design solutions that emerge through collaboration. In this paper we present two community-driven co-creation courses that were held in South Africa and Botswana respectively under the umbrella of a North-South-South programme. The main purpose was to acquaint students with the skills and responsibilities of community change agents that address the challenges of a design reality gap and thereby build local and international capacity for ICT4D. Student learning experiences have been shown to be greatly enhanced, along the line of community design skills, empathy, and embodiment. On the other hand initial challenges of establishing fair and equal community partnerships as well as integration of new courses into existing educational systems still need further attention. We hope to initiate a dialogue reviewing current practices of local capacity building for community development projects to enhance future innovation attempts within ICT4D projects.

Keywords: Community Development, Design Education, Southern Africa, Co-Creation, Participatory Design

1. INTRODUCTION

Numerous ICT4D projects have reported a lack of local capacity to develop and maintain appropriate solutions. Involved in community-based development projects in Southern Africa we have further observed the initial struggles of novice researchers and students in the field, in regard to communication techniques, protocols and collaboration methods adopted. This is not surprising, considering that Southern African universities, in their internationalization efforts, offer ACM aligned computer science courses, use standard literature and only include mainstream research. In an attempt to offer a locally relevant yet adhering to international standards education, Fendler and Winschiers-Theophilus (2010) propose the Contextualized Software Engineering Education Frame Work (CSE²). The framework challenges the validity of universally transferable education in favor of a more context aware process. Fendler and Winschiers-Theophilus (2010) explain that CSE² "…takes fundamental contextual differences such as political motives and agendas, local research results, cultural values, and perception

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

41

towards technologies into account and integrates them into the SE education system throughout all levels: from curriculum planning and development, teaching methods and delivery modes, to outcome evaluation and feedback" p.603. Although the CSE² is a good conceptual model, it fails to convince a more practical implementation of a contextualized education in the current pedagogical landscape of non-western countries.

For example it is clear that in Namibia, educational institutions are part of the legacy of colonial political systems, these systems prioritize old rigid policy over new educational reform. Even with its recent efforts educational policy reform, the Polytechnic of Namibia has still only followed ACM guidelines instead of contextualized education contributing toward locally appropriate and sustainable development.

As an immediate answer Blake et al. (2014) implements a specialized course on community-based co-design (CBCD) at the University of Cape Town. The course aims to convert students with high technical skills into interlocutors, essentially change agents that take part in dialogue with community members to co-create in the truest sense of the word, carried out within an action research paradigm (Blake et al., 2014). Concurrently to Blake's effort a "community-driven co-creation" intensive course was conceived under the North-South-South collaboration UFISA (User-centered Design for Innovative Services and Applications), as a remedy to the lack of community versed designers. Martinez et al. (2013) from the University of Colombia equally advocates that universities should focus on developing external groups like communities and integrate experiential-based social projects such as community-based design into the academic curricula.

In this paper we present two community-driven co-creation intensive courses that were held in South Africa and Botswana respectively. This is done to emphasise our approach of community-driven co-creative courses as a viable methodology to promoting openness through community collaborative projects while galvanising the development of local skills to reduce the design-reality gap

2. RELATED WORK

This section focuses on first situating the research challenge of developing ICT4D capacity through the optic of the design reality-gap. We review the wider background of university-community partnerships. We then introduce the UFISA collaboration and the course model. Although the model of the two courses was similar, the local circumstance differed contributing to the results. Upon a reflection of the interventions we make a number of recommendations for further initiatives of this kind.

2.1. Design-Reality Gap: Skills and Capacity for ICT4D

When considered in the scheme of many ICT4D projects, failure has been attributed to a lack of skills and knowledge production. The design-reality gap is a high-level model used to evaluate the failure of ICT4D in developing countries, the premise of it being that a majority of IC4D projects fail because of the misalignment of Northern designs to Southern realities. Heeks (2002) identifies one of the contributing factors to the design-reality gap as a lack of skills and staffing. The lack of these skills is seen as the main challenge to effectively developing, implementing and maintaining information systems initiatives meant to improve both social and economic conditions.

2.2. University-Community Research Partnerships

Considering the various definitions and etymological differences around the concept of "community", in this paper we adopt the following understanding of community: "a group of people with diverse characteristics who are linked by social ties, share common perspectives, and engage in joint action in a geographical locations or settings" p.1 (Norris et al., 2007).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

42

Martinez et al. (2013) notes that universities are uniquely positioned to solve community issues and actualizes their role in social development through an approach known as university social responsibility (USR). At their core universities instruct students not only on scientific matters but also instill democratic, moral and ethical values in students. Thus Martinez et al. (2013) endorse university-community partnerships and participatory design to be consistent with a university's social responsibility- they further identify the inclusive open source software movements and the bottom-up approach as instrumental to the success of ICT4D projects.

The motivation behind many university-community partnerships is that the methodology produces evidence-based interventions that are supported and generated by communities – this in turn improves intervention uptake (Norris et al., 2007). Research conducted by Wells et al. (2006) successfully executes Community based participatory research (CBPR) for health care in the Los Angeles County, America. Through an academic-community partnership, the initiative Community Health Improvement Collaborative (CHIC) conducted translational research aimed at empowering under-served communities. The achievements of the CHIC in reducing health disparities is attributed to a simple trade– that communities require resources and training to actively participate in research and in return academic partners require the institutional support of their community partners in order to produce health outcomes that are consistent with the values, practices and priorities of the community (Wells et al, 2006).

Studies conducted in South Africa such as the case of iDart (Loudon and Rivett, 2011), an HIV medication dispensing system developed by student research outside of the general curriculum has reported success at influencing learning and teaching. Loudon and Rivett (2011) contribute that "students who are exposed to socially responsive research often continue to incorporate a development orientation in future work" p.42. The former purports to the lasting benefits of university-community partnerships, it improves continuation and sustainability. A close rapport with communities of study and participatory engagement are a pragmatic way to encourage openness in the development of ICT4D systems (Loudon and Rivett, 2011). Action research guided by participatory principles effectively shifts technology from static objects to evolving tools built through democratic means, enabling communities to determine the kind of change they require. As an outcome of their research Loudon and Rivett (2011) contribute that, due to their unique position as mediators, universities in the Global South need to adopt liberal models to research and teaching as a pragmatic response to failing information systems. The poor involvement of communities in research activities around knowledge production is often cited as a cause of the continued marginalization of communities. Loundon and Rivett (2011) propose a reworking of the traditional academic model of knowledge production saying that it promotes an inequitable practice that favors academics and over communities. .

Wells et al. (2006) argue that the lack of funding for meaningful research and the weak incentives of academic partners to continue partnerships are often the biggest challenges in sustained university-community partnerships. There is often a bifurcation in the agendas of academic and community stakeholders and the agenda of the funders usually takes precedence.

3. INTERVENTIONS

This section presents the community-driven co-creation courses model and gives a description of the context under which it was implemented.

3.1. Community-Driven Co-Creation Courses

Funded by the Ministry for Foreign Affairs of Finland, a consortium of six universities – Aalto University, University of Lapland, Laurea University of Applied Sciences, Polytechnic of Namibia, Cape Peninsula University of Technology, and University of Botswana – join their activities around an important multi-disciplinary area of education and development: user centered design for innovative services and applications (UFISA). The main activities of the

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

43

UFISA project are reciprocal student and teacher exchange and intensive courses organized at the African partner institutions. In addition to increasing mutual awareness and establishing new contacts leading to joint research projects and other educational cooperation the project aims at benefiting the communities in Southern Africa through innovative ICT-based prototype services.

Under this consortium a new model of intensive courses was put forward and implemented at all three Southern African partner universities in collaboration with local communities. This involvement is an attempt to increase local and international capacity in community based design by imparting valuable skills to both students and members of communities.

3.2. UFISA Intensive Course and Conceptual Model

The UFISA intensive course is a two-week academic endeavor, based on a Living Lab approach, that situates students and staff in a community context to establish how service design may sustainably improve the quality of life in rural areas by involving local communities in targeted steps of the solution development process to support and empower. During the course students receive a good balance of theoretical and practical training in the field. First, lecturers from the different universities and different fields such as industrial and software design, present design paradigms and approaches including user–centered, participatory, service and community-based co-design. Then participants then emerge into a local community and jointly explore the context, needs and possible solutions. This approach creates a balance and flow from the concept and method approach (Hecht & Maas, 2008) to the experiential-oriented approach (Ho, Ma & Lee, 2011). Thus the underlying theory is similar to that proposed by Blake et al. (2014) and Hayes (2011) that by preparing students with a theoretical knowledge followed by a practical application of skills in the field we not only create highly competent field researchers but it also provides a direct match for designer-user relationships to complement student experiences all the while forming long-standing rapport with communities to ensure the continuity and sustainability of co-creative interventions

The UFISA intensive courses are based on a framework of context exploration in line with a Living Lab approach, in which the design opportunity emerges organically without being pre-defined. Qualitative methods of inquiry include extensive observation (field notes and photographic) and interviews. A Living Lab approach, to both the exploration of context and the development of proposed solutions, allows for greater user input and participation, while acknowledging the socio-emotional impact on all stakeholders (Pallot et al., 2010). When considered as an approach to research, Living Labs support interlinking methods, following basic principles of action research. This approach highlights a shift towards participatory and collaborative investigation where the community is a key stakeholder in the process – not merely an environment to test assumptions and pre-conceptualized design solutions. Through this process of collaborative investigation and interaction, all participants in the process learn from one another and there is the potential for knowledge and skills development beyond formal education.

The criteria in the evaluation of intervention or action are defined with the community partners and success is determined by a good balance between academic and community desired outcomes (Hayes, 2011). The community is a key stakeholder in the development of proposed concepts and the final evaluation. Daily outcomes of field studies are formalized in research report assignments and discussions are held between the student groups, community members and lecturers. Furthermore, tools and prototypes are co-developed to empower the community to address local problems.

The courses afford students an opportunity to work in multidisciplinary and international groups and to develop their own understanding of their research context in a practical sense. Through self-directed and group research, students examine their own study context and personal

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

44

assumptions and pre-judies. The course is formally credited towards their studies at their respective universities.

3.3. Cape Peninsula University-Grabouw Community

The first UFISA intensive course in June 2013 was organized by CPUT, comprising of fifteen students and four lecturers from the partner universities. The course was structured around the design process, using phases similar to that of the Double Diamond model.

The following phases of community engagement and co-design were applied:

1. Establish context, gather insights and meet the community.
2. Making sense of initial findings. (This phases happened away from the community)
3. Generate ideas and co-create with the community
4. Reflect, review objectives, evaluate ideas

The course was conducted in collaboration with community members of Grabouw. In the frame of conventional academic/community partnership there was no existing or formalized partnership between the academic institutions in UFISA and the community of Grabouw. There was however a pre-existing relationship between stakeholders which was formative to research being conducted.

Grabouw is a small agricultural town that epitomizes the diversity of South Africa's population of 54 million. South Africa's ethnic composition is spread across the African, Coloured, Indian and Caucasian groups, with 11 national languages and more than 23 religions (Statistics South Africa, 2014).

Many of the initiatives of social development in Grabouw are facilitated by a social outreach programme called the Elgin Learning Foundation (ELF). ELF was formed in 1996 as an initiative to empower the agricultural communities of the Elgin valley through skills training. Focus is placed on home-based health care, counseling programs, an array of developmental programmes and skills development (Elgin Learning Foundation, 2014). ELF has different divisions responsible for social development goals; one of those divisions is health education that employs health promoters, who are tasked with distributing health information and educating the people of Grabouw, at home and at work.

Health promoters are deeply rooted in the community, which is located in a High Transmission Area for HIV/ AIDS. The goal of the first UFISA intensive course was to understand the challenges health promoters face on a daily basis. These challenges were then addressed through community based research efforts that ultimately lead to co-design preliminary solutions. Four groups Masters and Honors students (mixed from Finland and Southern Africa) were each introduced to a health promoter, who then acted as a "gatekeeper" to the community (Schutt, 2009). Students explored the areas in which each health promoter was located; this included a school, a taxi rank and a health clinic.

Immersion was under the temporal restrictions of the two-week intensive course, which favored rapid prototyping and co-creation over lengthy ethnographic practice. The process did contribute to students beginning to understand the role of user-as-partner, and participation in a co-emergent design process (Sanders & Stappers, 2008).

The health promoters defined the main challenge in the Grabouw area as HIV awareness and sex education. This situation manifested particularly as cultural apathy towards using free condoms- distributed by government, through health institutions. After engaging the community through interviews, observation and storytelling it became apparent that complicated cultural and religious edifices underpin behavior and can prevent interventions from yielding any true success. Powerful statements like "Did God give you these condoms? Why are you giving them

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

45

to us? " And "if we do what you say, we'll never have any more children" bolstered our assumptions. Unraveling value tensions between religion, tradition and modern medicine such as this can only be adequately unpacked in a longitudinal study. Yet a number of practical products to enhance immediate practices of health promoters were designed with community members in co-design sessions, such as more appealing and persuasive posters, pamphlets, condom packaging and suggestions of process improvements.

Figure 1: Health promoter and UFISA students facilitating co-design activity in Grabouw, South Africa

3.4. Cape Peninsula University-Grabouw Community

The second intensive course, comprising of fifteen students and seven lecturers, focused on using a Community Centered Design approach (CCD) and service design processes within a community context, to build a sustainable socio-economic models. The collaborating local community was a stoneware (pottery) manufacturer and distributer run by local women. It was established in the 1970s by the people of Thamaga village, but has recently been suffering low economic returns, organizational challenges, and has largely remained in the dark whilst similar institutions have been actualizing themselves to the demands of the contemporary global consumer.

To address the issues, the students were divided into four groups of variegated profiles, and thematic areas assigned to each, according to the key issues identified. The themes were: Management communications and relationships within Thamaga pottery; Thamaga social context; Operational issues; Conditions of service.

The research tools and design methods were used interactively, in adaptive manner, and sometimes collectively including service design, co-design, role-play, ethnography, context mapping, and constructive interaction. The groups made three different visits where their interactions with the community was building from the initial familiarization, through a deeper understanding for the challenges, an agreement on the co-working and the ensuing co-creation activities, culminating in results that the community felt they could effectively use to improve their enterprise.

In concluding the course, different stakeholders from the local community, which the student groups worked with, were invited to the student presentations and final evaluative discussions of the design intervention. The pottery management and workers were appreciative of the interaction they had with students, saying they learnt a lot, have refreshed their ideas on some of

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

46

their old work approaches and as a positive example, the students' intervention managed to break some communication barriers they had been experiencing. Whilst promising to implement the proposals from the co-design sessions, they were also looking forward to a long lasting collaboration with the students, even beyond their study periods, because they felt this will continue to help them grow with new ideas and keep in touch with new developments.

Also invited to the final presentation of the results was the Local Enterprise Authority, being the entity whose mandate is to promote and facilitate entrepreneurship in small micro medium enterprise development through targeted interventions in pursuit of economic diversification in Botswana. The chosen community falls within the mentorship scheme of the authority, which showed great satisfaction at the positive role of the students and the project.

Figure 2: UFISA students engaging Thamaga pottery member, Botswana

4. REFLECTIONS

We have identified topics critical to the success and improvement of the course, such as learning experiences, continuity, and empathy in design interventions.

4.1. Students' Learning Experience

Exposing the students to an unfamiliar context both within and outside academia gave them a richer understanding of the nuances that influence design. All in all, the students considered the intensive course eye opening in the way that the users were engaged in the service design process. They felt that the co-creation with the community members was beneficial to both their professional and personal development and despite the intense workload they were very happy they had joined the course. The experience of working with a community in a participatory manner, allows students, and lectures, the opportunity to challenge their own ways of working and assumptions. Benefits to students when working with a community relate to a number of developmental areas, including personal outcomes, social outcomes, career development and relationships with the institution (Eyler, et al., 2001). The students also enjoyed the social dynamics and ideas shared during the course which allowed them to establish relationships with students and professors from other countries and universities who were all involved in the service design process.

On the other hand students concern was mostly centered on the high workload, the short time given leading to unsatisfactory prototype development and the co-location aspects. In the UFISA Grabouw course, students felt temporarily disconnected from the community because after two days they were required to return to the classroom to complete field reports. Some students

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

47

expressed that it would have been better for them if the community was always part of the co-design process (Van Dugteren, 2014). Van Dugteren (2014) reports that the latter caused some of the students to become disenchanted with the research, this happened when they realized that they were not conducting "true" co-design.

The intent of the course was to expose students to different approaches of learning. Particularly interesting seems to explore the experience of "emotional and embodied learning", especially in the context of computer science education where this has widely been ignored. Much value was added from the start in the self-representation phase of the course, where students expressed themselves in form of dances, poetry, and even personal deep emotional stories. The loss of feeling in control and experience of fear lead the body to be at the center of the learning experience. The emotional reaction to letting go can be a crippling one but also deeply rewarding. Van Dugteren (2014) quotes a student in the course to have said that they could have gone into the community "as a normal person" and "with no tools, with no ideas"; these comments emphasize crumbling power hierarchy that unraveled within the students when they are immersed in the community. Owuor (2007) states, that this approach to learning is the key to producing "multifaceted bodies of knowledge, practices, and representations". Learning as a full body experience has been practiced in many African traditions, which considers the entire world as a living laboratory, where all indigenous knowledge is embedded in all activities of communal and social life (Mushiba and Asino, 2014).

4.2. Empathy in Design Learning

Van Dugteren (2014) posits that taking a sequential based or prescriptive approach to participatory design for the novice designer is detrimental to forming an empathic connection with the community. Instead novice designers are encouraged to negotiate their own ways of experiencing the community through the design process; this enhances their understanding of the target audience. What we see with participatory design underpinned with empathic evolution is a shift from an etic to an emic approach. It saves students from developing abstracted notions of the community that will ultimately hamper the benefits of a real conversation. Instead it allows for a cognitive shift in identity for students when switching between what is classically known as designer-user roles. This sort of experience speaks towards the positive psychological effects of the practical experience, to be able to empathize with the community is essentially to inherit the wants and the needs of the community that helps realize real appropriate design.

In her evaluations with establishing empathic connections Van Dugteren (2014) expresses that time dimensions can be crucial to the formation of good community rapport. Within the frame of a two-week intensive course, empathy is jeopardized for research results; this highlights the problem of a prioritization of academic goals that usually plagues academic-community projects. A UFISA student in Van Dugteren (2014) research is quoted saying

"I knew the relationship that we were going to have was going to be short…so I would go in and ask a little more obtrusive questions, than if…I knew I was going to see them again and build a relationship with them. Maybe I was a bit less sensitive to them, I think (Appendix G: S4)

Equally the inexperience and lack of confidence within certain student groups did little to inspire trust and despite this being a "learning process" these students were still "being let loose on the community". This could potentially have damaging effects on community driven participatory, or co-design, projects that do not place a strong focus on developing mutual empathetic, respectful and responsive techniques.

The legitimacy of empathic connections within and outside the research team becomes questionable under strict constraints of time and academic goals. Empathy and mutual understanding might be merely a necessity to accomplish research goals, people can be tolerated and understanding feigned under hurried research conditions. Van Dugteren (2014) contributes that prioritizing time and goals violates participatory design principles, forcing the designer to

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

48

design for and not with people-this was especially a problem for task-oriented students that took part in the UFISA courses. Moreover the benefit of the participatory process to the community seems unclear under such conditions.

4.3. Continuity

The success of our interventions in Grabouw belies our own ineffectiveness at securing the longevity of the intervention. The community's plans to launch nationwide campaigns and interact with other communities fall beyond the scope of our academically supported projects. The community's plans are left to be picked up by national organizations that often lack the insight and enthusiasm to continue the interventions. The prototypes created in Grabouw were left there; yet the health promoters don't have the links necessary to realize their designs. We imagine the promoters that worked passionately with the students have since become disenchanted by the involvement of external parties, even though they realize the ineffectiveness of current practices prescribed by the organizations they work for.

With the Thamaga community in Botswana, continuity was ensured thanks to the strong relationship that had already been fostered by the hosting University of Botswana with this community. The inclusion of local lecturers and students facilitated the spread of cultural and linguistic capital within the co-design interactions with the community. The positive results achieved in the project were well received and appreciated by the community, promoting ownership and uptake.

5. RECOMMENDATIONS

In response to our reflections we make the following recommendations.

5.1. Institutional Integration of Learning

We theorize a more peripheral approach, one that gradually socializes contextual education into the existing educational framework. This is done under the moniker of action education derived from AR. It offers a democratized approach to research that involves rigorous scientific process to infuse quality while ensuring that solutions are sustainable and informed by engagements with people (Hayes, 2011). Action research is concerned with the consequence of an intervention or action; the action is planned and the effects of that action are investigated. The latter makes it primarily ideal for studying and improving interventions, especially those that involve partnerships between community participants and their academic partners (Hayes, 2011). Thus we propose the institutionalization of community-driven co-creation courses and their full integration into existing curricula. While the benefits of multi-disciplinary, internationalization and embodied learning approaches have been recognized in theory they have not yet found their way into every day computer science education in Southern Africa. We strongly suggest in the interest of suitable local capacity for community development projects to include such aspects.

5.2. Mutual respect and intentionality

Special care needs to be taken not to objectify communities as exotic entities freely available for study; collaborations must be carried out in keeping with the true spirit of co-creation and participation. Relationships should be formed around strong structures of mutual learning, trust and respect. Students, and researchers alike, should be formal prepared for their work with communities. Simply understanding the theoretical and academic frameworks, and practical methods, do not imply that the interaction will be beneficial and valuable to both students and the community. Attention must be paid to the development of students' communication and facilitation skills as well as exploring the role of empathy, trust and openness in participatory design processes. As noted by Langstraat, and Bowdon (2011): "…when the subject matter of a course is inherently about emotion and politics and human intimacy, it is disingenuous to fail to allow students to engage with those elements as course content..." p.13.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

49

The methodologies of participatory design, co-design and community conversation conflate and bring about drastic changes in the front of social development. These methodologies however lose any chance at sustainable change if the principles and tenets are not instilled or inspired in the hearts and minds of the community. It is important to put ideation, design and implementation squarely in the hands of the community, and present these concepts in a way that the community can engage with, and be empowered through. Perhaps in the most ideal scenario, academic-community partnerships will involve imparting knowledge of research processes to communities in an elucidative way, long running partnerships would be suitable for this kind of skills transfer.

5.3. Formalizing Committed Partnerships

Participatory design in communities, or research in general carried out without the governance structure of a formalized partnership, runs the risk of becoming largely ineffective. This creates fragmented feedback that only produces incomplete insights on communities, hampering any real valuable learning outcomes that can be extrapolated from research. Norris et al. (2007) propose the use of a Memorandum of Understanding (MOU) to document protocols, roles and responsibilities, moreover it maps out the length of community involvement and how new members are socialized into the partnership. Communities are less likely to feel despondent if they know when academics are expected to exit the community, and their expected contribution is documented before. A community advisory board is also a useful addition to community based education; it allows the community to be involved in planning and to disseminate results to community members in a meaningful way. The framework of acknowledging community contribution needs to be reworked to suit a situation where there are equitable gains for both academic and community partners.

6. CONCLUSION

The lack of local capacity in ICT4D projects is a general concern that can only be addressed by local tertiary institutes. Existing university-community partnerships should be expanded beyond research or community service activities by anchoring community-based courses into local curricula and international exchanges. A promising approach has been the conceptualization and implementation of the community-driven co-creation courses under UFISA, demonstrating enhanced knowledge and skill transfer for students, staff and community members. A critical review shows a number of weaknesses in the current approach, such as lack of institutional integration and lack of sustained activities, which need to be addressed formally. We are confident that a continuous investment and improvement of such educational interventions will benefit academia and the communities and enhance innovation efforts in ICT4D in the long run.

7. REFERENCES

Blake, E., Glaster, M., Freudenthal, A. (2014). Teaching Design for Development in Computer Science, Interactions March-April 2014

Elgin Learning Foundation (2014). Community Development. Available: http://www.elginlearning.org.za/Default?pPage=RKmwXhMUZrncCZR [accessed 11 November 2014]

Eyler, J.S., Giles, D.E., Stenson, C.M. and Gray, C.J. (2001). At a Glance: What We Know About the Effects of Service-Learning on College Students, Faculty, Institutions and Communities (3 edition) Available: http://www.compact.org/wp-content/uploads/resources/downloads/aag.pdf [accessed 11 November 2014]

Fendler, J., Winschiers-Theophilus, H. (2010). Towards Contextualised Software Engineering Education: An African Perspective, ICSE 2010

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

50

Hayes, G. R. 2011. The Relationship of Action Research to Human-Computer Interaction. ACM Trans. Comput.-Hum. Interact. 18, 3, Article 15 (July 2011), 20 pages.

Hecht, K. M., Maas, S. (2008) Teaching Participatory Design. Proceedings of the Tenth Anniversary Conference on Participatory Design 2008 pp. 166-169

Heeks, R. (2002). Information Systems and Developing Countries: Failure, success, and local improvisations. The Information Society 18(2), p 101-102.

Loudon, M., Rivett, U. (2011). Enacting Openness in ICT4D Research. Information Technologies and International Development. 7(1), p 33-46.

Ho, D. K., Ma, J., Lee, Y., (2011) Empathy @ design research: a phenomenological study on young people experiencing participatory design for social inclusion. *CoDesign: International Journal of CoCreation in Design and the Arts* 7(2), 2011. pp 95-106

Martinez, D.F.C, Mora, H.G.C, Reyes, J.I.P. (2013). ICT Application from the Perspective of University Social Responsibility In Ict4d Projects, *Proceedings of the 12th International Conference on Social Implications of Computers in Developing Countries, Ocho Rios, Jamaica, May 2013*

Langstraat, L., Bowdon, M. (2011). Service-Learning and Critical Emotion Studies: On the Perils of Empathy and the Politics of Compassion. *Michigan Journal of Community Service Learning*, pp 5-14.

Mushiba, M., Asino, T.I. (2015). Afrikan Pedagogy & Technology-Supported Learning, Bidwell, n., Winschiers-Theophilus, H. (Eds). Intersections of Indigenous and Traditional Knowledges and Technology Design, Informing Science Institute

Norris, C. K., Brusuelas, R., Jones, L., Miranda, J., Duru, K., Mangione, C.M (2007) Partnering with community-based organizations: An academic Institution's Evolving Perspective, Ethnicity & Disease Vol (1)

Owuor, A.J. (2007). Integrating African Indigenous Knowledge In Kenya's Formal Education System: The Potential For Sustainable Development. Journal of Contemporary Issues In Education, 2(2), 21-37.

Pallot, M., Trousse, B., Senach, B., & Scapin, D. (2010). Living Lab Research Landscape: From user centred design and user experience towards user cocreation. *In First European Summer School "living labs"*. Paris, August 2010.

Sanders, E., Stappers, P. (2008). Co-creation and the new landscapes of design. *CoDesign,* 4(1), 5-18.

Schutt, R. K. (2009). Investigating the social world: the process and practice of research. Thousand Oaks, California: Pine Forge Press, Sage Publications.

Statistics South Africa (2014). Mid year population estimates. Statistical Release P0302.Pretoria, South Africa: Stat SA

Van Dugteren, J.R. (2014). The dynamics of empathy within Participatory Design Pedagogy and Practice, University of Cape Town, https://open.uct.ac.za/handle/11427/6864

Wells, K.B, Staunton, A., Norris, K.C, Bluthenthal, R., Chung, B., Gelberg, L., Jones, L., Kataoka, S., Koegel, P., Miranda, J., Mangione, C.M, Patel, K., Rodriguez, M., Shapiro, M., Wong, M. (2006) Building an Academic-Community Partnered Network For Clinical Services Research: The Community Health Improvement Collaborative (CHIC), Ethnicity & Disease Vol (16)

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

51

MHEALTH-ENABLED COMMUNITY HEALTH WORKER STRENGTHENING: EVALUATING A PROGRAM TO IMPROVE MATERNAL AND NEWBORN HEALTH IN INDIA

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Abstract: There has been a great deal of enthusiasm around the potential for equipping community health workers (CHWs) with mobile applications to improve their job performance and impact. However, there is currently a lack of rigorous evidence about how effective such interventions are. In this paper, we report on a midterm evaluation conducted in 2014 of the ReMiND project Uttar Pradesh, India, which equipped 257CHWs with the CommCare mobile application. The evaluation showed that the greatest success of the project has been in increasing the linkages between pregnant women and the health system. Within three months of program roll-out, 60% of pregnant women were being visited by a CHW, as a result of support from project supervisors and the increased confidence of CHWs from the mobile phone job aid. The number of low performing CHWs (counselling less than 40% of pregnant women in their village) dropped from 61% to 19%. A significant increase in the antenatal care that pregnant women received was measured, especially among less educated households. However, the increased contact between CHW and women did not translate into observable improvements in key outcome indicators. The evaluation provided an opportunity to reflect on key improvements to the project as well as recommendations for how to improve evaluation strategy.

1. BACKGROUND

1.1. Health Environment in Rural India

In India, national averages camouflage huge variances in socioeconomic status. The north Indian state of Uttar Pradesh (UP) contains a fifth of India's population, but lags far behind national averages in maternal, newborn and child health (MNCH) outcomes, threatening both national and global progress towards achieving the Millennium Development Goals. Kaushambi district, one of UP's 70 districts, exhibits some of the worst health statistics, with neonatal, maternal and child mortalities far greater than the national averages (respectively, 84%, 92 % and 103 % higher). This is compounded by poverty, gender inequality, and limited access to services and skilled health care. Kaushambi is a Government of India priority district, where concerted efforts aim to fast track improvements and reduce regional inequalities.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

52

1.2. Community Health Workers in India

In 2006, the government of India formed a network of CHWs known as Accredited Social Health Activists (ASHAs) in an attempt to promote improved health practices in rural communities. ASHAs are usually women, selected from local areas, who are provided with limited training, few materials, and minimal incentives; yet they act as the critical cornerstone between rural households and the health system. Often serving as the main source of essential health information to rural families ASHAs provide support across the continuum of care from pregnancy through the postpartum period, monitoring pregnancies and assisting with childhood immunizations. They receive a financial incentive based upon services provided, such as completing a child's immunizations, or bringing a pregnant woman to a facility for delivery. ASHAs do not receive compensation for making a home visit. A 2011 evaluation of the ASHA program highlighted several challenges to ASHAs' provision of effective community health services; among these were limited training and job aids, weak supervision structures, and low literacy (Bajpai & Dholakia, 2011; Government of India 2011).

1.3. Technology for Community Health Workers

The emerging field of mobile health (mHealth) represents a novel, and increasingly popular approach to addressing some of the challenges faced by CHWs (DeRenzi et al. 2011) and there is a good deal of evidence that CHWs can have a positive impact on the communities that they work in by improving both access to and coverage of health services (Lehmann & Sanders 2007; Perry and Zulliger 2012).

mHealth programs take a variety of forms, but those supporting CHWs are often mobile-based apps providing decision support, text messages reminding CHWs to follow-up, or digital data collection tools to more efficiently aggregate data and inform supervisors. However, while an increasing number of organizations are equipping their CHWs with mobile apps, there is a widely-cited lack of evidence on how effective they are (Tomlinson 2013; Braun et al. 2013). This paper focuses on the use of one such mHealth platform- CommCare, an open-source job aid for that has been implemented in many community health programs in resource constrained settings. It can be customized to support a variety of different community health tasks and workflows, and is particularly well-suited to support CHWs in ongoing case management, such as following a pregnancy through its course (DeRenzi et al. 2011; Mohamed 2014).

1.4. Objectives of ICT in ReMiND Project

In light of the poor health figures of Kaushambi and the specific challenges facing ASHAs, Catholic Relief Services in April 2011, together with technology partner Dimagi and local implementing partner Vatsalya formed the Reducing Maternal and Newborn Deaths (ReMiND) Project. Using mHealth, ReMiND aims to increase the adoption of key MNCH and nutrition practices by improving the presentation and content of health information provided by ASHAs, as well as strengthening support and supervision structures for the ASHA. In particular, the ReMiND program focuses on the ASHA's most important task- visiting pregnant women in her coverage area and providing counseling for appropriate health behaviors and referral services. The specific goals of the introduction of the ReMiND mHealth program to the ASHAs in Kaushambi included:

> **Objective 1:** Increase the coverage of the ASHA (i.e., increase the number of pregnant women who are visited at least once by an ASHA)

> **Objective 2:** Increase the frequency and quality of counseling by ASHAs to their pregnant clients.

> **Objective 3:** Increase client knowledge of danger signs in pregnancy and postpartum.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

53

Objective 4: Increase adoption of key MNCH and nutrition practices of clients during pregnancy and postpartum (e.g. number of antenatal care visits, Tetanus Toxoid injections, care seeking for danger signs, and appropriate breastfeeding)

1.5. ReMiND Solution Details

The ASHAs in the ReMiND program were provided with basic Java enabled mobile phones operating a CommCare application job aid. The ReMiND application had tailored content, and was developed through iterative design as a multimedia-rich job aid that guides the ASHA through the course of a woman's pregnancy, newborn and child care. ASHAs use the application to register each pregnant woman, update her record on the phone and track her from pregnancy into the postpartum period. The phones contain audio and visual prompts in a Hindi dialect specific to the area, which helps ASHAs navigate the app and extended topical recordings and pictures to enrich the counseling experience during their home visits. The application uses the data entered about the pregnancy to guide the ASHA to provide timely and appropriate health information; helps to prioritize home visits, and employs algorithms to assist in the early identification, treatment, and/or rapid referral of any problems to appropriate care. While ASHAs have many tasks assigned to them, the key one is to identify pregnant women and visit them throughout the course of their pregnancy, seeing them through to a safe facility-based delivery, and appropriate newborn care.

In addition to training on the use of CommCare, ASHAs in the project area attending capacity building sessions on how to effectively communicate with their clients to improve the quality of the counselling experience, and how to use CommCare during a counseling session.

ReMiND also strengthened the supportive supervision structures for ASHAs through project-supported Sector Facilitators (SFs) that act as ASHA supervisors. SFs used CommCare data and mobile-phone based monitoring tools to guide supportive supervision and follow-up with low performing ASHAs, conducting routine observations of the quality of ASHA counselling during home visits and periodically assessing ASHAs' mobile technology skills. Lessons learnt from SF's have guided the development of an application for a new cadre of CHWs in India called ASHA Sanginis, or ASHA supervisors.

All real time data is transmitted from the applications to CommCareHQ, Dimagi's cloud-based server, where project supervisors and government health professionals can monitor and support ASHA activities, and produce reports.

2. METHODOLOGY

2.1. Background

The goal of this study was to assess how well the ReMiND project achieved the above objectives. The ReMiND project completed a baseline study in January 2013 that included a qualitative study and a quantitative knowledge, practice and coverage (KPC) survey covering 1,100 households. The KPC established baseline measures for the project's strategic objective (SO) and targeted output-level indicators. The midterm evaluation in August 2014 employed the same methodology.

2.2 Data Collection

The evaluation presented here is based on the two rounds of KPC surveys. In each round, interviews were conducted with women who had given birth in the last 6 months. The questions were adapted and expanded from USAID's KPC2000+ survey tools, focusing on areas likely to be influenced by the intervention. Major topics included antenatal care, knowledge of pregnancy, delivery and post-partum danger signs, interactions between the women and CHW during and after pregnancy, institutional delivery and care at the time of delivery, post-partum care and feeding of the newborn.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

54

2.3 Baseline KPC Survey

During the baseline survey interviews were conducted in the Manjhanpur and Mooratganj blocks of Kaushambi District, where the ReMiND project was ongoing. Based on estimates of the effect of the project, power calculations determined that 1,148 households should be surveyed spread across 69 villages (16 surveys in each village). Using village population data from the 2011 Indian census, estimates were generated of the number of children aged 0-6 months in all villages in these two blocks. A sample of 69 villages was then drawn from the list of villages using probability proportional to size (PPS) cluster sampling.

2.4 Midterm KPC Survey

The midterm evaluation expanded the sample from Mooratganj and Manjhanpur to include the remaining six blocks in Kaushambi district into which the ReMiND program had started to scale its work through the ASHA Sanginis program. In Mooratganj and Manjhanpur, where the baseline survey had been done, surveys were done in the same villages as at baseline. In the new six blocks, another sample of 69 villages was drawn using probability proportional to size (PPS) cluster samples (based on estimated population of children less than six months).

The project team used a novel sampling technique based on voter rolls. In villages with fewer than 2,200 residents, all recently delivered women in the village were interviewed, since there was unlikely to be many more than 16 recently delivered women. In larger villages, voter rolls were used as the basis of sampling.

2.5 Data Analysis

Analysis was done using Stata 13. Quantitative data was exported from CommCareHQ into Stata for data analysis. Two main empirical strategies were utilized to estimate the effects of the ReMiND program. Survey data from the baseline was compared to survey data at midline, after 15-18 months of program implementation. There was no control group, thus a second, auxiliary approach was utilized. At baseline in December 2012, the ReMiND intervention had been underway in Manjhanpur blocks for three months, but had not yet started in Mooratganj. In Manjhanpur, around half of the interviewed women had given birth prior to the start of the program, while half had not. It is thus possible to use Mooratganj as a pseudo-control group, and compare the changes occurring in Manjhanpur before and after the implementation of ReMiND to any simultaneous changes in Mooratganj.

3. FINDINGS

3.1. Objective 1: ASHA Home Visit Coverage

As stated in Objective 1, one goal of the ReMiND project was increasing the coverage by the ASHAs, i.e. the percentage of pregnant women to whom the ASHA provides information during their pregnancies. At the start of the project, only 60% of recently pregnant women received at least one home visit from their ASHA, and only 44% received visits that had a counseling component.

ReMiND markedly increased both visits made by ASHAs and the percent of visits that contained a counseling component. The average number of counseling visits per pregnant woman nearly doubled, primarily due to a decrease in the percent of women who were never visited by an ASHA. For those women who already received at least one visit, there was little change, mostly because visited women typically receive only the government's recommended 3 visits (average of around 2.7 visits). These visits were much more likely to contain a counseling component, with only 5% of ASHA visits failing to contain a counseling component at the time of the midline.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

55

	Baseline	Midline	Difference
Percent of Women Ever Visited by an ASHA	61% [0.58,0.64]	76% [0.73,0.78]	+15% [<.001]***
Average ASHA visits per pregnant woman	1.18 [1.09, 1.27]	1.95 [1.86, 2.03]	+0.77 [<.001]***
Average number of ASHA visits per woman receiving at least one visit	2.66 [2.58, 2.76]	2.71 [2.65, 2.79]	+.04 [0.39]
Percent of Women Receiving Counseling from their ASHA	44% [0.41,0.47]	72% [0.69,0.74]	+28% [<.001]***

95% confidence intervals listed below the points estimates, with p-values listed under the differences

Table 1. ASHA Visits: Baseline to Midline Comparison

ASHAs were divided into four categories: low (visiting 0-40% of pregnant women in their area at least once), medium (visiting 40-66% of pregnant women in their area at least once), high (66-99% of pregnant women in their area visited at least once), and full coverage (visiting 100% of pregnant women in their area at least once). Sixty percent coverage could result from all ASHAs failing to visit around 2 of 5 pregnant women, or from some ASHAs having high coverage while others have low coverage (e.g. half of ASHAs visits all their pregnant women while the other half only visit 1 of 5 pregnant women). For ReMiND the latter holds true. These two situations merit very different programmatic responses.

The majority of ASHAs fell into the low coverage category at the baseline. ReMiND's project and applied technology tools produced a massive shift into high coverage among initially low performing ASHAs. In addition to one fifth of ASHAs becoming full coverage, the number of low or zero coverage ASHAs shrunk to a third of the previous amount.
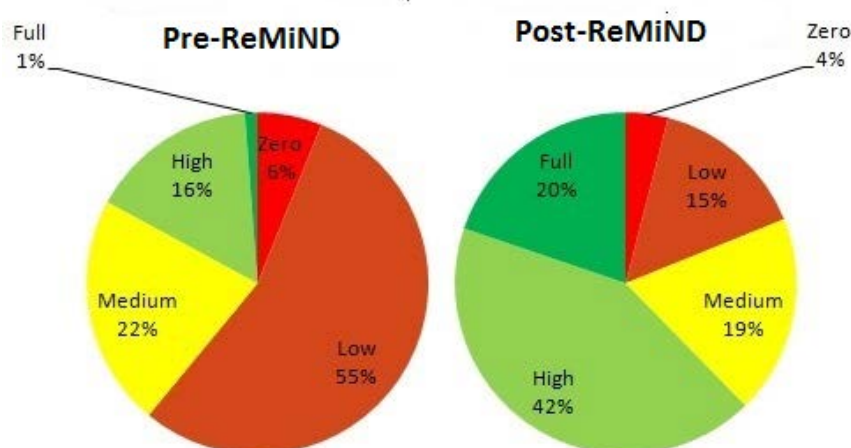
Figure 1. Low, medium and high coverage ASHA comparison- Baseline to Midline

3.2. Objective 2: ASHA Counseling

Home visits increased markedly as a result of the program, which in turn led to a large increase in counseling as part of Objective 2. Women received counseling on nearly twice as many topics, with the average woman being counseled on 0.77 topics at the time of baseline and 1.46 topics at the time of midterm evaluation. Most of the improvement came from an increase in counseling on nutrition and rest during pregnancy, topics which were explicitly addressed with multimedia messages in CommCare. While at baseline, only 17.8% of women reported that they

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

56

had received counseling on nutrition and rest, this tripled to 55% at the time of the midterm evaluation. Counseling on pregnancy danger signs also increased from 3.8% to 14% of women.

	Baseline	Midline	Difference
Average Topics Counseled on per pregnant woman	0.77	1.46	62% [<.001]***
Percent of Women Counseled on Nutrition and Rest	17.8%	55%	37% [<.001]***
Percent of Women Counseled on Pregnancy Danger Signs	4%	14%	10% [<.001]***
Percent of Women Counseled on Antenatal Care	4.6%	8.5%	3.8% [<.001]***

Two-sided t-test of difference in means is conducted, with p-values listed under the difference.

Table 2. ASHA Counselling: Baseline to Midline Comparison

The CommCare system was quickly adopted by ASHAs. Within three months of implementation, 60% of recently delivered women in Manjhanpur reported having been visited by an ASHA using CommCare. Such rapid adoption suggests that the system is relatively easy to pick up for the ASHAs. By the time of the midterm evaluation, 74% of women receiving a counseling visit during their pregnancy had received counseling from ASHAs using CommCare.

3.3. Objective 3: Client Knowledge

Women's knowledge of pregnancy danger signs, the target of Objective 3, went up substantially. At the time of the midterm evaluation, women could recall an average of 1.23 pregnancy danger signs, while baseline recall was at an average of 0.86. The increase was most pronounced for those with lower levels of education. While they had much lower knowledge at the time of the baseline, knowledge of danger signs had nearly equalized across different educational groups by midterm evaluation.
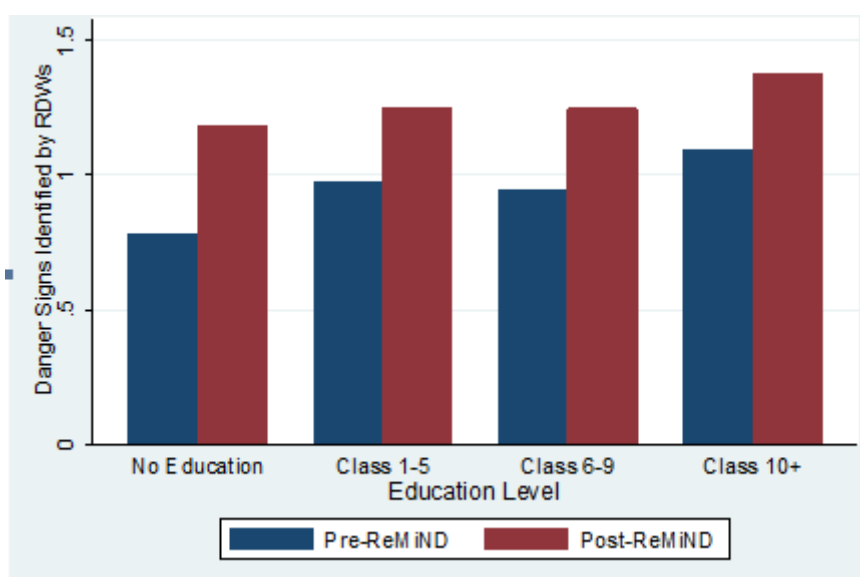

Figure 2. Delivery Danger Signs Identified by Recently Delivered Women by Education Level

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

57

3.4. Objective 4: Health Behaviors

Antenatal Care: At baseline, 57% of women did not receive any antenatal care and only 20% received the recommend three sessions. Number and quality of antenatal care sessions is heavily dependent on education, wealth, and caste, with a 10th grade education woman accessing 0.47 sessions more than an uneducated woman, and those from scheduled castes getting 0.56 fewer antenatal care sessions than one from general castes.

The program appears to have had a major success in antenatal care. The average woman accessed 41% more antenatal care sessions after the program, with 58% more women receiving the recommended number of three or more antenatal care checkups (moved from 18.9% of women to 30.2%). The program was particularly successful at reaching women of lower education: while there were major increases for those with a 5th grade or less education, there is much less of an effect for wealthier households.
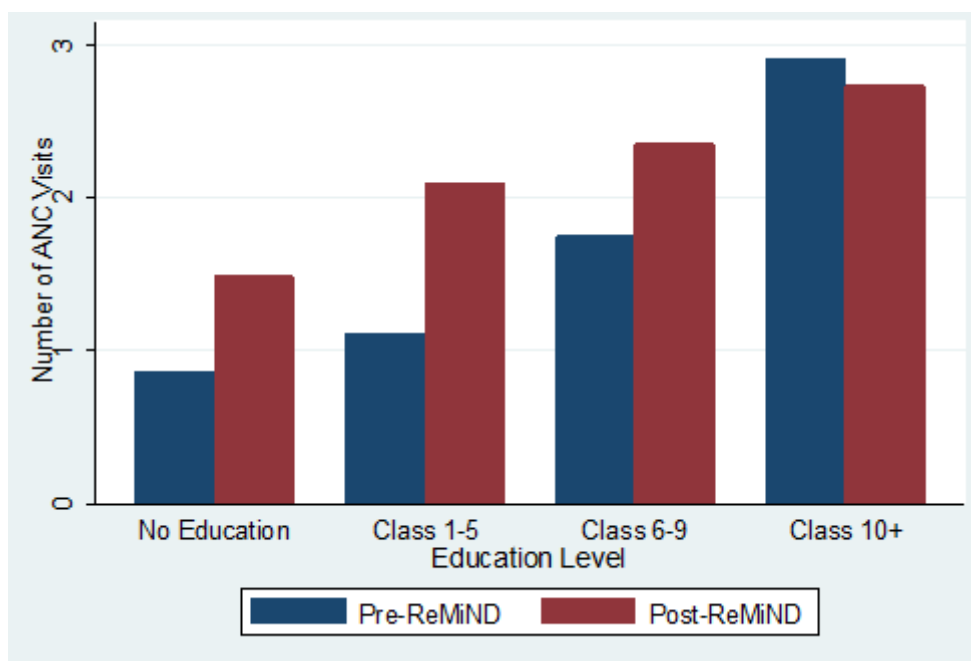
Figure 3. ANC Sessions by Level of Maternal Education

As a result of the increase in number of antenatal care sessions accessed, the percent of women experiencing a given component of quality antenatal care increased. At mid-term, 59% more women reported receiving an abdominal exam, while more women also had their blood pressure taken (increase from 32% to 39%), or gave blood or urine samples (both increased from 28% to 33%).

Tetanus Toxoid Injection: There is a marginally significant increase in the percent of women receiving the appropriate number of Tetanus Toxoid (TT) injections during their last pregnancy, from 75% to 78% (p-value of 0.08).The increase is more pronounced among less educated households, which is consistent with ReMiND having a larger effect among the more disadvantaged.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

58

Figure 4. Appropriate TT Injections Received by Education

Delivery by Skilled Providers: ReMiND seemed to have had no effect on institutional deliveries. There is a minor increase in the percent of births assisted by a skilled birth provider, 60% to 63%, but it is not statistically significant and concentrated entirely in one block.
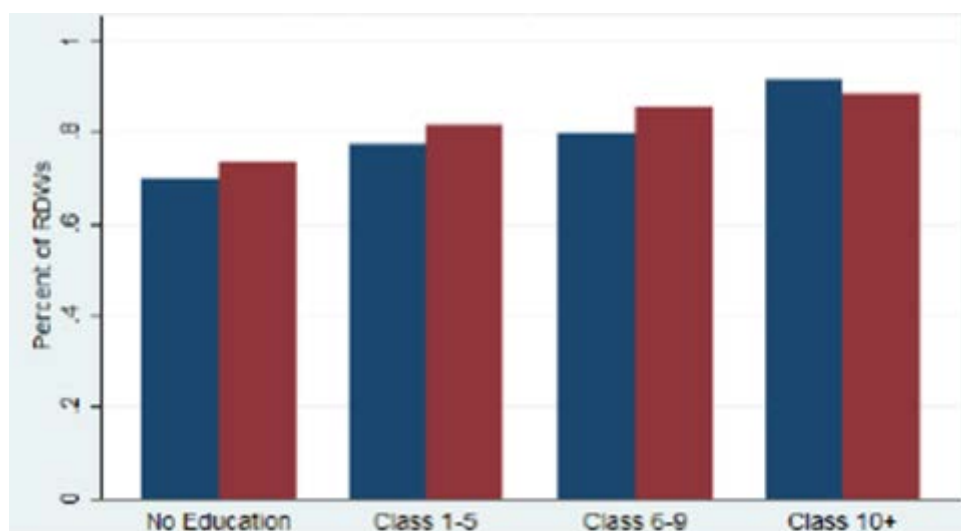
Pregnancy Complications: The percent of women reporting that they sought medical care after a particular danger sign does not show any consistent pattern in the data. At the time of midterm evaluation, women were more likely to seek help for complications during pregnancy, but less likely to seek care for complications during delivery.

Feeding of Infants: Colostrum feeding improved substantially between the baseline and midterm survey, going from 32% to 51% of women. Non-exclusive breast-feeding for children aged 1-6 months increased from 93.3% of women to 96.1% of women, a statistically significant increase. The government began a campaign encouraging colostrum feeding during this time period so it is unclear whether these improvements are attributable to the government program or ReMiND.

4. DISCUSSION

4.1. Objective 1: ASHA Home Visit Coverage

One of the major successes of ReMiND has been in Objective 1: increasing ASHAs' coverage of pregnant women in their community. This proved especially effective at reducing the number of low coverage ASHAs to less than 20% of the total. Discussions with ReMiND staff point to improved supervision and the mobile job aid being important factors. As part of their job, SFs visited pregnant women alongside the ASHA and carefully monitored ASHA activities, making it difficult for ASHAs to not visit pregnant women in their area. The phone may have also increased ASHA confidence in making home visits, but it is less plausible that the increase in confidence alone could have generated such a massive increase in coverage. Building on this success, future efforts to improve ASHA coverage rates should consider increased monitoring and supervision of ASHA activities. In the final stages of the ReMiND program the ASHAs will not be so rigorously supervised by the SFs, which will provide an opportunity to explore the impact of an alternative model.

4.2. Objective 2: ASHA Counseling

Only 44% of women received an ASHA visit with a counseling component prior to the intervention, but 72% received a counseling visit from their ASHA at the time of the midterm survey. While the mobile job aid is likely not responsible for the improved coverage, it is likely

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

59

responsible for this massive increase in the amount of counseling per visit. Fully 75% of visited women reported seeing material from CommCare during the midterm survey, which can explain the majority of the increase. It is possible that the presence of SFs from ReMiND also contributed to the increased counseling of pregnant women, but since the phone was a much more frequent companion on home visits, it seems more likely to be responsible. Given the breadth of topics an ASHA must cover, and the limited training they are provided with, the mobile phone becomes a confidence-building tool. The SFs and mobile job aid proved excellent complements, with the presence of SFs improving ASHA's allocation of effort, and the mobile job aid improving the quality of those visits made due to increased effort.

4.3. Objective 3: Client Knowledge

While women's knowledge did show some signs of improvement post-ReMiND, the effect was relatively limited. Recall of counseling on danger signs increased from 3.8% to 14% of women, while that on nutrition showed a massive increase, from 17.8% to 55%. Knowledge of danger signs during pregnancy did increase, from an average of 0.86 danger signs known to an average of 1.23, but this is inadequate to show any effect on health outcomes. Furthermore, most of the "knowledge" was on relatively obvious danger signs, such as severe abdominal pain (50%) and dizziness (26%). Households may have recognized these as problems and taken the appropriate response without being directly told that these are danger signs.

This data and anecdotal observation suggest that women find the nutrition content more engaging, whereas the danger signs information may be hard to recall or too abstract. Going forward, it will be important to determine what is responsible for the minimal impact on danger signs knowledge: 1) non-engaging presentation of the information on CommCare; 2) danger signs information is not easily conveyed or remembered by the woman; or 3) ASHAs are not presenting the content on danger signs to the women. It is possible that targeting other household members, such as mother-in-laws and/or husbands, with the danger signs information would be more effective for recall. This report finds the second explanation to be the most likely.

4.4. Objective 4: Health Behaviors

Ante-natal Care: The increase in antenatal care is the greatest outcome-level success of the program. Women received 41% more antenatal care checkups, with 58% more women receiving the recommended number of three or more. Most importantly, the effects were concentrated among lower socio-economic status households. While women with between 1-9 years of education had much lower antenatal care access during baseline, average antenatal care approached that of more educated households during midterm evaluation. Women with no education still lag far behind, but even among this group, average number of antenatal care visits almost doubled between baseline and midterm surveys. Yet despite these gains, 40% of women still do not have any antenatal care checkups with an appropriate provider. Antenatal care access increased and became more equal, but there is still need for further improvement

Tetanus Toxoid (TT): Between baseline and midterm evaluation, more women received the appropriate number of TT injections (75% to 78%), but fewer took the appropriate number of Iron Folic Acid (IFA) tablets during pregnancy. The improvement in TT injections is likely due to the program and large increase in counseling around TT injections by ASHAs. The drop in IFA is likely attributable to massive stock-outs in the supply of IFA across UP during the project period.

Delivery by Skilled Providers: Although there are many constraints that prevent ASHAs from bringing more women for facility delivery, one real barrier to increasing institutional delivery is the poor treatment or perceived poor treatment at health facility. This supply-side barrier may prevent or de-motivate pregnant women from going to the facility for delivery, and without more holistic programming ReMiND will have difficulty moving this indicator.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

60

The next round of surveying should explore why women are not giving birth at institutions, and implications of this for program messages. For example, if those who are not giving birth in facilities can be categorized into groups (e.g. mother-in-law is resistant, monetary reasons), then messages could be designed and targeted. It also might be helpful to more explicitly focus CommCare messaging on institutional deliveries as opposed to information provision, given the limited improvements on knowledge outcomes.

4.5. Limitations

The primary limitation of the quantitative comparison is the lack of a true control group. As detailed in the findings section, it is somewhat problematic to attribute all the changes between baseline and MTE to ReMiND, since other changes may have occurred in the district over the time period. In some cases, it is possible to create a pseudo-control group using Mooratganj at the start of program implementation, but that does not allow detection of long term effects. Use of an experimental design would be helpful in determining whether effects are attributable to ReMiND.

It is difficult for surveyors to precisely replicate the way that questions were asked during a baseline. For example, midterm evaluation surveyors might have probed more or less on certain questions than during the baseline, leading to findings such as a little change in knowledge of danger signs (if the surveyors did less probing on this question). To avoid this, future evaluations should consider the addition of a plausible control group, such as in an experiment or by extending the surveys to nearby comparable blocks.

The KPC baseline data set did not collect information about the caste and religion of beneficiaries interviewed, and only limited information on income. This information was collected during the midterm survey only, thus it is not possible to make comparisons from baseline in terms of the populations to which benefits accrued.

The survey was modeled after USAID's KPC2000+ tools. However, many of the questions would have been better if slightly modified. For example, respondents were asked to list danger signs during pregnancy. Due to memory issues, this is likely to give a substantial underestimate of their actual knowledge. The end line survey should consider further modifications to the survey.

5. CONCLUSIONS AND RECOMMENDATIONS

The findings are encouraging for other community health programs that are considering the use of mobile technology, and provide examples of the types of improvements that may be harnessed when successfully integrating technology to support supervision, data collection and use as well as a counselling tool and job aid. Even if it is not possible to attribute the observed gains solely to the technology components of the intervention, since there were several important non-technology components such as improved supervision and interpersonal communication trainings once could surmise that technology will always be a component of a successful intervention, and not sufficient on its own. Many of the gains, do seem directly tied to the introduction of CommCare, and some of the supervisory components were supported by the data collected by CommCare and could have been a catalyst for positive change.

Important lessons learnt for evaluation of programs like ReMiND include: limitations of carrying out evaluation without a true control group; the usefulness of proactively designing program implementation with evaluation in mind by using a phased roll out to better detect effect size; exploring qualitatively and quantitatively which aspects of the technology or supervision structure account for the changes that are detected in evaluation.

These results also give us hope that CommCare can help make programs more cost effective, since they yield large gains in the coverage of clients, counseling rates etc. We expect that these

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

61

gains are larger than the increase in cost of deploying mobile technology. To test these assumptions, additional research is underway to analyze the cost effectiveness of the ReMiND project, which is expected to be completed mid-2015. mHealth solutions such as ReMiND have the possibility to make community healthcare more innovative, affordable and accessible.

6. REFERENCES

Bajpai, N., & Dholakia, R. H. (2011). Improving The Performance Of Accredited Social Health Activists In India, Working Paper No. 1. Mumbai.

Bhavsar, M., & Grijalva, K. (2013) From Paper to Mobile: Design Considerations for Field Level Worker Programs. In Proceedings of 4th International Conference on Mobile Communication for Development. 255-259. Retrieved January 22, 2015 from http://www.diva-portal.org/smash/get/diva2:709233/FULLTEXT03.pdf#page=258

Braun, R., Catalani, C., Wimbush, J., & Israelski, D. (2013). Community health workers and mobile technology: a systematic review of the literature. PloS one, 8(6), e65772.

Catholic Relief Services. (2013). ReMiND Project Baseline Study Report - Kaushambi District, Uttar Pradesh (December 2012 - January 2013). New Delhi.

DeRenzi B., Borriello G., Jackson J., Kumar V.S., Parikh T.S., Virk P., & Lesh N. Mobile phone tools for field-based health care workers in low-income countries. The Mount Sinai Journal of Medicine, 78(3), 406-418, 2011.

DeRenzi B., Sims C., Jackson J., Borriello G., & Lesh N. A framework for case-based community health information systems. Global Humanitarian Conference, 2011.

Lehmann, U., & Sanders, D. (2007). Community health workers: What do we know about them? The state of the evidence on programmes, activities, costs and impact on health outcomes of using community health workers. Geneva: World Health Organization. Retrived January 22, 2015 from http://www.who.int/hrh/documents/community_health_workers.pdf

Mohamed, N., Lesh, N., Conte, F., & Findlater L. Using ICT4CHW To Influence Decision Makers. Mobile Communication For Development Conference. April 2014. Dakar, Senegal.

National Health Systems Resource Centre. (2011). ASHA Which way forward...? Evaluation of ASHA Programme. Vasa. New Delhi. Retrieved from http://medcontent.metapress.com/index/A65RM03P4874243N.pdf

Paul, V. K., Sachdev, H. S., Mavalankar, D., Ramachandran, P., Sankar, M. J., Bhandari, N., … Kirkwood, B. (2011). Reproductive health, and child health and nutrition in India: meeting the challenge. Lancet, 377(9762), 332–49. doi:10.1016/S0140-6736(10)61492-4

Perry, Henry and Zulliger, Rose. (2012). How Effective are Community Healthworkers? Johns Hopkins School of Public Health White Paper. http://www.coregroup.org/storage/Program_Learning/Community_Health_Workers/review%20of%20chw%20effectiveness%20for%20mdgs-sept2012.pdf

Tomlinson M, Rotheram-Borus MJ, Swartz L, Tsai AC (2013) Scaling Up mHealth: Where Is the Evidence? PLoS Med 10(2): e1001382. doi:10.1371/journal.pmed.1001382

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

62

STAKEHOLDER ROLES AND POTENTIAL MODELS TO SUPPORT COLLABORATIVE OPEN INNOVATION IN EAST AFRICA

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Abstract: This paper provides an analysis of the Innovation Ecosystems for three representative instances in East Africa: Nairobi (Kenya), Dar es Salaam (Tanzania) and Kampala (Uganda). The authors propose that to maximise the impact of innovation systems in a developing country context, innovation interventions (including ICT4D) must (a) facilitate shared, local ownership, with objectives driven by end-user community needs and taking account of previous interventions, good practices and socio-cultural norms; (b) be co-designed, co-created or adapted in consultation with key Innovation Stakeholders; (c) strengthen the capacity of local beneficiary and/or contributing Stakeholders and (d) address sustainability and wider socio-economic impact after the interventions ends. Innovation (including ICT4D interventions) that do not address these issues run the risk of damaging the local Innovation Ecosystem or breaching trust with local stakeholders, by not taking account of local socio-cultural differences or not adequately addressing expectations raised.

1. INTRODUCTION

ICT4D often signifies activities concerning the improvement of quality of life and accelerating economic, employment, political and socio-cultural opportunities in resource constrained environments, by adapting appropriate technology good practices in areas such as agriculture, education, healthcare and public service delivery, to address the needs, aspirations and capacities of local communities. While most current Open Innovation related literature is focused on a developed country economic and technology context, the authors here propose that this concept is equally valid in an African context. Despite the flair of neo-colonialistic connotation, Open Innovation approaches require adaptation depending on the specific socio-economic and cultural context, including addressing urban, rural or deep rural environments.

From an African policy development perspective, the African Union Commission (2014) acknowledges the important contribution of "*collaborative innovation and entrepreneurship...in achieving the Knowledge Economy and sustainable socio-economic development*". It is de facto historic that 54 African Member States have adopted a continental level strategic approach to socio-economic development based on the premise that Science, Technology and Innovation can make an invaluable contribution over the next ten years. The challenge however is how to successfully operationalise that strategy at both a Member State and Regional Economic Community (REC) level, supported and coordinated at a continental level by NEPAD and the African Union Commission. While this clearly relies to a considerable degree on the commitment and vision of the public sector in terms of policy coordination and implementation, it is obvious that coordination with (and active cooperation by) other key Innovation Stakeholders is essential to achieve success.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

63

This paper builds on previous work by Cunningham et al (2014a, 2014b) analysing Innovation Stakeholders in Nairobi, Dar es Salaam and Kampala and assessing the current level of ICT-related collaboration and Innovation Absorption Capacity of these Stakeholders. In particular, the following have been utilised as unique settings for this study: (a) Focus Group involvement in national Innovation Stakeholder workshops (2011 - 2014) hosted by IST-Africa Partners, (b) face to face semi-structured interviews with senior representatives of key Innovation Stakeholders in Nairobi, Dar es Salaam and Kampala (Q4 2012 – Q1 2013), and (c) annual IST-Africa surveys of Research and Innovation capacities (2014c) and ICT/STI related Bilateral and Multilateral Cooperation (2014d). This was further supplemented by desk research, e-mails and telephone interviews, validated during IST-Africa workshops in Nairobi and Kampala in Q4 2014. It is clear from this study that credible Innovation Ecosystems are now in place in Nairobi, Dar es Salaam and Kampala, and are furthermore supported by necessary digital infrastructure and a policy environment that is pro ICT-related Innovation and Entrepreneurship.

The next section presents a brief literature review linking definitions of Collaborative Open Innovation and National Innovation Systems with key Stakeholder Groups active in the Innovation Ecosystems of Nairobi, Kampala and Dar es Salaam. It also presents concepts (some already in use in East Africa) supporting Collaborative Open Innovation. Section 3 presents a brief analysis of different stakeholder groups and their roles in supporting local Innovation Ecosystems. Section 4 outlines a number of scenarios designed to facilitate collaboration between Innovation Stakeholders, including the Demola Model. Section 5 presents a number of recommendations based on these findings.

2. CONCEPTS AND DEFINITIONS

2.1. Collaborative Open Innovation

A more extensive survey of open innovation research is beyond the scope of this paper and it can be noted that while Chesbrough (2003a, 2003b, 2006) acknowledges the contribution of previous work to what he called open innovation, Trott and Hartmann (2009) go so far as to describe it as "*old wine in new bottles*", suggesting that "*the Open Innovation community has given insufficient credit to previous researchers who described, analyzed and argued in favor of most of the principles on which Open Innovation was founded, long before the term for this new model was actually coined*" (p731).

The concept of Collaborative Open Innovation was previously discussed by Von Hippel (1986) who defined Lead Users as "*users whose present strong needs will become general in a marketplace months or years in the future. Since lead users are familiar with conditions which lie in the future for most others, they can serve as a need-forecasting laboratory for marketing research. Moreover, since lead users often attempt to fill the need they experience, they can provide new product concept and design data as well.*"[1]

Other early Open Innovation related literature focused on areas including: business and technology sectors (Chesbrough, 2003a, Chesbrough, 2003b, Chesbrough et al, 2006); role of intermediaries in business models (Chesbrough, 2006, Chesbrough, 2007, Chesbrough and Appleyard, 2007); extended/distributed enterprise (Seely Brown and Hagel, 2005, Panchai and Fathianathan, 2008, Valkokari et al 2009); and open source software (West and Gallagher, 2006, Chesbrough et al, 2006, Henkel, 2006). However, Gassmann, Enkel and Chesbrough (2010) suggest that while Open Innovation related research initially focused on research and development processes, it now has a broader base that they have provisionally organised into some more specific research perspectives (Spatial, Structural, User, Supplier, Leveraging, Process, Tool and Cultural Perspectives). They identified the **User Perspective**, which is

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[1] von Hippel (1988) also emphasized the impact of lead users, the availability of toolkits (von Hippel and Katz, 2002), mass customization (Franke and Piller, 2003), and democratizing the innovation process (von Hippel, 2005).

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

64

focused on integrating users into innovation processes to better understand potential customer requirements and hidden user knowledge, as one of best researched areas within Open Innovation,. However, as Gassmann et al (2010) acknowledge, over time, some areas may converge and new research areas may emerge.

2.2. National Innovation Systems

Open Innovation and entrepreneurship related characteristics are most often encapsulated in (quite vague) definitions of National Innovation Systems, such as Furman, Porter and Stern (2002), where open innovation systems are characterized as "*the ability of a country - both a political and economic entity, - to produce and commercialize a flow of new-to-the-world technologies over the long term. National innovative capacity depends on the strength of a nation's common innovation infrastructure (cross-cutting factors which contribute broadly to innovativeness throughout the economy), the environment for innovation in a nation's industrial clusters, and the strength of linkages between these two*". Similarly, Nelson (1993) states that this is constituted by "*a set of institutions whose interactions determine the innovative performance ... of national firms*" and Metcalfe (1995) "*that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process.*"

Clearly the general context is important. Freeman (1995) argues that "*Whilst external international connections are certainly of growing importance [to innovation], the influence of the national education system, industrial relations, technical and scientific institutions, government policies, cultural traditions and many other national institutions is fundamental*". Cunningham et al (2014a) also argues that "*Globalization and technological and social innovations has expanded the universe of contributing Innovation Stakeholders to include Public, Private, Education and Research, Societal, International Development and Funding Sectors, End-user Communities and Innovation Spaces (i.e. Pre-Incubators, Incubators, Innovation Centres, Entrepreneurship Centres, Accelerators) inside and outside national borders*".

Figure 1 provides a visualisation of such a context in terms of key Innovation Stakeholder Groups, each of which can potentially make a valuable contribution in supporting Collaborative Open Innovation and Entrepreneurship in these target cities (Cunningham et al, 2014a).

Each Stakeholder Group can also be regarded as a potential End-User Innovation Community for ICT-enabled innovation targeting the specific needs of *their* sector. Through the application of the concepts described in Section 3 and Section 4, there is potential for coordinated collaboration to achieve impact at cross-border and regional as well as national level.
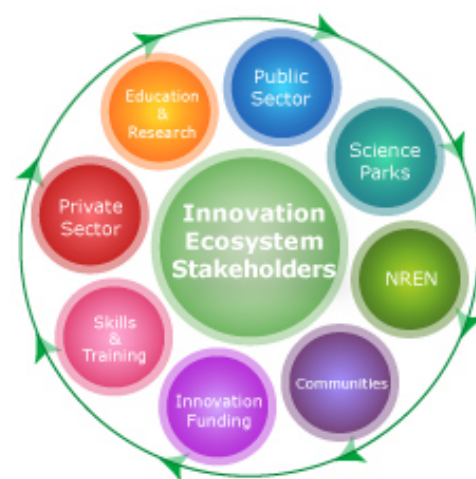
Figure 1: Key Stakeholder Groups

2.3. Concepts for Supporting Collaborative Open Innovation

There are various structures that can promote innovation independent of a specific context. These include Living Labs, Innovation Spaces (Incubators, Pre-Incubators, Accelerators, Innovation Centres, Entrepreneurship Centres); Innovation Value Chain and Virtual Enterprises; and Clusters.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

65

2.3.1. Living Labs and Innovation Spaces

The European Commission (2009) states that Living Labs involve users early in the innovation process "*to better discover new and emerging behaviours and user patterns, bridging the innovation gap between technology development and the uptake of new products and services involving all relevant players of the value network ... [and] allowing for early assessment of the socio-economic implications of new technological solutions by demonstrating the validity of innovative services and business models*".

Cunningham (2013) proposes that "*Living Labs are environments or a methodological approach that facilitates user-driven open innovation in real-life settings, where end-users (including communities) collaborate with Innovation Stakeholders to co-create or co-design innovative products, services, processes, business models or policies. Successful deployments should be capable of adaptation and replication to achieve wider socio-economic impact*".

Living Labs and Innovation Spaces can have either ad-hoc or longer-term relationships with their peers as well as other Innovation Stakeholders. This can be in the same location or same sector, between different sectors and may also emerge as networked, while connecting different places (Soetanto and Van Geenhuizen, 2011). The founders of AfriLabs for example, applied this principle in creating a network of Innovation Spaces in different African countries.

Properly coordinated collaboration between Innovation Spaces supported by other Innovation Stakeholders could facilitate the creation of a sustainable framework supporting open innovation within East Africa for example, make it easier to identify regional and national market opportunities as well as opportunities for greater collaboration between entrepreneurs and SMEs.

Currently identifying and exploiting such opportunities is ad-hoc and high risk, relying on personal connections. Managing networked Living Labs or Innovation Spaces makes significant demands on those involved. Van Buuren et al (2009) presents a Competence Model for Networked Innovation, which defines the issues to be considered during the business planning and implementation phases, but without any policy guidance for accomplishing structural changes.

While some of the independent Innovation Spaces in Nairobi, Dar es Salaam and Kampala have developed a multiple-revenue model to increase their financial stability, they could be seen to be at a potential strategic disadvantage compared to Innovation Spaces established by the education and research sector, in terms of financial security, access to resources and credibility by association.

2.3.2. Innovation Value Chain and Virtual Enterprises

It is difficult, expensive and time consuming for any Innovation Stakeholder to develop and sustain the necessary capacity and range of competencies required to address the Innovation Value Chain (described by Porter, 1985) in a comprehensive, impactful way.

The potential strength of applying a multi-stakeholder approach to supporting the Innovation Value Chain (described by Hansen and Birkinshaw, 2007 as Idea Generation, Conversion and Diffusion) is that stakeholders with common or complementary objectives can successfully implement larger, more complex projects by leveraging their complimentary expertise, knowledge, resources and skills. This form of collaboration is called a Smart and Virtual Enterprise, characterised by the European Commission (2001) as "*knowledge driven, adaptive and learning as well as agile in their ability to create and exploit the opportunities of an inter-networked economy and are key posts of the shift from industrial to the digital era. These organisations are virtual in concept, highly flexible, dynamic and capable of leveraging the power of network technologies to meet customer demands for high value added products and services in a global market*."

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

66

Martinez, Fouletier, Park and Favrel (2001) describe the evolution of a Virtual Enterprise as having three phases: Short Term Virtual Enterprise (opportunistic); Consortium Virtual Enterprise (regular project cooperation); and Extended Enterprise. These phases can be characterized as reflecting increasing level of trust, starting with cooperation for a once-off opportunity, followed by more regular cooperation if initial experiences are positive, with the possibility of developing a strategic partnership, where the potential mutual benefits of collaboration are strong and ongoing.

One example of an African Extended Enterprise is the Siyakhula Living Lab, Eastern Cape, South Africa. A company in East London refurbishes computers for the Dwesa community, with transportation provided by another company and installation and maintenance provided by a third.

A different example is MPesa mobile money transfer in Kenya, which facilitates money transfer between citizens without registration fees (de Carvalho, Klarsfeld and Lepicard, 2011). This functions successfully because local agents collaborate in an extended value chain network.

2.3.3. Clusters (ICT and Thematic)

Clusters can be defined as voluntary groupings of geographically or sectorally concentrated independent economic entities. While they may collaborate and compete, they are usually linked by similar or complementary technologies and skills and specialization in specific fields. The primary objective is to address common problems, identify mutually beneficial collaboration opportunities to achieve economies of scale, reduce costs and address skills capacity gaps.

Connect4Change (C4C) is a successful example of a Thematic Cluster which started in 2011, and focuses on co-creation of ICT programmes for health, education and economic development. IICD, Cordaid, Edukans, ICCO, AKVO and Text2Change are collaborating in Burkina Faso, Bolivia, Ethiopia, Ghana, Kenya, Malawi, Mali, Peru, Tanzania, Uganda and Zambia.

C4C employs a participatory, multi-stakeholder approach to address structural problems and innovate social sectors such as education, health and agriculture. Driven by user needs and powered by local networks of passionate individuals and organisations, the approach facilitates the co-creation of ICT-enabled solutions that are designed to be appropriate to local contexts.

In Tanzania and Uganda, thematic clusters have been operational since 2003 and 2005 respectively. Supported by SIDA, facilitators were trained on the Cluster concept and how to identify "low hanging fruits" - i.e. immediate needs in a specific sector that could be addressed at low cost. Clusters were developed by engaging enterprises focused on similar or related activities (e.g. agriculture brings together cooperatives, farmers, industry, MNCs, HEIs and agribusiness).

Clusters are now well developed in Tanzania with 26 active Cluster Initiatives - 21 on the mainland and 5 on the Island of Zanzibar. The majority of existing clusters in Tanzania are vertical (e.g., honey, agribusiness, fish, spice, tourism, hand loom, sunflowers etc) and geographic in focus. However, the ICT Cluster is horizontal as it focused primarily on provision of Services and can support all other sectors. It is now mapping potential, collaborative partners and developing a business plan. In Uganda, over 31 cluster initiatives have been supported, addressing key economic sectors, including agriculture, food processing, manufacturing, service sector and ICT.

Following a recommendation of the Kenya National Economic and Social Council (NESC) in 2009, Kenya's Vision 2030 recommends the development of regional clusters "as engines for realizing industrialization" following analysis carried out by the Kenya Institute for Public Policy Research and Analysis (KIPPRA) and ECORYS Netherlands, which mapped out 20 priority sectors defined by NESC. Taking account of the Kenya Private Sector Development

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

67

Strategy (PSDS) and consultation with the NESC Secretariat and Vision 2030 Delivery Secretariat, six priority clusters have been identified: ICT (Nairobi); Transport and Logistics (Mombasa); Coach Beach Tourism; Inland Fisheries (Kisumu); Beef (Garissa) and Horticulture (Naivasha-Limuru).

There is a significant level of Innovation Space activity in Nairobi, Dar es Salaam and Kampala, supported by the education and research, private and societal sectors, and there is a clear alignment with national policy in Kenya, Tanzania and Uganda. While the level of Living Labs activity in East Africa is still relatively low (with most activity in Tanzania, supported by TANZICT - a joint Finland – Tanzania innovation programme), there is now considerable interest in Collaborative Open Innovation as a result of IST-Africa Living Labs Training Workshops in recent years. There is an increasing focus on exploring the potential to co-locate Living Labs or apply Living Labs methodologies at Innovation Spaces, where the importance of coordination between different stakeholder groups is increasingly appreciated.

3. STAKEHOLDER ROLES AND COLLABORATIVE OPEN INNOVATION

Figure 2 illustrates that Innovation Spaces, Living Labs and ICT and Thematic Clusters provide complementary and mutually-reinforcing Innovation Community Models, with the potential to facilitate and strengthen collaborative open innovation both *within* and *between* stakeholder groups. Interaction between Innovation Communities and Stakeholders is discussed in Section 5.
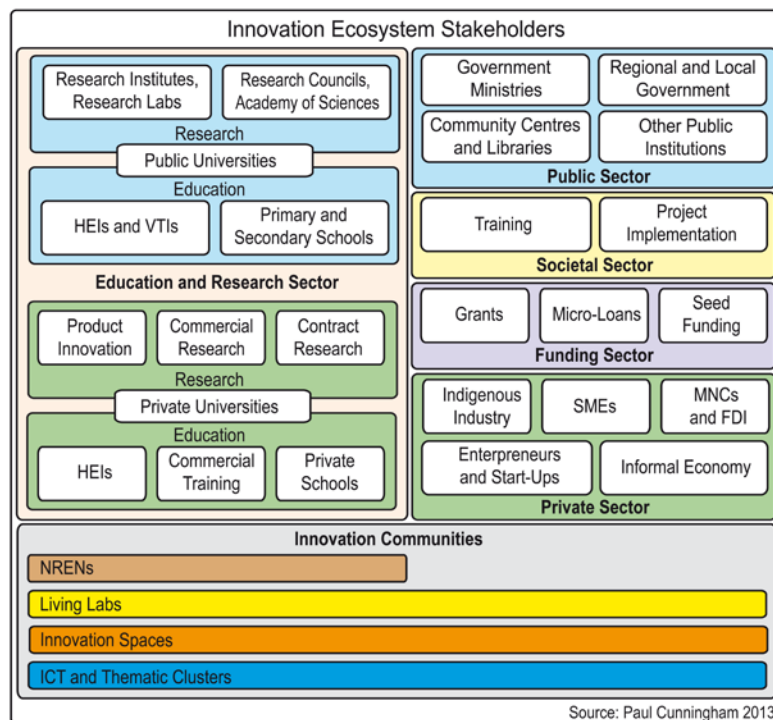
Figure 2: Stakeholder Engagement in Collaborative Innovation Lifecycle

Figure 3 illustrates a proposed model for collaboration between Innovation Ecosystem Stakeholders and Innovation Communities, more abstractly outlined in Figure 2, focused on co-creation in the development or adaptation of innovative prototypes, products, services, processes, business models and policies. The most significant roles in the model are discussed below.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

68

Figure 3: Mapping of Innovation Ecosystem Stakeholders and Innovation Communities

3.1. Role of National Research and Education Networks (NRENs)

While National Research and Education Networks (NRENs) traditionally engaged with the education and research sector, Dyer (1998) noted that cross-sectoral partnership and collaboration was strategic for many NRENs. It is clear in a European context that the role of NRENs is continuing to expand - for example JANET (UK NREN) is supporting collaboration between research/academic organisations and industry including SMEs and HEAnet (Irish NREN) is supporting primary and post primary schools as well as HEIs/VTIs.

One of the key recommendations of the ASPIRE Study is that NRENs should aim to "*increase inter-institutional collaboration, aggregation of demand for joint procurement and sharing of services*" (Dyer and Haver, 2012). While KENET (Kenya), TERNET (Tanzania) and RENU (Uganda) are primarily focused on education and research members, with suitable infrastructure this could be expanded to support other Collaborative Open Innovation stakeholders, whi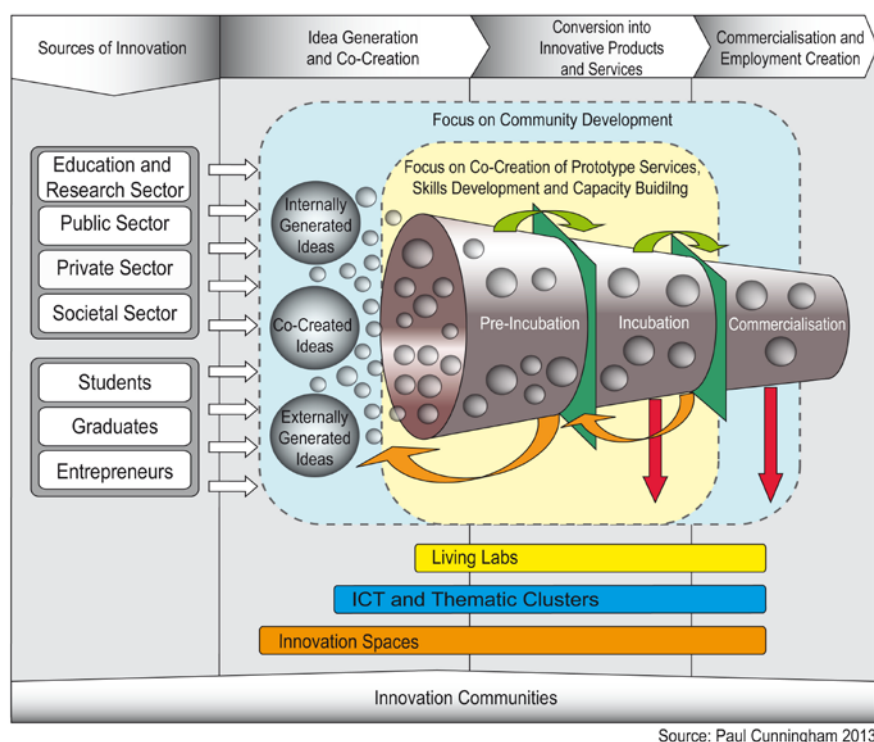ch would be beneficial for their respective countries. While KENET is currently the most progressive NREN in East Africa, through the UbuntuNet Alliance, there is active sharing of good practices across East and Southern Africa.

3.2. Role of Clusters, Innovation Spaces and Living Labs

It is important to both create and foster opportunities built on trust and mutual respect, and identify complementary capacities, expertise and experience of all key Innovation Stakeholders. Participation in Clusters facilitates collaboration based on enlightened self-interest (e.g. influencing strategic direction, building strategic partnerships, knowledge sharing, strengthening sectoral skills capacity) between stakeholders who often have competing commercial interests. This is important in stimulating the wider adoption of collaborative open innovation in the private sector in Kenya, Tanzania and Uganda, where there is often relative low levels of differentiation.

Clusters, Innovation Spaces and Living Labs are distinct but complementary Innovation Communities whereby stakeholders engage in different combinations and at different times depending on organisational type and objectives. While Clusters are primarily focused on community building and knowledge sharing, Innovation Spaces support entrepreneurs and early

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

69

stage start-ups, while Living Labs are more focused on supporting co-creation or adaptation of products, services, processes, business models and policies. As a result each model attracts a different combination of stakeholders with Clusters attracting practitioners and thematic experts (from the education and research and private sectors), Innovation Spaces students and graduates, and Living Labs researchers from the education and research, public and private sectors.

While the Innovation Ecosystems in Nairobi, Dar es Salaam and Kampala are quite vibrant, active community building activities and knowledge sharing is necessary to mitigate fragmentation. Ultimately entrepreneurs will benefit from the insight, knowledge and experience that end-user communities, thematic experts, and public, private, education and research and societal sector stakeholders can provide. These in turn will benefit from collaborating with innovative technology entrepreneurs to co-create ICT-enabled prototypes addressing sectoral challenges & requirements[2].

3.3. Role of Education and Research Sector

Education and Research stakeholders have access to knowledge and expertise, and a critical mass of students who would benefit from work experience and insight into the skills and knowledge required to secure employment (including self-employment). Rather than working on small scale projects with limited real-world applicability, cooperation with Innovation Spaces, Living Labs, Clusters and the Public, Private and Societal sectors offers the opportunity to contribute as part of a multi-disciplinary team addressing real-life challenges with real-life end-user communities. Students can gain practical experience capturing user requirements in a structured manner, co-creating relevant functionality, developing prototypes and interacting with clients to assess relevance and user acceptance. Ultimately this co-creation approach will assist students in securing practical experience that will help equip them better for both employment and self-employment. The wider adoption of such opportunities by the education and research sector will provide opportunities to strengthen the relevance of their offerings by informing curriculum development.

3.4. Role of Public Sector

The public sector has a key role to play, particularly in co-creating ICT-enabled public services. Given current infrastructure development, it is timely for relevant agencies to collaborate with Innovation Spaces, Living Labs and the education and research sector. This will provide opportunities to exploit the undoubted potential offered by investing in high quality Open Data as well as improving the relevance and accelerating the implementation of innovative public services.

3.5. Role of Private Sector

As discussed in Cunningham et al (2014a), while international and indigenous private sector stakeholders are generally well represented in supporting the Innovation Ecosystem in Nairobi, private sector innovation support is more limited in Dar es Salaam, while improving in Kampala[3].

However, much of the private sector engagement that does exists is tactical and short term in nature (e.g. sponsoring an event, providing Internet access, providing resources). There is

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[2] In the context of the Innovation Value Chain and Virtual Enterprises, current cooperation in East Africa can be described as informal and opportunistic. Anecdotally, progress is being made at some Innovation Spaces in Nairobi, Dar es Salaam and Kampala, where entrepreneurs and entrepreneurial graduates and students with complementary skills have come together to address business opportunities they could not fulfil alone. This is likely to result in some amalgamation and the capacity to achieve scale. The challenge and opportunity is to leverage Virtual Enterprise principles to manage the transition from informal to more formal long-term relationships, based on trust, mutual benefit and sustainable competitive advantage.

[3] While Kenya is currently behind both Tanzania and Uganda in the development of Clusters, it is clear that in each country, cluster development is strongly aligned with national economic policy. In the case of Kenya, cluster development is also tightly integrated with mechanisms to attract Foreign Direct Investment (FDI), such as the Kenya Export Processing Zone (EPZ) Program.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

70

significant scope for increased strategic engagement by both the international and the indigenous private sector to sustain collaboration. Mobile operators see ICT-enabled services as potential differentiators, as well as revenue drivers through increased data traffic and Internet usage.

More strategic private sector engagement with the education and research sector would offer the opportunity to inform and influence the acceleration of curriculum development to better match real-world skills requirements. It also provides the opportunity to identify and build relationships with talented students and graduates who could become future employees or supply chain partners.

More strategic private sector engagement with Innovation Spaces offers the opportunity to reduce risks and costs associated with assessing and commercialising innovation through co-creation of ICT-enabled prototypes as well as the ability to identify and mentor future entrepreneurs.

A benefit of more strategic engagement with Living Labs and Clusters is the opportunity to reduce Innovation related risks and costs through a multi-stakeholder, user-driven co-creation approach.

It is clear based on discussions that the authors have had with international private sector stakeholders, that there are currently constraints in terms of available research and development resources. This makes it critical to qualify which concepts should be prioritised internally and which should be considered for external assessment by other Innovation Ecosystem Stakeholders.

3.6. Role of Societal Sector

Traditionally the Societal Sector has tended to focus on training, hands-on community development support and implementation of projects. They potentially could play an important role, by contributing to the co-creation process in Living Labs and validation of the prototypes developed based on their extensive experience and access to end user communities.

4. FACILITATING MULTI-STAKEHOLDER COLLABORATION

There are a number of different ways of stimulating a culture of Collaborative Open Innovation. Examples provided below focus on how the public sector can actively encourage innovation through grants and public acknowledgement of the strategic importance of Innovation.

The Finnish TANZICT Programme in Tanzania established an ICT Innovation Fund in late 2012 in cooperation with COSTECH to address the current gap in funding for early state start-ups to develop a prototype or pilot a service. It is a requirement that the recipient is hosted at an existing Innovation Space such as DTBI, Buni Hub, KINU Innovation Hub or one of the university hosted incubators that can provide mentoring and monitor their progress. This is a very practical example of supporting a Collaborative Open Innovation based approach.

It is also necessary to sensitize the general public to appreciate the socio-economic importance of innovation and the valuable contribution to society made by entrepreneurs.

The Uganda Communications Commission (UCC) is supporting ICT Innovation through both grants and the annual ACIA Awards which started in 2010. This combination of encouraging, co-funding and recognising Innovation is important to encourage stakeholder cooperation and increase awareness of activities ongoing within the Innovation ecosystem. The ACIA Awards, which recognise ICT Innovations (applications, services and content) implemented in Uganda has seen the number of applicants growing from 54 in 2012 to 281 in 2014. Categories in 2015 have expanded to encourage innovation from primary school level, by including Young ICT Innovators - ICT Explorers (Primary Schools), Rising Stars (Secondary School students) and ICT Visionaries (youth aged 18 - 28); ICT for Development; Business Excellence and Digital Content.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

71

The Ministry of ICT and ICT Authority organised the first ICT sector Innovation Forum in Nairobi in March 2015 to bring together national stakeholders. Unfortunately, the national innovation agency for Kenya foreseen under the Science Technology and Innovation Act passed in January 2013 has not yet been established.

There are two basic scenarios that can be considered to promote and facilitate collaboration between Innovation Stakeholders. The first scenario is based on inviting new stakeholders with complementary objectives and skills to collaborate on scaling or replicating an existing project. The second scenario is based on a Greenfield concept, where lead stakeholders invite other stakeholders to cooperate on co-creating and executing a new intervention, with each stakeholder making a contribution that increases the overall likelihood of success including sustainability.

While there are many effective models addressing these options, the authors suggest that good practices and lessons learnt from the Finish Demola model launched in 2008 could be used to inform an appropriate model to facilitate Collaborative Open Innovation in an African context.

4.1. Good Practices and Lessons Learnt from Demola

The Demola Model leverages Living Labs principles by bringing together a number of different key stakeholder groups – organisations with ideas, universities and students. Teams of students work together to assess the market potential of concrete project ideas proposed but not yet researched by public and private sector organisations and develop a prototype.

Student teams are brought together around specific project ideas nominated by public or private sector organisations. While these projects are treated as part of their university studies, participating universities sign an agreement that allows participating students to retain rights to any IPR created. This is very unusual in a European context, where most universities would claim shared or even primary intellectual property rights over any innovation created as part of studies.

Students sign a contract with the organization proposing the project challenge and have a set duration (typically four months) to solve a problem, test a new concept, and co-create demonstrations or prototypes. While each team receives coaching from the partner organization and their respective universities, they are otherwise entirely responsible for the success or failure of their project. Participating organisations setting challenges do not pay the students to evaluate what they consider a potentially viable opportunity, but which they have not yet prioritised for internal assessment. At the end of the project, the results are presented to the partner organization, with the clear understanding that the results of the project are owned by the students themselves.

To receive academic credit from their respective universities, each team is expected to present results achieved and a demonstrator or prototype. If the organisation who posed the challenge believes the results warrant further development, they have an option for up to two months, to decide whether to pay the students a fee to secure either a shared license or full license to the Intellectual Property (IP) created. If they are not interested in exploring the opportunity further, the students walk away without payment but with full ownership rights to their IP and prototype.

In the first three years of operation, over 700 students carried out 140 Demola projects, of which 95% of completed projects were licensed, with students earning €700,000 of license income. More importantly, 15% of students were head-hunted based on the potential of their results, and the number of students expressing interest in being an entrepreneur doubled by the end of each course.

Starting with 10 partner organisations and one location in 2008, by 2014 there were 9 Demola Centers (Tampere, Vilnius, Budapest, Oulu, South Sweden, East Sweden, Maribor, Latvia,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

72

Basque Country, Saint Petersburg), 140 partner companies, 1,600 participating students, 37 participating universities and 350 projects evaluated.

Demola has successfully demonstrated how effective attracting strong local public and private sector engagement with students and universities and providing private sector mentorship to project teams can be in terms of facilitating and nurturing entrepreneurship and innovation.

One of the key lessons learnt from having the Demola Nodes operated by a neutral party (e.g. pre-incubation space and Coordinator for Demola Tampere, is paid for by the City with mentoring provided by a City agency responsible for supporting start-ups), is avoiding potential perceived conflicts of interest (e.g. if the Node was hosted by a private company or University of Tampere).

By putting the emphasis on creating innovation in a neutral Innovation Space and using a balanced contractual framework outside the normal student – university relationship, Demola circumvented a potential complication for commercialisation.

4.2. Characteristics of a Framework to Support Collaborative Open Innovation in Africa

Just as Demola evolved from teams of technology and engineering students, it is important to promote the formation of teams representing different faculties and departments. This will promote the adoption of multi-disciplinary approaches to problem solving, as well as build an innovation culture focused on complementary skills sets such as required in real world innovation.

While it is important to take account of the good practices and lessons learnt outlined above, it is vital to remember that designing a framework to support Collaborative Open Innovation in a developing country context requires both adaptation and strong local ownership to be sustainable.

In an African context where the level of private sector innovation is relatively low, it is very important to remember that while it is obviously critical to actively encourage local stakeholder engagement, it is also important not to underestimate the potential contribution and role of partners outside the traditional public, private, education and research and financing sectors. International development partners, other ICT4D stakeholders as well as international and local non-governmental organisations (NGOs) are a significant source of expertise and resources for interventions in Agriculture and Food Security, Education, Energy, Governance and Health.

It is also important to remember that in a developing country context, the socio-economic impact of the activities of social entrepreneurs can in some contexts (particularly in deprived urban areas as well as rural and deep rural areas) be even greater than those of commercial entrepreneurs. Ashoka has over 50 Fellows in East Africa alone focused on sustainable social entrepreneurship. A key strength of their methodology is the support network and knowledge sharing between Fellows, and the international linkages and access to expertise and resources that their model incorporates.

Considering the existing silos within the education and research sector at national level across Africa, there are potential advantages of not alone promoting the establishment of inter-institutional teams, but also considering establishing teams potentially comprising a mix of students, graduates, recent entrepreneurs and even intrapreneurs (executives considering spinoffs).

A critical success factor will involve establishing mutually satisfactory and mutually reinforcing mentor relationships between teams and public, private, education and research, societal, international donor and funding sector stakeholders.

Such a framework must offer the public and private sector with five key benefits: (a) cost effective assessment of non-prioritized concrete project ideas without committing scare

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

73

resources; (b) opportunity to build sustainable collaboration with participating universities, Innovation Spaces and other Innovation Stakeholders; (c) facilitate engagement with the wider Innovation Ecosystem; (d) a channel for recruiting promising talent; and (e) a channel for identifying internal talent with the commitment and capacity to launch potential spin-off businesses.

5. RECOMMENDATIONS

Success requires participating stakeholders to have (a) clearly defined common or complementary interests, (b) an agreed shared vision of target goals and what constitutes success, (c) the capacity and willingness to work as a team and contribute necessary resources and knowledge, and (d) the capacity to make a medium to long term commitment.

One of the key challenges associated with inviting additional stakeholders to collaborate on scaling or replicating an existing project or pilot is to co-create a new Terms of Reference that supports strong co-ownership by all contributing stakeholders. It is necessary for all stakeholders to clearly appreciate the contributions being made in reducing associated risks going forward.

It is beneficial to identify existing or potential Geographic and Thematic Clusters with the capability to scale based on an identifiable medium to long-term strategic opportunity. There is limited value in focusing scare resources on developing solutions for short term opportunities or where there is insufficient potential for scalability to justify the investment required. To maximise potential impact, it is also essential to focus on scenarios targeting communities or Thematic Clusters where (a) solutions of increasing sophistication or impact can be layered on the foundations provided by previously validated adapted or co-created solutions or (b) where existing recipients of Train the Trainer programmes can be further up-skilled and provided with the necessary capacity to train others to replace them.

Finally, it is important to acknowledge that Innovation Spaces and education and research sector are not the only stakeholders essential to the creation, maintenance and sustainability of Collaborative Open Innovation. Unless all key stakeholders (including international development and other ICT4D partners) enter into such collaborations in a full spirit of cooperation, openness, transparency and trust, developing sustainable Innovation Ecosystems is doomed to failure.

5.1. Potential Contribution of NRENs

It is recommended that consideration be given to how NRENs such as KENET, TERNET and RENU can actively strengthen collaboration between education and research stakeholders, Innovation Spaces, Clusters and Living Labs.

This could be achieved in part by connecting Innovation Spaces, Thematic Clusters and Living Labs in Nairobi, Dar es Salaam and Kampala to existing NRENs on a phased basis.

The greatest short term potential exists in Nairobi, as KENET is currently more advanced in terms of available infrastructure and capacity than TERNET and RENU. However, as the national fibre optic rings and associated national backbones in Tanzania and Uganda are completed, it is hoped that TERNET and RENU will accelerate progress in connecting and supporting capacity in education and research stakeholders, and then consider expansion to support additional innovation stakeholders.

5.2. Potential Contribution of Clusters, Innovation Spaces and Living Labs

It is recommended that the key to strengthening the existing Innovation Ecosystems in Nairobi, Dar es Salaam and Kampala is for all Innovation Stakeholder groups to actively explore opportunities to collaborate on issues of enlightened self-interest. There are important opportunities to both influence government policy as it relates to innovation and technology entrepreneurship capacity and align activities with national policy to address sustainability

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

74

challenges. Clusters, Innovation Spaces and Living Labs all have important contributions to make.

It is recommended that Clusters should focus on facilitating cross-sectoral ICT and Thematic community building and knowledge sharing between practitioners and Public, Private, Societal, Education and Research, and Funding Sector Stakeholders, and supporting the activities of Innovation Spaces and Living Labs as cross-sectoral end-user communities, by contributing to the co-creation of thematically relevant products, services, processes, business models and policies.

It is recommended that Innovation Spaces and Living Labs should focus on providing neutral Innovation Communities that facilitate engagement between entrepreneurs, end-user communities and different stakeholder groups to enable co-creation of innovative products, services and business models and facilitate delivery of accreditation friendly ICT and Entrepreneurship training to empower sustainable job creation.

5.3. Potential Contribution of Public, Public and Societal Sectors

It is recommended that a model such as Demola is adapted to socio-cultural differences in Africa. Such a model should be leveraged to facilitate the contribution of national and regional challenges by public, private and societal sector stakeholders to be addressed by teams of entrepreneurs through the co-creation of ICT-enabled prototype solutions with end user communities. Prototype validation can be undertaken in cooperation with Living Labs, end-user communities and appropriate Clusters. Each organisation should work closely with the entrepreneurial team, providing coaching and mentoring during the co-creation and validation process. It is critical to embed all legal and practical constraints associated with service delivery.

6. ACKNOWLEDGEMENT

7. REFERENCES AND CITATIONS

African Union Commission 2014. *On the Wings of Innovation: Science, Technology and Innovation for Africa, 2024 Strategy (STISA-2024)*, AUC, Addis Ababa

Chesbrough, H.W. (2003a). *Open Innovation: The new imperative for creating and profiting from technology*. Boston: Harvard Business School Press

Chesbrough, H. (2003b) *The Logic of Open Innovation: Managing Intellectual Property*. California Management Review 45:3 (Spring 2003) pp33 - 58

Chesbrough, H. (2006) *Open Business Models: How to Thrive in the New Innovation Landscape*, edn. Boston, Massachusetts : Harvard Business School Press

Chesbrough, H., Vanhaverbeke, W. and West, J. (2006) *Open Innovation: Researching a New Paradigm*, edn. Oxford: Oxford University Press

Chesbrough, H.W. (2007) *Why companies should have open business models*. MIT Sloan Management Review, 48, 2, 22–28.

Chesbrough, H., and Appleyard, M. (2007) *Open Innovation and Strategy*. California Management Review, 50(1), pp. 57-76.

Connect4Change (2011). *ICT-Led social innovation process*. Online available at: http://www.iicd.org/.../ict-led-social-innovation-process/ICT

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

75

Cunningham, P., Cunningham, M., and Ekenberg, L. (2014a), *Baseline Analysis of 3 Innovation Ecosystems in East Africa*, Proceedings of International Conference on Advances in ICT for Emerging Regions (ICTer2014)

Cunningham, P., Cunningham, M., and Ekenberg, L. (2014b), *Assessment of Potential ICT-Related Collaboration and Innovation Capacity in East Africa*

Cunningham, P., Cunningham, M., et al (2014c). Guide to Bilateral & Multilateral Cooperation Agreements Supporting ICT/STI-related Activities in IST-Africa Partner Countries. ISBN: 978-1-905824-42-7

Cunningham, P., Cunningham, M., et al (2014d). Guide to ICT Initiatives and Research Capacity in IST-Africa Partner Countries. ISBN: 978-1-905824-41-0

De Carvalho, A., Klarsfeld, L. and Lepicard, F. (2011*). Leveraging Information and Communication Technology for the base of the Pyramid: Innovative business models in Education, health, agriculture and financial services*. Hystra report. Available at: http://www.hystra.com/opensource/ICT_for_the_BoP.html

Dyer J. 1998. *UK Academic Network Architecture*. A Study commissioned by the ACN. UKERNA

Dyer J. and Haver M. (2012) *The Future Roles of NRENs*. ASPIRE Foresight Study (FP7).

European Commission. (2009). *Living Labs for user-driven open innovation: An overview of the Living Lab methodology, activities and achievements*, Unit F4 on New infrastructure Paradigms and experimental facilities. Information society and Media. Online available at:
http://ec.europa.eu/information_society/activities/livinglabs/docs/brochure_jan09_en.pdf

European Commission (2001). *New Methods of Work and Electronic Commerce*. December 2001

Franke, N. and Piller, F.T. (2003) *Key research issues in user interaction with user toolkits in a mass customisation system*. International Journal of Technology Management, 26, 5–6, 578–599

Freeman, C. (1995) *The 'National System of Innovation' in historical perspective*, Cambridge Journal of Economics 1995, 19, 5-24

Gassmann, O. Enkel, E. and Chesbrough, H. (2010) *Perspectives on Open Innovation. Special Issue: The future of open innovation*. R&D Management eds. Volume 40, Issue 3, pages 213–221, June 2010

Hansen, MT and Birkinshaw, J. (2007). *The Innovation Value Chain*. Harvard Business Review June 2007

Henkel, J (2006) *Selective revealing in open innovation processes: The case of embedded Linux. Research Policy* Volume 35, Issue 7, September 2006, pp953 - 969

Nelson, R. (ed.) (1993), *National Innovation Systems. A Comparative Analysis*, Oxford University Press, New York/Oxford.

Martinez, MT, Fouletier, P, Park, KH, Favrel, J. (2001) *Virtual Enterprise – Organisation, Evolution and Control*. International Journal of Production Economics. Vol 74, Issues 1-3, December 2001 pp225-238

Metcalfe, S. (1995), "*The Economic Foundations of Technology Policy: Equilibrium and Evolutionary Perspectives*", in P. Stoneman (ed.), Handbook of the Economics of Innovation and Technological Change, Blackwell Publishers, Oxford (UK)/Cambridge (US).

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

76

Panchai, J and Fathianathan, M (2008) *Product Realization in the Age of Mass Collaboration*. Proceedings of IDETC/CIE 2008. ASME 2008 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, August 3 - 6 2008, New York City, NY

Porter, M, (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. THE FREE PRESS

Seely Brown, J and Hagel III, J (2005), *The Only Sustainable Edge; Why Business Strategy Depends on Productive Friction and Dynamic Specialization*, Boston: Harvard Business School Press

Soetanto,D. and Geenhuizen, MS (2011) *Social networks, university spin-offs growth and promises of 'living labs'*. Regional Science Policy & Practise. 3, 3, p. 305-321

Trott, P and Hartmann, D (2009) *Why "Open Innovation" is Old Wine in New Bottles*, Internatioanl Journal of Innovation Management, Vol. 13, No. 4 (Dec. 2009) pp715-736

Valkokari, K, Paasi, J and Luoma, T (2009) *Beyond Open Innovation - the concept of networked innovation*, Proceedings of 2009 ISPIM Symposium, New York

Van Buuren, R., Haaker, T. & Janssen, W. (2009), *Networked Innovation*, Novay: The Netherlands

Von Hippel, E. (1986) *Lead users: a source of novel product concept*s. Management Science, Vol. 32, No. 7 (Jul., 1986), pp. 791-805

Von Hippel, E. (1988) *The sources of innovation*, edn. New York: Oxford University Press

Von Hippel, E. and Katz, R. (2002) *Shifting innovation to users via toolkits*. Management Science, 48, 7, 821–883

Von Hippel, E. (2005) *Democratizing Innovation*. Cambridge, MA: The MIT Press

West, J and Gallagher, S (2006) *Challenges of Open Innovation: the paradox of firm investment in open-source software*. R&D Management Volume 36 Issue 3 (June 2006) pp319 - 331

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

77

EXPLORING HYBRIDS OF COMMERCIAL AND WELFARE LOGICS IN IMPACT SOURCING

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Abstract: The purpose of this paper is to explore impact sourcing (ImS) organisations as examples of hybrids using the lens of institutional logics. ImS is concerned with outsourcing arrangements that employ people at the base of the pyramid, with limited opportunity, in business process outsourcing centers for poverty alleviation. Specifically, the paper focuses on how and why such organisations manifest commercial and welfare institutional logics and the interplay, contradictions and responses employed to competing logics. The paper explores qualitative field data collected in two case studies - one a social enterprise located in the Pakistani state of Kashmir, and the other a private sector organisation in the Indian state of Kerala. Institutional logics and the concept of hybrids are employed to illustrate the tensions between the welfare and commercial orientation manifested across several dimensions in each case. Strategies of decoupling, compromising and combining are analysed. The analysis shows that combining welfare and commercial logics in ImS can be problematic and may not translate directly to commercial and welfare improvements. This paper furthers the theoretical understanding of the multiple tensions in ImS and the interplay between commercial and welfare orientation. Practical implications of this paper focus on the need to acknowledge the tensions and contradictions inherent in this model.

Keywords: Impact sourcing, Hybrids, Institutional logics, Organizational theory, India, Pakistan.

1. INTRODUCTION

In this paper we explore impact sourcing (ImS) organisations as examples of 'hybrids' using the lens of institutional logics. According to the Rockefeller Foundation, ImS "*employs people at the base of the pyramid [(BOP)], with limited opportunity for sustainable employment, as principal workers in business process outsourcing [(BPO)] centers to provide high-quality, information-based services to domestic and international clients*" (Monitor, 2011:2). The goal of ImS is to achieve a social mission through commercial activities. Yet because the activity is caught between the demands of a market logic and a social welfare logic, we are motivated to ask: can this work in the long term?

ImS has recently been examined empirically in a series of white papers (e.g. Accenture, 2012; Everest Group, 2014; Monitor, 2011) and in the academic literature (Madon & Sharanappa, 2013; Malik et al., 2013b). These studies report positive commercial potential to organisations and clients, including cheaper costs, increased markets, lower staff attrition rates, as well as positive social benefits, including increased self-esteem, confidence and upgraded technical skills for the local community. However there have been some early indications of challenges to ImS; for example, Sandeep & Ravishankar (2013) question whether the local community will

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

78

accept ImS with open arms. To date, however, most prior literature assumes a unitary ImS organisation and does not call into question the challenges of competing priorities related to contradictions in institutional logics.

The institutional logics perspective is one of various developments in new institutional theory where the focus has moved away from isomorphism and legitimacy to practice variations and institutional logics (e.g., see Lounsbury, 2008). Lounsbury (2002: 253) defines institutional logics as "*organizing principles that govern the selection of technologies, define what kinds of actors are authorized to make claims, shape and constrain the behavioural possibilities of actors, and specify criteria for effectiveness and efficiency.*" A related stream incorporated into this paper focuses on *hybrids* that are by nature arenas of contestation and contradiction of institutional logics. Hybrid organizations are defined as organizations that incorporate elements from different institutional logics (Pache & Santos, 2013). An institutional logics perspective on ImS presents the challenges of competing priorities and interests of multiple stakeholders with conflicting views.

This paper addresses the current knowledge gap by examining the competing and contradictory institutional logics that are present in a particular form of hybrid - ImS organisations - and how this contradiction plays out. The aim is to try to unpack the impact that these dual logics can play on strategic decision-making that may effect the longer term viability of this type of ICT4D initiative. Specifically, we focus on these research questions:

- how and why do ImS organisations manifest commercial and welfare logics
- what is the nature of the contradictions and what responses are employed to competing logics.

The empirical basis for the paper is longitudinal qualitative field data collected from two case studies - one a private sector outsourcing firm operating in the Pakistani state of Kashmir, and the other a public sector funded social enterprise in the Indian state of Kerala. Both cases have been operating as ImS for over 5 years, but offer very different flavours of ImS. By analysing some of the strategic choices they have made, and unpacking the rationale and drivers behind those choices, we can learn more of the potential for ImS as a viable development model.

This paper furthers the theoretical understanding of the multiple tensions in ImS and the interplay between commercial and welfare orientation. Practical implications of this paper focus on the need to move away from simple deterministic visions of ImS for development (implied in much of the practitioner literature), towards an approach based on acknowledging the tensions and contradictions inherent in this model.

2. LITERATURE REVIEW: IMPACT SOURCING

ImS is a recent term introduced by the Rockefeller Foundation to represent a practice of IT and business process outsourcing (BPO) providing job creation for marginalised people (Avasant, 2012; Monitor, 2011; William Davidson Institute, 2013). (For a comprehensive review see Carmel et al. (2014).) A taxonomy of ImS business models is presented in Malik et al. (2013a), where one category includes the social enterprise type of outsourcing organisations, and an other the private sector commercial outsourcing organisations that incorporate ImS practices as part of corporate social responsibility (CSR). In both categories a 'win-win' outcome is posited for employees, outsourcing service providers and outsourcing clients (Accenture, 2012; Lacity et al., 2014; Monitor, 2011). Prior research into social enterprise ImS includes Heeks & Arun (2010) and Madon & Sharanappa (2013). Commercial model arrangements are described in Malik et al. (2013b) and Sandeep & Ravishankar (2014). All of these discuss empirical research in India, and as noted above, identify positive as well as some negative impacts on employees and their communities. The scope of ImS is not limited to developing countries, however, and includes

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

79

outsourcing work to prisons and to rural areas of the USA where labour is plentiful and costs are relatively low (Lacity et al., 2010). For example, commercial outsourcing service providers such as the USA-based RuralShores relocate to rural areas to provide low-cost outsourcing services to their clients within time zone and country boundaries (Carmel et al., 2014; Monitor, 2011). However, to date no study has examined the potential for contradictions in delivering this 'win – win' outcome (conflicting institutional logics) and no study has compared social enterprise and private sector cases. To address this literature gap, this paper draws on institutional logics to explore the interplay of competing logics and responses in ImS in social enterprise and commercial ImS organisations.

3. CONCEPTUAL FRAME : INSTITUTIONAL LOGICS AND HYBRIDS

An institutional logic represents a particular 'worldview' (encompassing goals, assumptions, values, etc) that governs acceptable rules of behaviour within an organisation (Lounsbury, 2002; Thornton & Ocasio, 1999). Scott (1995) points out that institutional theory has emphasized isomorphism and stability but by contrast the institutional logics perspective emphasises that institutions are never homogeneous within an organization and multiple logics may exist simultaneously contributing to institutional contradictions (Friedland & Alford, 1991). Over the last few years, institutional logics has gained acceptance in information systems research as a lens for empirical inquiry and recent empirical applications emphasize the coexistence of multiple competing logics (Currie & Guah, 2007; Hayes & Rajão, 2011; Lounsbury, 2008; Marquis & Lounsbury, 2007). In the field of ICT for development, Sahay et. al., (2010) draw on institutional logics as a lens to explore a centralized paper based health management information system in Tajikistan. The competing logics were evident in the replacement computerized system and implementation process which was embedded with values of decentralization and local empowerment.

Much of the extant research on institutional logics focusses on how dominant logics shape institutions. As noted above, the related research on *hybrids* is relevant here, where several existing institutional logics contradict and contest one an other (Pache & Santos, 2013). Most ImS organisations by their very nature embody both a worldview based on a welfare agenda (eg. addressing socio-economic goals for marginalised communities), and one based on a commercial agenda (eg. maximising sustainability of enterprises, profitability, etc) (see Malik et al., 2013a for a deeper classification on ImS models). Hence they can be conceptualised as hybrid organisations. Prior research into hybrids raises questions of how legitimacy is maintained to the various stakeholders where commercial and welfare logics contradict (eg. Battilana & Dorado, 2010). In cases where logics are incompatible there is potential for coalitions and conflict /contestation for a preferred template. Pache & Santos (2013) identify three main strategies that hybrids use to navigate competing logics. The first involves *decoupling* the logics. This could include symbolical endorsement of one logic while practicing another more closely aligned. An example could be in the symbolic 'greenwashing' sustainability statements by oil exploration companies. The risk of this approach is that coalitions and conflict may emerge or be cynically interpreted by stakeholders (e.g. recent Greenpeace campaign vs. Shell Arctic exploration). Other strategies may be to *combine* the logics, an example shown in microfinance that combines commercial banking and development. The third strategy hybrids may adopt involves *compromise;* an example again from microfinance is in setting interest rates which a banking logic would set at highest rate the market will stand compromised with welfare logic of lowest possible rate. There is a risk that a compromise strategy may present partial compliance and problems with long term legitimacy. The contradictions and conflict generated by attempts to combine and compromise competing logics are demonstrated in the rather fraught history of microfinance (see Hulme & Arun, 2011).

The area of ImS is still relatively young and the sustainability of the model is yet to be tested. By examining two case study ImS organisations using an institutional logics lens to unpack the rationale for strategic decision-making, further insight can be gained into the issues and problems faced by such organisations.

4. METHODOLOGY

Qualitative methods were employed to collect empirical data in the two case studies. The case study selection was based on (i) each case represents a different ImS business model (Malik et al., 2013a), where AlphaCorp is a commercial private sector outsourcing firm and Kudumbashree is a for-profit social enterprise; and (ii) availability of data.

In the case of AlphaCorp data was originally collected during fieldwork in Pakistan between September 2013 to March 2014, through semi-structured interview, observation written in field notes and during informal talks with AlphaCorp employees over lunch and tea breaks. Secondary data was also analysed in the form of publically available documents analysis (brochures, company reports, NASDAQ IPO documents). A total of 72 interviews were conducted with employees, middle and higher level management based in Pakistan. 6 interviews were conducted in USA with senior management during a visit from 5th to 8th August 2014. Interview audio recordings (where permitted) were transcribed and hand written notes were converted to electronic format and coded using computerised data analysis software (NVivo). Initial codes were constructed based on inductive analysis involving reading of the interview data, followed by axial coding (Strauss & Corbin, 1998) grouping related codes. Theorisation for this paper involved re-reading the data with a logics frame in mind and the transcripts were re-examined using Nvivo to code and identify the competing logics and strategies (decoupling, compromise, combination).

For the second case study based on Kudumbashree in Kerala India, data was collected at two timeslices over a 10 year period: in 2005-6 and again in 2014. The first phase involved on site field visits gathering primarily qualitative data via (i) group interviews with members of 38 IT micro-enterprises, (ii) structured interviews with 133 women micro-entrepreneurs working at these enterprises, (iii) unstructured life story sessions completed by 6 of these women and 4 semi-structured interviews with State Poverty Eradication Mission officials. The second phase is still ongoing but to date has included semi structured interviews with 4 Kudumbashree officials, 1 Unnathi official and 5 women micro-entrepreneurs. Further data collection in the field is planned for 2015. In both phases secondary data was also used. Interview audio recordings (where permitted) were transcribed and qualitatively analysed with documentary data, as above. Again, for this paper, data was re-read with a logics frame in mind.

4.1 Case A: Alphacorp

AlphaCorp (A pseudonym) is a USA based public listed IT and BPO company that provides business services of electronic healthcare claims processing and IT services through a fully integrated suite of proprietary web-based solutions to clients in the USA healthcare industry. Their Head office is located in the USA and provides face-to-face marketing and client support. All IT and business process operational services are provided by AlphaCorp's offshore-outsourcing subsidiary in Pakistan, located in two regions; Islamabad and Azad Jammu Kashmir (AJK). More than 1000 employees are working in three centres (USA, Islamabad and AJK) and provide outsourcing services to more than 900 clients in 40 states of USA. The business and operational model of AlphaCorp is depicted in figure 1. In 2014 it was listed on the US stock exchange.

In 2005 AJK was hit by a devastating earthquake covering a total 7000 sq. km and affecting 1.8 million people, including 46,570 deaths and 33,136 people injured (Planning and Development Department – AJK, 2013). The estimated impact was monetized as a loss of Rs. 60.875 billion,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

81

($0.6 billion) to the private sector, and damages of Rs. 64.328 billion ($0.63 billion) to the public sector (ibid). In 2009, AlphaCorp established its outsourcing centre in AJK, supporting both commercial and welfare objectives: first, to act as a backup office and second, to provide employment opportunities to educated youth of that region and contribute in socio-economic development of the community. More than 200 employees are working in the AJK centre and providing BPO services to USA healthcare providers. The AJK centre operates in three shifts to provide 24/7 support to clients in USA, where morning shift is exclusively dedicated for female employees to encourage female employment.
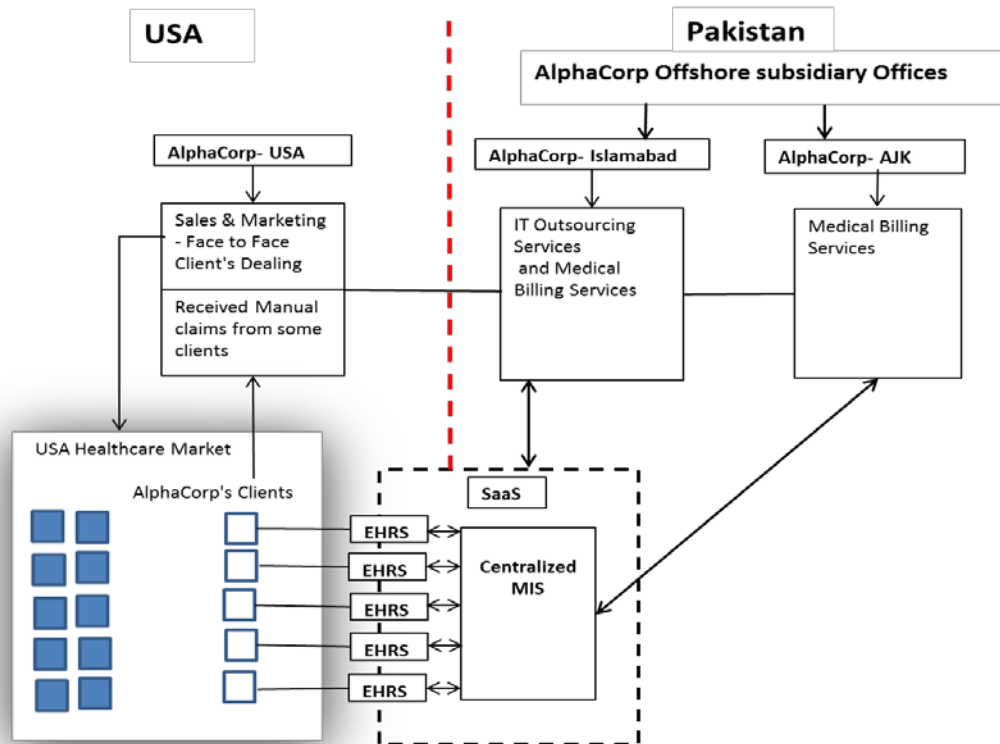
Figure 1 Business and operational model of AlphaCorp.

4.2 Case B: Kudumbashree

Kudumbashree – which means 'prosperity of the family' – is an initiative of the Kerala State Poverty Eradication Mission (SPEM) which was launched in 1998 as a women-oriented, participatory and integrated approach to fight poverty (GOK, 2003). Families below the poverty line (BPL) are identified by a multi-dimensional set of indicators based on non-monetary factors. Neighbourhood Help Groups (NHG)– a type of cooperative of ten women – are formed as the basis for each Kudumbashree unit and they then operate in a multi-functional mode: partly as an enterprise aiming to increase employment and ensure stable income for the women, but also as micro-finance organisations in the form of thrift societies, and as self-help groups for discussion and action on issues such as health and nutrition. The enterprise side of the Kudumbashree units can take many different forms (for example working in clothing production or in processing of agricultural produce). However, one of Kudumbashree's most innovative aspects has been its use of ICTs to form the basis for some of its enterprises. These ICT micro-enterprises targeted women with basic skills such as a high secondary education, typing skills and basic computing skills (skills already existent in Kerala) (Interviewee TK Jose, 2006). Some training in ICT and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

82

entrepreneurship were provided by Kudumbashree plus set up costs and access to a low interest loan.

By 2005, 104 ICT-based micro-enterprises existed across the state of Kerala, reaching over 2000 women (Heeks & Arun, 2010). The work carried out was primarily data entry and digitisation work (78%), plus some IT training and hardware assembly. These enterprises were providing income for the women entrepreneurs of $45 per month on average (Heeks & Arun, 2010) which was seen as significant for the households at BPL. The majority of contracts were obtained from government departments (ibid), often via the Kudumbashree link, but enterprises were free to negotiate for private sector work and were aiming to be competitive in the local market, though little success was evident in this regard.

In 2006 Kudumbashree commissioned a survey to evaluate progress of their micro-enterprises and found that, due to constraints such as poor marketing expertise and lack of markets, several were struggling (Kudumbashree, nd). By 2011 the number of ICT units had reduced to 79 and rural units in particular were vulnerable (Interviewee Unnathi, 2014). As a response to this, Kudumbashree set up an umbrella IT Consortium in 2012, *Unnathi*, that could *"… possess the capability to execute data entry and other assignments to potential clients…. and canvass orders from various sources.*" (Kudumbashree, nd:10) with the objectives to bring *"…better management, better quality, better delivery and better economic benefits*" (Unnathi, nd:1) to the partner micro-enterprises. Unnathi contains marketing and project management expertise and is able to negotiate with clients for larger projects and distribute the work across several member micro-enterprises. They deal with contract negotiation, assigning work, monitoring quality, delivering outputs to clients and collecting and disbursing payment (ibid).

By 2014, the number of ICT units has been reduced to 62. The client base has expanded to include some large projects in private sector but most clients remain in the public sector (Interviewee Unnathi, 2014; Interviewee Micro-enterprise, 2014).

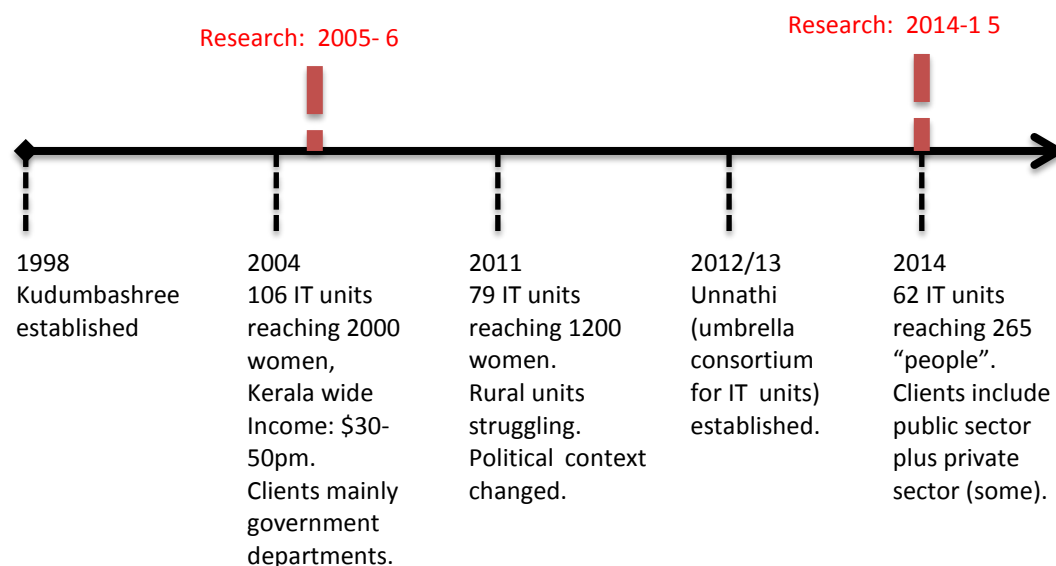Figure 2 summarise the timeline and figure 3 shows the business model.

Figure 2 Kudumbashree Timeline.
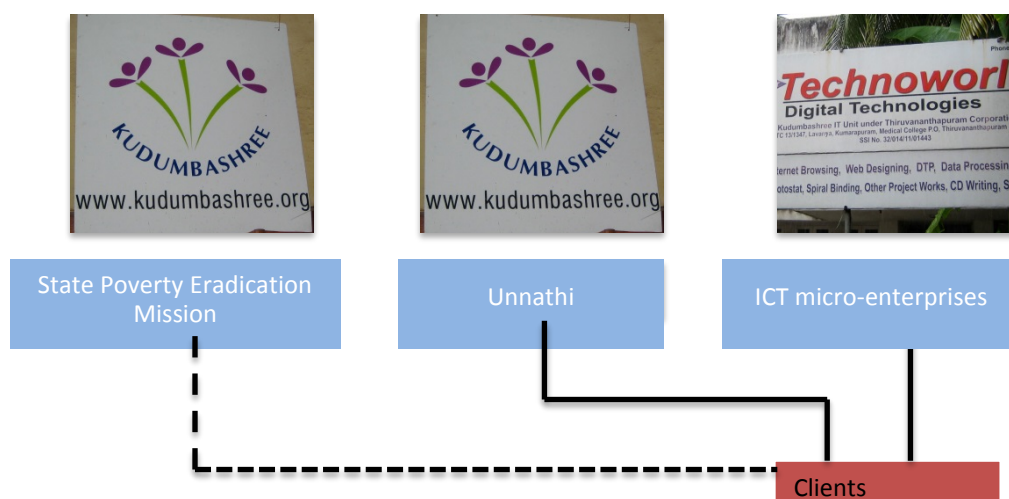
Figure 3 Kudumbashree business model

5. ANALYSIS

The following sections explore competing logic contestations and strategic responses (decoupling, compromising, combination) evident in the two cases.

5.1. Decoupling

5.1.1. Company Goals

As a public listed company on the American stock exchange, AlphaCorp has an explicit commercial goal of becoming a leading software and business solution provider in the USA healthcare industry. Business strategies of AlphaCorp to achieve its commercial goal are stated on the company website and included in publically available reports. These strategies include provision of practice and electronic healthcare record management systems and high quality business process services at a significantly low price, provided by highly skilled offshore workforce hired in two offshore-outsourcing centres in Pakistan. This very explicit and clear business goal reflects the commercial logic of AlphaCorp.

During field work, we found an *implicit* welfare logic of the company which although not documented, is practiced as CSR in the AJK centre. The establishment of a remote offshore centre in AJK as a backup office is motivated by a welfare logic and driven by the emotional connection to AJK of higher management. Interviews with higher management officials at the main offshore centre in Pakistan revealed this implicit welfare goal of socio-economic value creation for the marginalised community of AJK.

*Some time it's not only financial gain you are looking for, sometime its other things like corporate social responsibilities which you have to fulfil. So if you go to that remote area you will find that you are getting the same quality of work as in Islamabad, plus you know even with same sort of investment your corporate image is improving and you are also getting lots of positive feedback from word of mouth. I think these are the positive edges and advantages AlphaCorp have when it comes down to [this town]. (*Interviewee Manager Financial Planning and Business Analysis- AlphaCorp).

Management in Pakistan repeatedly mentioned in interviews about different steps they have taken to achieve welfare goals of socio-economic development of marginalized employees; such as, equal wages rate for Islamabad and AJK employees, dedicated shift for female employees to respect the local culture and increase women employment etc.

However, this welfare logic is decoupled from the commercial logic for overall organisational goals, as it is not explicitly included in any policies or official documents of AlphaCorp. This means that not all organisational actors (especially clients and shareholders in USA) are aware of the existence of any welfare logic in AlphaCorp's organisational goals. Keeping in mind that since 2014 AlphaCorp is a NASDAQ public listed company, the pressure from shareholders or other organisational actors, who are unaware of any welfare logic, may cause conflict between these two competing logics in the future, and influence the sustainability of the welfare logic. It also shows that two competing logics in this case are not discrete across the whole organisation. This decoupling pattern of two competing logics, where some organisational actors are unaware of organisational strategy, may lead to enclaves of competing logics across different centres of the same organisation located at different locations.

5.2. Combination

5.2.1. Location Decision

In December 2007, the assassination of the former prime minister of Pakistan caused some unrest in Pakistan. The incident made AlphaCorp management consider a backup office at some remote location to keep the business operations continuing in case of any further instability. The town where the office is located is in a small district under the government of AJK and in 2009 was selected as a suitable backup office location for AlphaCorp. The non-existence of any competitor in the region (IT or BPO company), the large pool of untapped human capital available there, and the availability of the necessary infrastructure and ICT resources, all contributed to this decision supporting the organisation's dominant commercial logic.

First of all, we needed to have a contingency office, just in case any thing happens to the main operational office in Islamabad, there should have been another office where operation can continue without any interruption. The founder of the company belongs to [the town] actually. He wanted to do something for people of his home town….. majority of the people in [the town] are educated, they move to cities to complete their education and find the work ….We knew that if we open an office in [the town] we will be able to get the human resource easily. (Interviewee General Manager-AlphaCorp)

However, the data reveals another aspect of location decision of AlphaCorp associated with their welfare logic. As indicated above, the town in AJK is the hometown of the founder of AlphaCorp. The location decision of the backup office was highly influenced by his own interest and preference to share the success with his hometown community. He wants to create job opportunities for youth of his native town, especially educated females who do not have options for work except teaching in private schools at very low pay. The respondents mention employment trends in AJK and told us that the majority of the educated men move to other cities of Pakistan and abroad to find work, but the culture of sending girls to other cities for work is not yet very common in that area. The CEO talked about his vision during an informal talk: *"we will see the real change in this community twenty years down the time, when these girls, who now have got empowerment, awareness and professionalism will bring up a new generation."* (Interviewee CEO-AlphaCorp).

In this example, we can see a dual rationale representing a successful combination of commercial and welfare logics behind the office location decision of AlphaCorp. However, we can't exclude the chances of future tension between the two competing logics. For instance, operational cost is considered high to operate in a mountainous area such as AJK, and there are also some challenges associated with the cold weather there as compared to other remote or rural areas of Pakistan. Because welfare logic is subordinate and not formally institutionalized, the threat remains of future contestation by the dominant commercial logic for reconsideration of the location decision to keep the operating cost at minimal.

5.2.2. Restructuring

In the Kudumbashree case we also see evidence of logic combination. The two alternate logics largely coexist. For instance, the clear (institutionalized) welfare goal to eradicate poverty (Kudumbashree mission statement) by *"… livelihood development …. to promote economic empowerment"* (Kudumbashree, nd:3) sits well with the commercial goal to support income generation via micro-enterprise activity (ibid). However in some areas the more subordinate role of a commercial logic has necessitated changes in the structuring of the organisation. To maintain professional legitimacy to commercial clients regarding project management skills and quality issues (The Hindu, 2012; Unnathi, nd), *Unnathi* was set up to serve essentially as an intermediary between larger commercial and public sector clients and the micro-enterprises. The commercial clients see the 'face' of *Unnathi* as a professional organisation who can negotiate, project manage and guarantee quality of work to fixed timescales. Staff at *Unnathi* possess the marketing and managerial skills necessary to fulfil this role (Unnathi, nd). At the same time, *Unnathi* is part of Kudumbashree and the State Poverty Eradication Mission, hence encompassing the welfare logic and providing professional legitimacy to government and the public (and to the micro-enterprises) regarding welfare goals.

Here, this combination strategy has resulted in the commercial logic becoming more institutionalised via this restructuring and the creation of *Unnathi*..However, as we shall see below this strategy has also caused other contradictions to emerge.

5.3. Compromise

5.3.1. Governance and Administrative Strategies

AlphaCorp has adopted hybrid governance and administrative strategies. The company follows centralized hierarchical governance and control structures and implements a uniform policy and administrative procedure to ensure coordination and consistence in company operations across all centres. For example, employee leave and holiday policies are designed to keep in mind clients in USA so only one holiday on Eid is granted instead of three/four that are common practice in Pakistan. The company management told us that clients in USA would not understand the interruption of services for three to four days because of national Eid holidays in Pakistan. This demonstrates how governance and administrative strategies are driven by the dominant business and client-oriented commercial logic.

However, the empirical data provides many examples of some governance and control transfer to the locally hired management, who have some authorisation in running the offshore-outsourcing centres especially in AJK. As a result, AlphaCorp has adopted some culturally accepted management strategies to encourage local employment, which ultimately support the welfare logic. For example, they have hired and trained a local HR and administration manager, who has some rights and authority to take decisions and manage situations according to the local social and cultural norms. For example, dedicated morning shifts for females ensure a specific number of female employees in the company. This strategy supports female employment in both Pakistani centres, but especially in AJK where the practice of women working with men is uncommon:

Wherever it makes sense, … we try to make it a uniform system with centralized policies and procedures. There are some areas where it's not appropriate to do that so it's a combination of the two; centralized and culturally adopted localized strategies. There is no hard and fast rule because that's the thing which may cause trouble, especially, in the situations where we have some local issues that need to be dealt way differently. (Interviewee President- AlphaCorp)

This hybrid governance and administrative strategy is an example of a compromise of welfare and commercial logics. In this example, we can see that compromise is not only required for the

sustainability of the subordinate logic, but can also be linked to the sustainability of the ImS centres.

5.3.2. Location, Target Population and Empowerment

When we look at the Kudumbashree case we also see evidence of a *Compromising* strategy. The tension between the commercial logic goal to support sustainable viable micro-enterprises versus the welfare goal of addressing the most marginalised in Kerala'n society has resulted in some compromise, resulting in a weakening of the predominant welfare logic and the subsequent impact.

Three areas provide example of this. Firstly location: originally Kudumbashree aimed to target women from below-poverty-line households throughout the state. Many of these households are located in rural areas with poor infrastructure and access to markets. The requirements of a commercial ICT-based micro-enterprise however, requires sufficient technical infrastructure to be able to operate and potential women micro-entrepreneurs with sufficient education standard. This lead to many of the micro-enterprises being setup in urban areas (Interviewee Unathhi, 2014). Additionally over time, several of the enterprises faced problems in being sustainable and it was found that this was particularly so in rural areas and those locations far from the main towns (see earlier).

Secondly, as stated above, originally the initiative was aimed at women to offer them better employment opportunities – clearly a welfare logic goal. However, recent evidence suggests that now the initiative targets 'people' of BPL households, and actually only half the members of the micro-enterprise need be Kudumbashree members (ie. women) (Interviewee Unnathi, 2014). The reason for this shift in target population is unclear – some evidence indicates shifting political priorities towards youth unemployment (ibid), other suggest that the restrictions of social norms regarding women doing shift work, mobility etc. may have caused a tension resulting in a need to compromise in favour of the commercial needs of the enterprises (Interviewee Kudumbashree, 2014; Interviewee Unnathi, 2014).

Thirdly, we have seen how a response to many commercial needs resulted in the establishment of Unnathi to act as an intermediary between clients and the enterprises themselves, to enable larger contracts to be commissioned and therefore enhance enterprise survival. Perhaps an unintended outcome of this is a sense of 'disempowerment' for the women entrepreneurs themselves. Contracts are negotiated by Unnathi without the micro-enterpises' involvement (Interviewee Micro-enterprise, 2014; Interviewee Unnathi, 2014). The work is then divided out by Unnathi among the micro-enterprises who wish to participate: "*The final decision is made by them [Unnathi]....Unnathi makes the selection.*" (Interviewee Micro-enterprise, 2014). Payment is received from the client via Unnathi. All of this means that the women themselves are removed further from the decision-making processes regarding the contracts (and income) and extra overheads need to be paid for the intermediary: "*We cannot make a profit .... [They] also have their share.*" (Interviewee Micro-enterprise, 2014). Additionally, some enterprises perceived that Unnathi was actually more of a barrier for them than a help: "*After Unnathi we get less projects... earlier when it was directly from Kudumbashree we were getting more work.*" (ibid).

Here we cans see that in an effort to compromise areas of conflict between the two logics, outcomes can result in a weakening of the welfare agenda.

6. DISCUSSION AND CONCLUSION

ImS is one example within the broad domain of business and development. It should be no surprise that it brings together the two worldviews that also intersect in that broader domain: one worldview rooted in profit and competition, and another rooted in cooperation and inclusion. The particular strength of each worldview differs between different cases: AlphaCorp' s is a

story of commercial logic being primary and welfare logic secondary. Kudumbashree' s was originally the mirror image, with welfare logic as the primary driver.

Strengths can also differ over time: our longitudinal study of Kudumbashree has shown commercial logic coming more to the fore, and one can identify dangers in each case if one logic dominates. For Kudumbashree particularly, if commercial logic overwhelms welfare logic, then it could lose its *raison d'etre* of women's empowerment and poverty eradication. Conversely, if welfare logic overwhelms commercial logic, then the cooperatives may be perpetually dependent on government contract "handouts" and lose any semblance of enterprise that could become commercially-viable and self-sustaining.

But we can also dig beneath the summary picture that associates whole value chains with a particular balance of logic. These worldviews – with their attendant values, processes, structures – adhere more strongly in some parts of the ImS value chain than others. In both cases, the client-facing 'enclave' of the value chain contained a strong element of commercial logic; reflecting a more general finding that ImS clients are themselves driven much more by commercial than welfare logic (e.g. Chertok, 2014). At the opposite end of the value chain, the employee enclave did, as might be expected, demonstrate some characteristics of welfare logic; but not exclusively. Whether inherent or induced through exposure to the business of ImS, at least some employees spoke the language of competition and profit.

Whatever the differing enclave profiles, in both these cases and more broadly (Bulloch & Long, 2012), ImS service providers find themselves having to manage the co-existence of the differing logics in different value chain enclaves by sometimes being 'Janus-faced': presenting messages dominated by one logic in some fora, presenting messages dominated by the other logic in other fora.

However, our analysis shows this is not in overall terms a simple one-or-other picture. Instead, there are different forms of hybridity reflected in the two cases, and we found examples of all three types identified by Pache & Santos (2013):

- Decoupling: Alphacorp, for example, presents a solely commercial picture to US clients, focusing on core commercial outsourcing issues such as cost, delivery time, and quality. Corporate social responsibility and the value of employment creation in a marginalised locale are not mentioned; they are held entirely separate and institutionally distant.
- Combining: in the Kudumbashree case, the combination of commercial and welfare logics has been given structural form in the creation of *Unnathi*. This is a hybrid organisation that simultaneously enacts activities drawn from each of the logics: commercial activities when handling most clients and in helping the more entrepreneurial of micro-enterprises to diversify from the government market; welfare activities when reporting to the State Poverty Eradication Mission and in supporting the more dependent of the micro-enterprises.
- Compromising: again taking Kudumbashree as the example, we find that the welfarist principles behind the structure and composition of the women's cooperative microenterprises have sometimes been compromised with commercial logic. This has allowed more hierarchical management, loss of members, and inclusion of men as members.

We find that, inherent within the notion of hybridity is often a sense that the two institutional logics must conflict. But this is not always so: they may sometimes accord. For Kudumbashree, greater profitability of the enterprises means greater eradication of poverty. For AlphaCorp, better working conditions for employees mean greater productivity, lower staff turnover, and thus higher earnings.

Analysis and categorisation of the two logics and their different forms of hybridity is of value, but we can also see further value in seeking to understand what determines the various outcomes we see when commercial and welfare logic intersect. There are multiple elements of explanation

that could be drawn out, but we will highlight three common issues we identified from both cases.

First, *champions*. In both cases, the champion was a Trojan horse who carried elements of one logic into a domain dominated by the other logic. TK Jose, the founder of the Kudumbashree IT initiative, brought commercial ideas into the welfarism of Kudumbashree's poverty alleviation mission. AlphaCorp's founder brought a concern for development of a devastated area into the bottom line-focused world of US digitisation and transcription contracts.

Second, *clients*. IT sourcing value chains are buyer-driven rather than producer-driven (Gereffi & Korzeniewicz 1994). That is, if we analyse the main locus of power, it lies with the clients. Their values and their institutional logics are thus driven down the value chain. If they are commercial logic-oriented – as always with AlphaCorp clients – then welfare logic will only survive if hidden or buffered by the service provider; and only if it does not conflict; i.e. that the low costs of contracting to low-income communities suit the clients' commercial logic. Less often, clients are welfare logic-oriented – this was the case for some Kudumbashree clients – in which case, the welfare logic of ImS does not have to be hidden from view but can be a more central part of the value proposition presented to the client group.

Third, *institutionalisation*. The unique proposition of ImS arises from combining the two logics. So both need to be institutionalised. But that typically proves harder with one than with another: it may be that it is harder to institutionalise welfare logic, or it may be that it is harder to institutionalise whichever is the subordinate logic. If AlphaCorp wants the subordinate logic of welfarism to survive, it has to institutionalise that logic in some way. We saw that in some of the firm's hiring practices, in its internal narratives, in its work arrangements. If Kudumbashree wants the subordinate logic of commercialism to survive, it has to institutionalise that logic in some way. We saw that in the quality control and contracting processes undertaken, and quite likely in the creation of *Unnathi*. Yet in both cases, this was a rather fragile and thin institutionalisation and helps to explain why ImS has been associated with a high risk of initiative failure (Rockefeller Foundation, 2011).

These and the other findings reported here should be seen as preliminary since they represent a largely post-hoc analysis of ongoing field data using an institutional logics lens. Despite that, we feel they do demonstrate a value of using institutional logics to understand ImS; that is it both feasible and relevant to research on this growing activity. As noted, the intersection of the two logics is essential to the nature of ImS. The logics lens provides a basis for understanding actor decision-making, value chain processes, and the emergence of structures. Equally important, we have found in presenting these ideas that they resonate with a practitioner audience.

Nonetheless, we are just at the starting gate and therefore identify a future research agenda of many strands around institutional logics and ImS. For example:

- How exactly do institutional logics manifest themselves in the strategic and operational activities of ImS actors?

- We have imputed logics from the actions and statements of our respondents. But what do those actors themselves perceive are their own dominant logics, and those of the actors and systems around them?

- What are the dynamics here: how exactly are institutional logics reinforced, hybridised, and changed over time within ImS initiatives?

REFERENCES

Accenture (2012). *Exploring the Value Proposition for Impact Sourcing - The Buyer's Perspective*. Rockefeller Foundation.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

89

Avasant (2012). *Incentives & Opportunities for Scaling the "Impact Sourcing" Sector*. Rockefeller Foundation.

Battilana, J. & Dorado, S. (2010) Building Sustainable Hybrid Organisations: the case of commercial microfinance organisaztions, *Academy of Management Journal*, Vol.53, No.6, 1419-1440.

Bulloch, G. & Long, J. (2012) *Exploring the Value Proposition for Impact Sourcing*, Accenture, Dublin

Carmel, E., Lacity, M. C. & Doty, A. (2014). The Impact of Impact Sourcing: Framing a Research Agenda. In *Information Systems Outsourcing. Towards Sustainable Business Value.* 4th ed.: Springer Berlin Heidelberg.

Chertok, M. (2014) Impact Sourcing Branding and Positioning, paper presented at *IT Sourcing and Development* international workshop, University of Manchester, UK, 20-21 Oct.

Currie, W.L. and Guah, M.W. (2007). Conflicting institutional logics: a national programme for IT in the organisational field of healthcare, *Journal of Information Technology*, Vol.22, pp.235-247.

Friedland, R., & Alford, R. (1991). Bringing society back in: Symbols, practices, and institutional contradictions. In W. Powell, & P. J. DiMaggio (Eds.), *The new institutionalism in organizational analysis* (pp. 232–262). Chicago, IL: University of Chicago Press

Gereffi, G. & Korzeniewicz, M. (eds) (1994) *Commodity Chains and Global Capitalism*, Westport, CT: Praeger: 95-122

GOK (2003) *Economic Review*, State Planning Board, Government of Kerala, Trivandrum, Kerala

Hayes, N., & Rajão, R. G. L. (2011). Competing institutional logics and sustainable development: the case of the Amazon rainforest monitoring systems, *Information Technology for Development*, 17(1), 4-23

Heeks, R. & Arun, S. (2010). Social Outsourcing as a Development Tool: The Impact of Outsourcing IT Services to Women's Social Enterprises in Kerala, *Journal of International Development,* 22**,** 441-454.

Hulme, D. & Arun, T. (2011) What's wrong and right with microfinance–missing an angle on responsible finance?, *Brooks World Poverty Institute Working Paper Series* 15511 (2011).

Kudumbashree (nd) *Kudumbashree and Livelihood Development*. State Poverty Eradication Mission: Kerala

Lacity, M., Rottman, J. & Carmel, E. (2012). *Emerging ITO and BPO Markets: Rural Outsourcing and Impact Sourcing*: IEEE Ready Notes Series, IEEE Computer Society.

Lacity, M. C., Rottman, J. W. & Carmel, E. (2014). Impact Sourcing: Employing Prison Inmates to Perform Digitally-enabled Business Services, *Communications of the Association for Information Systems,* 34**,** 1-20.

Lacity, M., Rottman, J. & Khan, S. (2010). Field of Dreams: Building IT Capabilities in Rural America, *Strategic Outsourcing: An International Journal,* 3(3)**,** 169-191.

Lounsbury, M. (2002). Institutional Transformation and Status Mobility: The Professionalization of the Field Of Finance, *Academy Of Management Journal*, 45, 255–266.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

90

Lounsbury, M. (2008) Institutional rationality and practice variation: New directions in the institutional analysis of practice, *Accounting, Organizations and Society*, 33(4/5), 349-361.

Madon, S. & Sharanappa, S. (2013). Social IT Outsourcing and Development: Theorising the Linkage, *Info Systems Journal,* 1**,** 1-17.

Malik, F., Nicholson, B. & Morgan, S. (2013a). Towards a Taxonomy and Critique of Impact Sourcing. *The 8th International Conference in Critical Management Studies.* Manchester.

Malik, F., Nicholson, B. and Morgan, S. (2013b) Assessing the social development potential of impact sourcing. Proceedings of the *6th Annual Conference SIG GlobDev*, Milan, Italy.

Marquis, C. & Lounsbury, M. (2007) Vive La Resistance: competing logics and the consolidation of U.S. community banking, *Academy of Management Journal*, Vol. 50, No. 4, 799–820.

Monitor (2011). *Job Creation Through Building the Field of Impact Sourcing* [Online]. The Rockefeller Foundation. [Accessed 14 Nov 2012].

Pache, A.-C. & Santos, F. (2013) Inside The Hybrid Organization: Selective Coupling As A Response To Competing Institutional Logics, *Academy Of Management Journal*, Vol. 56, No. 4, 972-1001.

Planning and Development Department - AJK (2013). *Azad Jammu & Kashmir, at a Glance*. Muzaffarabad: Planning and Development, AJK

Rockefeller Foundation (2011) *Impact Sourcing: An Emerging Path to Sustainable Job Creation?*, Rockefeller Foundation, Washington, DC

Sahay, S., Sæbø, J. I., Mekonnen, S. M., & Gizaw, A. A. (2010). Interplay of institutional logics and implications for deinstitutionalization: case study of HMIS implementation in Tajikistan, *Information Technologies & International Development*, 6(3), pp-19.

Sandeep, M.S. and Ravishankar, M.N., (2013) The other India - emergence of rural sourcing, *Professional Outsourcing*, Spring (12), pp. 14 - 20.

Scott, R.W. (1995). *Institutions and Organizations*, Thousand Oaks, CA: Sage.

Strauss, A. & Corbin, J. (1998) *Basics of Qualitatitive Research: Techniques and procedures for developing grounded theory*, Thousand Oaks, CA: Sage

The Hindu (2012) Kudumbashree plans 'Unnathi' for women in IT. *The Hindu,* January 18th 2012. Available at: http://www.thehindu.com [Accessed July 2014]

Thornton, P. H. & Ocasio, W. (1999) Institutional Logics and the Historical Contingency of Power in Organizations: Executive Succession in the Higher Education Publishing Industry, 1958-1990. *American Journal of Sociology*, 105: 801-843

Unnathi (nd) *Unnathi Society of Kudumbashree IT Enterprises*. Unnathi: Kerala.

William Davidson Institute (2013). *Impact Sourcing - Assessing the Opportunity for Building a Thriving Industry*. Rockefeller Foundation.

MOBILE MONEY TRANSFER SYSTEMS FOR IMPROVING THE ACCOUNTABILITY DEFICIT IN HUMANITARIAN ASSISTANCE: THE CASE OF M-PESA IN KENYA

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Abstract: Innovations in mobile technology present opportunities for the timely delivery of relief assistance to disaster-affected communities thereby improving accountability of the overall humanitarian effort. This study examines the extent to which M-Pesa, a mobile money transfer system, is able to improve the quality of humanitarian assistance to poor urban populations in Mukuru slum in Nairobi Kenya. We commence with a review of the concept of accountability as it refers to humanitarian assistance ranging from efforts to improve internal accountability to the more recent identification of beneficiary participation as a key mechanism for improving downward accountability to beneficiaries. Our fieldwork presents the perspectives and opinions of beneficiaries with regards to usage of the M-Pesa system and its overall contribution in making the humanitarian effort more accountable to beneficiaries. Our findings show that the Mukuru pilot project has advanced accountability by placing beneficiaries and the community at the centre of the relief effort. However, humanitarian NGOs need to identify suitable mechanisms for integrating local knowledge into their existing accountability structures. Finally, we point to wider policy implications of mobile money cash transfer systems for eliminating food insecurity and further avenues for research on this topic.

Keywords: Humanitarian assistance, mobile money transfer, cash transfers, Oxfam, M-Pesa, Kenya

1. INTRODUCTION

Innovations in ICTs and specifically mobile money transfer systems have been identified as crucial for providing timely humanitarian assistance to disaster-affected populations (Meier, 2011; IFRC, 2013). From the more than 120 mobile money projects that are in use in approximately 70 emerging markets, Kenya's M-Pesa[1] mobile money transfer system stands out as a leader (Beshouri & Gravrak, 2010). Over the years, the M-Pesa system has moved from a pure money transfer system that facilitates financial transactions to a payment platform that allows non-governmental organisations, businesses and firms to send and receive payments as part of humanitarian assistance to vulnerable populations in remote, often reachable and insecure regions (Acker & Mbiti, 2010). The rapid penetration of mobile phones that now serve rural and less affluent urban areas in Kenya has been a major catalyst for the rapid expansion of the M-Pesa platform[2]

The use of mobile money transfer systems supports a more general move that has taken place in the humanitarian field towards recognizing the need for centrality of crisis-affected populations in response action. For example, evidence on implementing settlement and shelter in post-Tsunami Sri Lanka shows how government policy saw advantages in supporting active

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[1] M for mobile, 'Pesa' for money
[2] Safaricom (2014) http://www.safaricom.co.ke/

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

92

household involvement in managing reconstruction of homes and community infrastructure (Kennedy *et al.,* 2008).   Recent policy focus has been on the implementation of technology-oriented approaches that put affected communities at the centre of humanitarian action as engaged participants rather than as mere recipients of aid with the aim of improving accountability to affected communities (IFRC, 2013).   A key concern in the discourse on humanitarianism has been the lack of downward accountability to beneficiaries and its negative impact on the efficiency and effectiveness of aid programmes. Despite attempt to correct the accountability deficit over the past decade by including consultations with and involvement of aid recipients in the design and delivery of programmes, affected communities continue to call for improved and accountable services (HAP, 2013).

In this paper, we focus on a mobile money transfer intervention adopted by Oxfam GB in Mukuru slum, Nairobi in order to facilitate the delivery of relief assistance to food insecure urban poor populations. According to official government analysis of the food security situation in Kenya, in 2009 more than 9.5 million people, including 4.1 million urban dwellers were faced with serious food insecurity (KFSSG, 2009). A combination of factors has been advanced to explain the rising incidence of food insecurity in Kenya including the global food crisis, poor rains, low food grain production, post-election violence, rising food prices, stagnant or falling incomes and a reduction in cross border imports (Hossain *et al.,* 2010). In 2009, an estimated 43% of this food insecure population were urban dwellers and in order to alleviate the food crisis in these low-income settlements, Oxfam and its partner Mukuru Slum Development Project (MSDP) piloted the use of M-Pesa mobile money transfer for delivery of relief assistance targeting the most vulnerable households in Mukuru slum, Nairobi (Oxfam, 2009). A total of 3,000 Mukuru residents were targeted by the project for a period of 18 months. Each household was to receive KES 1,500 (USD 17.6) every month with funding provided by the Swedish International Development Agency, Oxfam GB, Safaricom and Tolkien Trust. Oxfam GB and MSDP provided technical support and were responsible for implementing the initiative.

The broad objective of this paper is to contribute to the limited critical study of ICT-based approaches to humanitarian action. Specifically, we examine the extent to which the Oxfam M-Pesa pilot project in Mukuru has provided leverage to improve accountability to beneficiaries. In the next section, we review key issues regarding accountability in humanitarian NGOs and consider the role of cash transfers in increasing beneficiary participation in programme implementation.   Section 3 describes our study methodology which is followed by presentation of findings in Section 4. Finally, by way of discussion, we highlight some policy and research implications of our study.

2. RETHINKING ACCOUNTABILITY IN HUMANITARIAN NGOs

There has been an explosion in the number of NGOs dedicated to humanitarianism since the 1990s with the bulk of the largest NGOs being American and European. This rapid increase in numbers and the sheer size of their operations has led to critical questions being asked about the performance and accountability of these agencies as they compete over funding and media exposure.   Following numerous examples in which NGOs have failed to act collectively and strategically as they compete for funds and profile often resulting in worse outcomes for disaster-affected communities, there has been a significant increase in policy focus on the issue of accountability in the humanitarian sector.   Here, the dominant discourse has been on the achievement of 'upward accountability' in which humanitarian organizations are held responsible for the achievement of strategic, legal and financial objectives to donor agencies and government (Hilhorst, 2002). In parallel, new techniques of governance have been introduced to improve managerial accountability through greater compliance with agreed standards for organisational practices and transparent reporting of operational performance (ALNAP, 2009; Barnett, 2005, 2013).   To date, however, there appears to be much less experimentation, implementation and documentation of beneficiary participation as a 'downward accountability'

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

93

mechanism through which humanitarian organizations can improve their response to disaster-affected communities (Ebrahim, 2003; Hilhorst, 2002). One reason for this is identified to be the emergency character of humanitarian assistance where there is often insufficient time to allow for a formalized inclusion of affected communities in the design and development of the relief effort. As Hilhorst (2002) argues, the participation of beneficiaries in the relief effort can provide additional information about priorities and challenges on the ground as well as about local coping capacities during crises.

From the development literature, participation is understood as an essential aspect of ongoing routines whereby citizens are able to negotiate and bargain over decisions with NGOs or state agencies and exercise greater control over the distribution of resources and humanitarian assistance (Ebrahim, 2003). For participation to serve as a mechanism for increasing beneficiary accountability, collaborative arrangements are identified as necessary in order to give affected communities leverage in key programmatic and financial decision-making bodies, and even by recruiting community members into management staff (Newell, 2006). These arrangements, referred to by Kilby (2006) as 'the depth of accountability', measures the likelihood of rectification occurring as a result of identifiable feedback arrangements between the NGO and its beneficiary community. For example, a feedback mechanism could be the frequency and range of topics discussed with beneficiaries and the extent to which they select the sequence of agenda for discussion. A second indicator Kilby identifies is the level of formality of NGO processes, for example the degree to which interactions and meetings with beneficiaries are formalized. Based on an analysis of two development projects in Cambodia, Chanrith (2004) found that beneficiaries were able to hold NGO to account when they were included in formal decision-making processes regarding programme implementation.

With increasing interest to connect disaster management mechanisms with the socio-economic activities of local people, linkages have also been made with the concept of social capital[3] - a term widely used in international development broadly referring to the trust, social norms and networks which affect socio-economic activities amongst communities (Shaw & Okazaki, 2003). For example, Nakagawa & Shaw (2004) present two case studies of the Kobe and Gujarat earthquakes showing that although the cases differed in terms of their local socio-economic and cultural background, in both situations it was the communities with social capital that were able to engage in pro-active participation during rescue and relief efforts. In the Gujarat case, it was the trust of the Soni community in their leaders which enabled collective decisions to be taken during the time of emergency. With the rapid deployment of mobile telephony in developing countries, social capital has been identified as a critical enabler of development supporting the ability to communicate and be connected amongst communities in the developing world (Smith *et al.,* 2011).

The ideas reviewed in this section suggest that community participation and the formation of social capital can be considered key processes for improving beneficiary accountability in humanitarian interventions. However, as yet, there is little theoretical understanding of the pathways that connects increased community participation to improved beneficiary accountability. As a contribution, in this paper we focus on understanding how communities perceive the gains they derive from participating in the implementation of humanitarian intervention through usage of mobile money cash transfer systems. Past experiments at increasing community participation within international development demonstrate the importance of identifying how communities view the exercise and its relevance for improving their prospects. As Chopra & Hohe (2004) note, popular perspectives will affect any form of intervention making it imperative, as a starting point, to understand the system of ideas and values that constitute the local worldview which in turn influences the way people act, how they interpret the crisis, and how they perceive the intervention (Chopra & Hohe, 2004).

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[3] Putnam

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

94

The specific humanitarian intervention we focus on in this paper is mobile money cash transfer. The increasing significance of cash transfers in development and humanitarian situations extends the opportunity for beneficiaries to take control of humanitarian assistance and to adapt it to their individual requirements in a timely manner, especially as a response to food insecurity (Mattinen & Ogden, 2006). As a result of their direct role in reducing chronic poverty, cash transfers have received much attention as a mechanism for improving overall accountability of the humanitarian effort. Others are more cautious that a singular focus on cash transfers may result in neglecting other vital supply side measures arguing that this form of humanitarian intervention needs to be combined with efforts to ensure that stocks of food and non-food items are available and that the provision of basic public services and infrastructure is not neglected (USAID, 2008; Harvey & Bailey, 2011; IDEAS, 2011; Sokpoh, 2012). Mobile phones have come to be accepted as a cheaper and more efficient mechanism than transferring physical cash to individuals with evidence that mobile-based cash transfer recipients walk for only 0.9 km. to cash out their transfers compared to 4.04 km. by those who received physical cash (Aker *et al.,* 2011). By 2011, mobile money cash transfer systems were being used by humanitarian agencies in 26 programmes in 11 countries as part of humanitarian relief (Smith *et al.,* 2011). These systems have been recognized by donor agencies and humanitarian organizations to grant beneficiaries discretion in the purchase of food and other household items and to enable them to exert some degree of scrutiny over NGOs for the regular, timely and equitable disbursement of cash. Our empirical work sought to identify how beneficiaries and local programme officers perceive the M-Pesa mobile money cash transfer system in Kenya as a mechanism for increasing accountability of the humanitarian effort to the local community.

3. RESEARCH METHODOLOGY

The study used a holistic single case study approach to describe the phenomenon of interest offering the researcher an opportunity to access multiple data sources regarding respondents' attitudes and perceptions towards the use of M-Pesa (Yin, 2003). Additionally, the case study approach enabled the researcher to collaborate closely with the participant organisation and provided the project beneficiaries with the space to tell their stories and describe their realities.

We used a descriptive cross-sectional study design which aimed to collect perceptions and opinions of the beneficiaries of Oxfam GB's M-Pesa pilot project in Mukuru slum. The design ensured that the research was inexpensive and easy to conduct within a short duration although we acknowledge that it only enabled us to obtain a snapshot of the project at a single moment in time. The study used questionnaires and in-depth interviews with key informants to collect primary data. Selected project beneficiaries and project partners under Oxfam GB's project in Mukuru slum formed the subject of the study. The data collected was triangulated to ensure reliability and to counter interviewee bias. Secondary data was collected through a review of documents that related to mobile money transfer. The target population for the research involved a sample of Mukuru dwellers drawn from six out of the eight villages that constitute the slum. This population share specific and unambiguous characteristics including an inability to afford three meals a day (Burns, 2000). A purposive sampling technique was followed to collect data from the project beneficiaries and also from project implementers. A total of 18 beneficiaries and 3 project implementers were selected as participants in the study.

Data collection involved a combination of strategies. In order to validate our questionnaire, we selected two beneficiaries and a representative of MSDP - a process that revealed some ambiguity with questions and their sequence. After fine-tuning, the questionnaire was administered to the project beneficiaries in six villages to obtain their perceptions and experiences regarding the adoption and use of M-Pesa. Questions were designed to capture beneficiary and representative perceptions on issues of accountability and cost-effectiveness, ease-of-use and socio-economic changes experienced during the process as indicated in Table 1.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

95

Interview category	Parameters
Personal information of beneficiary/representative	Gender, age, occupation, education
Beneficiary perception of M-Pesa compared with original food distribution system	Cost-effectiveness, reliability, convenient, secure, enhances communication, promotes self-accountability, networking, transparency of information about transactions, discretion

Table 1: Main themes used for interviews with beneficiaries and representatives

All 18 beneficiaries filled the questionnaire which were administered with the help of two research assistants whose understanding of the questionnaires was harmonised before the study. The second phase involved structured in-depth interviews with five project beneficiaries – three females and two males. The last phase involved face-to-face interviews with one representative of Oxfam GB and two representatives of MSDP in Nairobi. We organised and coded the data using SPSS software according to themes that emerged from the literature review. Research consent for undertaking this study was sought from Oxfam GB in Kenya and from the project beneficiaries. The respondents' confidentiality and anonymity was assured.

4. RESEARCH FINDINGS

Demographic characteristics of the sampled population

The study sample population was made up of men and women aged between 28 and 67 years. The mean age of the participants was 40.4 years. Since the project had a bias towards targeting vulnerable women, the percentage of women respondents at 61% was higher compared to 39% of men. The female dominance can also be attributed to the fact that men perceived the responsibility of budgeting for food at the household level to be taken by women. Table 1 shows the distribution of the respondents according to the villages in Mukuru slum.

The study participants' level of education was very low. Only three (16.7%) of the respondents had attained secondary school education while 77.8% had primary level education and one had no formal education as shown in Figure 2.
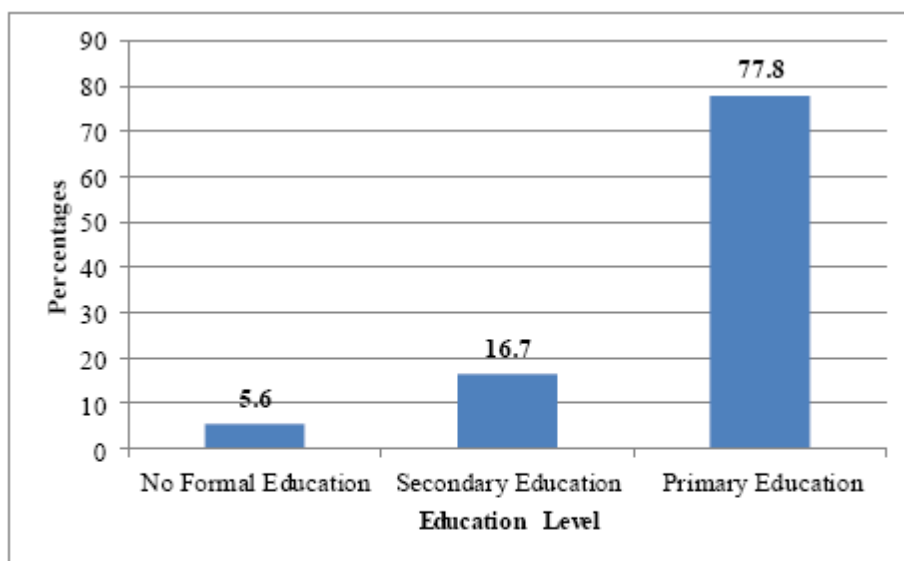

Figure 2: The level of education of the participants

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

96

None of the respondents had tertiary education which limited their ability to secure formal employment since they did not have the requisite set of skills and competences. They therefore relied on casual manual labour as their source of income. The uncertainty of income confirms Oxfam's initial findings of the high susceptibility of poor urban populations to minor shocks in fluctuations in food prices (Oxfam, 2009).

A majority of Mukuru residents had a monthly income below KES 10,000 (USD 114.9). 66.7% of these respondents earned less than KES 5,000 (USD 57.5) per month as shown in Figure 3.

Occupation	Frequency	Percent
Informal Employment	3	16.7
Small Scale Business	13	72.2
Jobless	2	11.1
Total	**18**	**100.0**

Table 2: Occupation of Study Participants

As their monthly income fell below the poverty line, this section of the population required supplementary humanitarian assistance all year round to survive. A large percentage of the respondents had lived in Mukuru for over eight years reflecting the linkage between long-term deprivation of entitlements, inter-generational poverty, vulnerability to shocks and a lack of social mobility.

Use of M-Pesa by project beneficiaries

The study findings revealed that M-Pesa use was widely adopted by the targeted populations before the project started. Most of the respondents (83%) were already using M-Pesa for other transactions. All the beneficiaries thought the money transfer system demanded less investment in terms of time and cost. They also felt that the registration requirements to use M-Pesa were minimal as reported by one of the beneficiaries:

> *'The registration process for M-Pesa is easy and affordable. One is only required to present his/her national identity card, which everyone has, and a SIM card (a SIM card costs KES 50 – USD 0.6). The total cost is less than a dollar to access this and other vital services'*

94.4% of the beneficiaries thought that using M-Pesa was convenient, straightforward and easy to learn and use:

> *… my illiteracy was not a hindrance to me and anyone else while using M-Pesa'*

The fact that some of the project beneficiaries did not have mobile phones did not hinder the project's implementation as beneficiaries were able to share mobile handsets that were provided by the project to the community health workers in Mukuru. Others chose to share with their neighbours or from M-Pesa agents. 94.4% of the beneficiaries reported that they were able to receive support to use M-Pesa when they faced difficulties during the project. The existence of a support system, mainly made up of community health workers within their settlements coupled with the advantage of other existing M-Pesa users made it easier for beneficiaries to access help in using the system as well as in sharing mobile handsets whenever the funds were paid out.

The study revealed that the well-developed network of M-Pesa agents in Mukuru ensured smooth disbursement of funds. 66.7% of beneficiaries were able to cash their amounts at the nearest agents, often less than a few minutes from their home.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

97

> *'M-Pesa use during the project saved me a lot of time and energy. Most times I could plan to stop at an agent's kiosk, usually not more than ten minutes' walk from my house'*

Even in cases where the nearest agent ran out of cash, beneficiaries indicated that they were able to cash from other numerous agents in the surrounding area and that the money transfer system had become trusted by both beneficiaries, agents and service providers. Indeed, 88.3% of respondents confirmed that availability of adequate cash at the various M-Pesa agents was not a challenge to the project beneficiaries:

> *'The M-Pesa infrastructure is well developed in Mukuru. On very rare occasions, the furthest I would walk was about ten minutes to cash the amounts. This only happened when the nearest M-Pesa agent had run out of cash. Usually M-Pesa agents were aware of the approximate dates we were to receive the amounts and they would replenish their accounts. The benefits of sharing information also acted as a guarantee to the beneficiaries in cases where they approached the nearest shopkeepers and other service providers such as water vendors, sanitation block officials and sometimes nearby dispensaries to pick essential household items or request for services on credit before the amounts were received. The benefits of using M-Pesa went beyond the beneficiaries. It boosted the local economy. New businesses were established while existing ones were expanded during the project period'*

All the 18 respondents felt that use of M-Pesa for delivering humanitarian assistance was personalised, reliable and secure compared with the traditional delivery approach. All 18 respondents indicated that the new system ensured their dignity at all times during the project period while 94.4% also thought the adoption of M-Pesa ensured their privacy and provided room for discretion:

> *'My personalised M-Pesa code gives me some sense of security. It is my secret. No one can access my account and whenever I wanted to cash the amounts received I could plan my day in such a way that I could go to the nearest M-Pesa agent and withdraw whatever amount I needed. I prefer cash transfers since it gives you the liberty to use the money according to one's priorities. This option enabled me to budget for the amounts received and meet my family's priority needs. Sometimes rent was the priority and not food'*

> *'For me the liberty to spend the KES 1,500 provided by the project according to need helped increase the diversity of foods my family consumed. I was able to meet my children's nutritional needs, pay for school fees and sometimes pay for emergency medical services. I felt in-charge of my life'*

> *'... on my way from the day's work and with the money I was free to decide what my family would eat. I was able to balance how we were to use the amounts received depending on what was most urgent to us as a family'*

100% of the respondents interviewed used cash for food and all the respondents felt that M-Pesa usage gave them a choice to buy food from places where hygiene standards were observed:

> *'After cashing your money, one had the liberty to choose where to buy foodstuffs and as it is the norm, hygiene standards is always key. It also gave me the opportunity to enrich our diet by buying what I thought was most suitable for my family'*

Apart from the ability to plan and prioritise their household needs, two thirds of the respondents felt they were able to save money from the disbursements:

> *'The flexibility to use the amounts and proper planning at the family level helped me save a few hundreds every time I received the assistance. I was able to save enough to start a small grocery shop that has expanded over the years. I make at least KES 250*

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

98

(approximately USD 2.9) profit per day. Today my family fully depends on the profits I get from my business'

The majority of beneficiaries thought that M-Pesa usage made it easy to account for the money disbursed as the project's records were available to all involved in the project. 88.9% of the beneficiaries reported that they were aware of the amounts to expect from the project, and the amounts disbursed and were able to freely access and share information about their M-Pesa disbursement information:

> *'This project was different. One was able to access records at MSDP offices and in case of any issue the project officials could take time to resolve it, fast. I once accessed my records and true to the letter they corresponded with all my M-Pesa records in my phone'*

The M-Pesa platform gave beneficiaries confidence that they were receiving equal amounts and this strengthened communications among the beneficiaries regarding relief distribution. Respondents expressed a high level of confidence in the M-Pesa platform's security with 72.2% indicating that M-Pesa records could not be manipulated for personal gain by either the beneficiaries or the project implementers. The system only allowed single entry for each beneficiary while records were produced in duplicate, one for the recipient and the other retained for accounting purposes and follow-up by Safaricom. In the words of an Oxfam GB officer:

> *'Even at the organisational level, the M-Pesa system does not give room for a single officer to take charge of the whole payment process. The system allows hierarchical authorisation for payment to be done'*

The observation above revealed that beneficiaries not only trusted the M-Pesa system but that they thought the use of the system ensured accountability of humanitarian assistance to the project beneficiaries. As expressed by one of the beneficiaries:

> *'Compared with the food distribution at the chief's Camp, the process of enrolling the various houses to benefit from the project was open with neighbours vouching for the very needy. At one centre, a household was dropped to accommodate a poorer family. To us M-Pesa use eliminated acts of hooliganism and clientelism associated with past relief food distribution. Moreover it was an open secret among beneficiaries of what to expect and once one had received the amounts word was spread around for others to confirm. Everyone looked forward to the day we received the amounts with certainty that s/he will receive the expected amounts'*

The table below summarises the gains that accrued to beneficiaries as a result of M-Pesa.

Reduction in time and cost of accessing basic items
Reliable, transparent fund transfer
System trusted amongst beneficiaries and community
Beneficiaries exercise agency in their recovery process
Encourages spending in local economy

Table 3: Outcome of the use of M-Pesa by beneficiaries

5. DISCUSSION AND CONCLUSION

A key contribution of this paper has been to shift the discourse away from accountability of NGOs to their donors and supporters and towards identifying workable mechanisms to improve accountability to beneficiaries by focusing on the adoption and use of M-Pesa in Mukuru slum, Kenya for the delivery of humanitarian assistance. We were interested in studying the perceptions and opinions of beneficiaries and project partners with respect to usage of the M-

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

99

Pesa system and the extent to which the system allowed beneficiaries to engage in humanitarian relief processes that affect them.

The beneficiaries in the Mukuru case share certain characteristics related to their residence, level of education, income, and vulnerability to fluctuations in food prices.   These beneficiaries have lived on less than two dollars a day for over ten years and this explains their lack of social and economic mobility.   The extremely low levels of income have contributed to not only their inability to meet basic needs but also to the achievement of low levels of education and formal employment.   This community relies mostly on small-scale businesses and casual manual labour for income to meet their daily needs resulting in a predisposition to shocks such as slight changes in food prices.   Yet we find that the circumstances of residents in this low-income settlement have not been a barrier to their adoption of M-Pesa.   The good coverage of mobile telephony infrastructure in Nairobi partly explains the high rate of usage of M-Pesa for delivery of humanitarian assistance.   Beyond good network coverage, the adoption and use of mobile money transfer has led to more regular receipt of cash payments helping beneficiaries meet basic needs.   Moreover, this method of delivering humanitarian assistance has given the urban poor a sense of mastery over their lives enabling them to make decisions leading to improvements in their living standards.   To that extent, Oxfam's Mukuru pilot project has increased accountability by placing beneficiaries at the centre of decisions regarding the logistics of accessing relief. Additionally, the project has strengthened local accountability structures within affected communities by harnessing relations among a wide range of local actors such as M-Pesa agents, community development workers and government service providers.

With the growing shift away from supply-driven logistics to demand-driven technology-enabled interventions, there is an opportunity for better preparedness in humanitarian programming by ensuring availability of micro-level data from different geographical regions.   Recent innovations in technology are expected to play an ever-increasing role in the delivery of humanitarian assistance.   Social media, mobile phones, short message service (SMS), global positioning systems (GPS) mapping and other digital platforms not only make it easier for humanitarian actors to communicate more effectively but provide an opportunity to involve affected communities in the relief effort.   As the Mukuru case demonstrates, the social capital of communities is an asset that can help in policy formulation from a grassroots perspective. However, NGOs and other humanitarian organizations need to identify suitable mechanisms for integrating local knowledge into their existing accountability structures in order to enhance the humanitarian effort and long-term development.   The real issue then is how to approach the complex issue of increasing community participation in humanitarian interventions.   In practical terms, area expertise needs to be incorporated into the training of local-level interveners and policy attention needs to be focused on longer-term transition in which space is provided for local voices to be expressed and for communities to get directly involved in the formal planning apparatus.   Integral to the process is the design of mechanisms for genuine popular participation in local administrative bodies which can also guarantee representation upwards throughout the government.

From a policy perspective, the provision of cash transfers through the M-Pesa platform has played a positive redistributive role enabling households to improve their diet by increasing their food variety.   In this context, the notion of openness promoted by ICT has promoted agency and participation of disaster-affected communities in their recovery process and increased the efficiency of the relief effort.   Yet, this ICT-based innovation is not a magic wand that can eliminate urban food insecurity challenges without the intervention of the state.   Indeed, addressing food crises is an issue that goes beyond the mandate of humanitarian organizations and ICT solutions as it implicates the role of the state in addressing a complex mix of global supply shocks, low and stagnating agricultural productivity, infrastructure and markets, and a deteriorating natural resource base amongst other issues.   It follows that from a donor agency perspective, the mobile money transfer system needs to be evaluated within the wider context of

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

100

long-term development in terms of its ability to strengthen the resilience of communities to withstand humanitarian crises.

While most of the literature and discussions about accountability in humanitarian action focus on how external agencies are attempting to engage with crisis-affected populations, the role of the state and local organizations in this process is rarely discussed. This point was recently a central focus of the 29th ALNAP meeting in Addis Ababa earlier this year where the importance of this type of local ownership and the potential for international actors to support it were themes that were given considerable attention (Brown & Donini, 2014). Delegates made the point that local civil society organizations, local government staff and business people make a huge contribution to decreasing mortality in emergency situations. Members of community-based organizations from a number of crisis-affected countries discussed the ways in which they prepared for and dealt with crises affecting them taking on more leadership in the communities' response and engagement with international agencies. Although many such examples were given, a central conclusion from the meeting was that these activities are still not well document. Indeed, the recent embrace of ICTs among international NGOs seems to be ad hoc with a tendency to take advantage of every available opportunity to experiment with pilot projects but with less of a focus on learning from the field. As a result, we have little understanding of how international humanitarian agencies engage with and support community-based organizations in their efforts to engage with crisis-affected populations.

This paper has been limited to the use of M-Pesa in Mukuru slums in Nairobi at a point in time and further research is needed to trace the continued usage and relevance of such interventions for the beneficiary community, M-Pesa agents and other service delivery agents. While mobile money cash transfer systems provide an opportunity for affected communities to gain control, further studies are needed to understand the dynamics of social capital formation within one locality and to compare and contrast similar initiatives in different contexts and across time. Moreover, there is need to develop deliberate strategies to ensure that learning about the role of mobile money cash transfers in humanitarian assistance takes place and that mechanisms are put in place for this learning to be translated into practice.

6. REFERENCES AND CITATIONS

Acker, J.C. and Mbiti, I.M. (2010) Mobile Phones and Economic Development in Africa, *Journal of Economic Perspectives,* 24, 3, pp. 207-232.

Aker, J.C., Boumnijel, R., McClelland, A. and Tierney, N. (2011) Zap It To Me: The short-term impacts of a mobile cash transfer program. CGD Working Paper 268. Washington DC: Center for Global Development.

http://www.cgdev.org/content/publications/detail/1425470

ALNAP. (2009) Cash Transfers Through Mobile Phones: An innovative emergency response in Kenya, *ALNAP Innovations,* Case Study 1, pp. 1-11.

Barnett, M. (2005) Humanitarianism Transformed, *Perspectives on Politics,* 3, 4, pp. 723-740.

Barnett, M. (2013) Humanitarian Governance, *Annu.Rev.Polit.Sci.,* 16, pp. 379-398.

Beshouri, C. and Gravrak, J. (2010) Capturing the Promise of Mobile Banking in Emerging Markets, McKinsey Quarterly.

Brown, D. and Donini, A. (2014) *Rhetoric or Reality? Putting affected people at the centre of humanitarian action.* ALNAP Study, London: ALNAP/ODI.

Burns, R.B. (2000) *Introduction to Research Methods*, Sage, London.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

101

Chanrith, N. (2004) Strengthening NGO Accountability through Beneficiary Participation: Lessons learned from two Cambodian NGOs, *Forum of International Development Studies,* 25.

Chopra, J. and Hohe, T. (2004) Participatory Intervention, *Global Governance,* 10, pp. 289-305.

Ebrahim, A. (2003) Accountability in Practice: Mechanisms for NGOs, *World Development,* 31, 5, pp. 813, 829.

HAP.(2013) Humanitarian Accountability Report, Humanitarian Accountability Partnership.

Harvey, P. and Bailey, S. (2011) Cash Transfer programming in Emergencies, *Good Practice Review,* 11, Humanitarian Practice Network, Overseas Development Institute.

Hilhorst, D. (2002) Being Good at Doing Good? Quality and accountability of humanitarian NGOs, *Disasters,* 26, 3, pp. 193-212.

Hossain, N., Fillaili, R., Lubaale, G., Mulumbi, M., Rashid, M. and Tadros, M. (2010) Social Impacts of Crisis: Findings from community-level research in five developing countries, Institute of Development Studies, University of Sussex, Brighton.

IDEAS (2011) Cash Transfers as a Strategy for Poverty Reduction: A critical assessment, Policy Brief 3.

IFRC. (2013) World Disasters Report: Focus on technology and the future of humanitarian action, International Federation of Red Cross and Red Crescent Societies.

KFSSG. (2009) Comprehensive Food Security and Vulnerability Analysis and Nutrition Assessment, Kenya Food Security Steering Group, United Nations World Food Programme, Rome, Italy.

Kennedy, J., Ashmore, J., Babister, E. and Kelman, I. (2008) The Meaning of 'Build Back Better': Evidence from Post-Tsunami Aceh and Sri Lanka, *Journal of Contingencies and Crisis Management,* 16, 1, pp. 24-36.

Kilby, P. (2006) Accountability for Empowerment: Dilemmas facing non-governmental organizations, *World Development,* 34, 6, pp. 951-963.

Mattinen, H. and Ogden, K. (2006) Cash-based Interventions: Lessons from Southern Somalia, *Disasters,* 30, 3, pp. 297-315.

Meier, P. (2011) New Information Technologies and Their Impact on the Humanitarian Sector, *International Review of the Red Cross,* 93, 884, pp. 1239-1263.

Nakagawa, Y. and Shaw, R. (2004) Social Capital: A missing link to disaster recovery, *International Journal of Mass Emergencies and Disasters,* 22, 1, pp. 5-34.

Newell, P. (2006) Taking Accountability into Account: The debate so far. In *Rights, Resources and the Politics of Accountability,* edited by P. Newell and J. Wheeler, Zed Books, London, pp. 37-58.

Oxfam (2009) The Nairobi Informal Settlements: An emerging food security emergency within extreme chronic poverty: A compilation and synthesis of key food security, livelihood, nutrition and public health data.

Shaw, R. and Okazaki, K. (eds.) (2003) Sustainability in Grassroots Initiatives: Focus on community-based disaster management, UNCRD: Kobe.

Smith, G. (2011) New Technologies Enhancing Humanitarian Cash and Voucher Programming. A report for the Cash Learning Partnership.

Smith, M., Spence, R. and Rashid, A. (2011) Mobile Phones and Expanding Human Capabilities, *Information Technologies and International Development,* 7, 3, pp. 77-88.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

102

Sokpoh, B.G. (2012) Sahel: Adapting a rehabilitation programme to a crisis situation in Burkino Faso. Groupe URD, Humanitarian Aid On The Move, Review No. 10, October.

USAID. (2008) Concept Paper: Lessons learned workshop on cash grants in UNHCR, Repatriation Operations, Workshop, 4 April 2008.

Yin, R.K. (2003) *Case Study Research: Design and methods*, Sage, Thousand Oaks, CA.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

103

FROM CONNECTIVITY TO DIGITAL CONTESTATIONS: THE EFFECTS OF FIBRE-OPTIC INFRASTRUCTURE ON FIRMS IN EAST AFRICA[1]

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Abstract: In the previous decade we have seen a concerted set of initiatives that have sought to provide fibre-optic infrastructure to East Africa, yet there has been very little systematic research on the actual effects of improved connectivity on firms in the region. Drawing on research in two sectors and two countries this paper seeks to understand if, in the contexts of changing connectivity, East Africa-based firms are able to capture more value. Findings suggest that improved connectivity is affecting relations of production, and the ability to capture value. Most notably, with improved connectivity, value chains are becoming increasingly data-driven. In these data-driven chains, value creation is determined by the ability to control, capture, and create digital resources. Contrary to expectations of political leaders in the region there is little evidence to suggest that improving connectivity is leading to extensive upgrading for firms in the region. The conditions necessary to control, capture, and create digital assets are more in place for already powerful rather than the marginal. Moreover, as digital networks in East Africa enable wider realms of production to become codified, digitised and transmitted, those with control over the digital are liable to further benefit.

Keywords: internet, East Africa, connectivity, value chains, production, tea, tourism

1. INTRODUCTION

The last decade has seen a notable growth in internet infrastructure in Africa. At the turn of the millennium Africa was virtually disconnected as a continent from high-speed fibre, with firms and individuals having to use expensive and low speed satellite links in order to access the internet. Since, then we have seen a concerted set of initiatives that have sought to provide fibre-optic infrastructure to the continent.

The anticipation that led to and following the construction of these cables has been palatable. International donor support was predicated on the belief that lack of ICT infrastructure was "a major bottleneck to growth and poverty alleviation in developing countries" (World Bank, 2005) and thus changing digital connectivity would drive growth and poverty reduction. In East Africa, media and politicians have spoken of the potential improved connectivity that this new infrastructure would bring to firms in the region, allowing them to become more competitive in global markets.

Yet, for all the hype there has been little systematic examination of the impacts this new infrastructure and little exploration to understand if improving connectivity has enabled firms and entrepreneurs in East Africa to economically transform themselves. With significant finances and political capital being invested in developing fibre-optic cables, understanding the

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

104

impact of this infrastructure is crucial to orientating appropriate policy and initiatives. Thus, this paper looks to answer the following research question. *In the contexts of changing connectivity, are East Africa-based firms able to capture more value?*

The paper is structured as follows. In section two, we examine two strands of literature. First, we explore perspectives from which improved digital connectivity and economic change have been articulated. We find a tendency towards the idea that connectivity will overcome the 'digital divide' which have underplayed more critical, empirical explorations. Second, discussions of economic production relations provides a framework for understanding firm activity in East Africa, and highlights suggestions of how improved connectivity might enable increased capture of value by firms in the region.

Analysis of changing connectivity draws on research conducted in Kenya and Rwanda. This extensive research (outlined in section three) explores two sectors, tourism and tea production. In section four, we outline how in each sector improved connectivity has supported the growing codification, digitization and transmission of digital data in value chains. The implications of these increasingly 'data-driven chains' of production, is that even where production is defined by movement of material goods, the control, capture, and creation of digital assets is becoming a crucial element in value capture and value creation. We suggest in section five that the conditions necessary to control, capture, and create the digital are more likely to favour already powerful firms who are better able to utilise online services and integrate systems to manage and co-ordinate production.

In sum, this paper provides a critical take on the elusive notion of 'openness' and digital networks. It provides an exploration of the idea that the expansion of digital networks will drive autonomous and individual linkages between firms. As others have shown, better digital connectivity is a necessary but not sufficient condition for firms to develop (Smith & Elder, 2010; Warschauer, 2003). However, this work goes beyond this foundation by arguing that as production is increasingly intertwined with digital data, it is those who can define, capture and access the digital who will benefit. We thus seek to bring back notions of power into the discourse on openness as a crucial variable in the "...ability to craft and/or take advantage of the new, more open networked social forms made possible by ICTs" (Reilly & Smith, 2014, p. 23).

2. CHANGING CONNECTIVITY AND ECONOMIC RELATIONS

2.1. Models of digital inclusion

As new fibre-optic cables have arrived in the region, expectations of the impacts of improved connectivity have been high, as can be seen in the speeches of East African leaders. Rwanda's President Paul Kagame, a fervent supporter for information and communication technologies (ICTs) has spoken of the 'revolutionary' effects improved connectivity will drive.

> *"In Africa, we have missed both the agricultural and industrial revolutions and in Rwanda we are determined to take full advantage of the digital revolution. This revolution is summed up by the fact that it no longer is of utmost importance where you are but rather what you can do" (GoR, 2005, p. i)*

At the launch of the TEAMs cable, then Kenyan president Mwai Kibaki suggested improved connectivity would lead to stronger and more resilient economies.

> *Thanks to ICT the world now is truly a global village with better communication and now better informed. I am confident that timely solutions to the ongoing economic crisis will be found using the crucial tools of ICT...[we] are finally joining what the American author Thomas Friedman called a flattened world.(Kibaki, 2009)*

Similar ideas to those articulated by politicians have been embedded in national development plans in East Africa (GoK, 2007; GoR, 2005).

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

105

Stepping back from the hyperbole, the key aspect of these expectations is that it ties economic impact to the notion of 'access' to digital connectivity. Consequently, we argue that it often mirrors well-established 'digital divide' perspectives, where digital access is seen to support new, more equitable economic relationships (Norris, 2001).

However, concepts around the digital divide, now nearly 20 years old have received much academic critique. Firstly, digital divide perspectives centralise digital *access* at the expense of a proper understanding of contextual *use* and *engagement*, which is crucial for how ICTs will actually have impact (Warschauer, 2003). Secondly, critiques suggest that digital divide perspectives can often underplay wider aspects of digital exclusion or access (skills, language, finance, culture) (Norris, 2001).

The divergence between the dominant discourse around connectivity in East Africa and the critical literature serves as the starting point for this paper. Critiques of the digital divide should make us question the way that fibre-optic cables and their impacts on connectivity has been discussed by politicians and represented in policy in the region, and how these expectations are feeding practice and policies. We need more systematic research on the actual effects of improved connectivity drawing on more empirical and critical perspectives.

2.2. Connectivity in global production

To understand how improved connectivity might enable East African firms to capture more value, we explore literature on production related to firms in the global South.

Analyses of economic production is seldom located within local, national, or even regional scales of analysis. Paradigms of globalised chains or networks can thus address development issues in a more appropriate manner by focusing on linkages, processes, and the trajectory of individual enterprises and products (Gereffi et. al. 1994).

Drawing on literature on global value chains, the notion of *value* in this work refers to an economic-focussed analysis to explore where in production benefits are accrued in fragmented production (in terms of actors or geography). Firms involved in value chain activity might *upgrade* through improving economic rents (e.g. innovating) or improving their value-add in production by repositioning themselves in the value chains to capture more value (Gereffi et al., 2001; Kaplinsky & Morris, 2001). The ability to upgrade and improve value can be seen as relational, where g*overnance* of value chains highlights how 'lead firms' can control activity, even without directly managing all value chain elements (Gereffi et al., 2005).

According to Dicken, underlying contemporary chains and networks of production are so-called "time-space shrinkage technologies" (Dicken, 2011, p. 81), which points to the role of ICTs in global production. Indeed transforming internet connectivity has been articulated as becoming influential in the shape of production. Gereffi (2001a, p. 35) at the height of the internet boom suggested "the internet is already beginning to have a significant impact on the structure and competitive dynamics of global value chains". Specifically, he suggested that internet connectivity would support a growing volume of online flows of information in value chains: 'Infomediaries' would serve as new online store-fronts for customers; and with growing internet use, existing firms would integrate online 'services' and 'platforms' to enable new value chain efficiencies. With the growth of online information flows and actors, capture of value in the value chain would likely be reconfigured (Gereffi, 2001a). Disintermediation has been particularly highlighted as one outcome of these changes in production, and the ability to remove intermediaries in production (or even access customers directly) (Benjamin & Wigand, 1995; Javalgi & Ramsey, 2001). Indeed, it has been speculated that such processes might particularly effect the ability of Southern producers to capture by facilitating more direct customer interaction and disintermediation (Moodley, 2002, 2003).

The above description provides some sense of the predicted role of digital connectivity in changing production. It highlights potential new digital actors and transformed production

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

106

relationships that are liable to affect value. However, the literature is sparse and has tended to explore the connectivity closer to the demand side of value chains (amongst consumers, retailers and first tier firms) than the supply-side. The activities of more marginal firms in the Global South have barely been explored in the contexts of changing digital connectivity[3], presumably because it is only now is internet access becoming viable for firms to use.

Thus, models of production provide a heuristic on how improved connectivity might affect production dynamics that move beyond a simplistic access model, and consequently an understanding of how the digital affects value distribution and firm upgrading. However, with gaps in both conceptual and empirical analysis, further work is required.

2.3. Summary

We have brought together two domains of literature. Firstly, we observed a mismatch between the ways that improved connectivity is articulated by politicians, and critiques which question the ideas underlying these articulations. This mismatch highlights the importance of a more critical and empirical research on East African production which moves beyond the rhetoric to more succinctly understand the effects of improved connectivity on firms.

Secondly, to more clearly conceptualise how connectivity will affect how firms capture value, we have explored the literature on globalised production. Literature has highlighted some potential directions of change to explore around the codification, digitisation and transmission of information, but a lack of specific insights for smaller and developing country firms suggests that in-depth qualitative research is required to explore changes in more detail.

3. METHODOLOGY

To explore the impacts of changing connectivity, we draw on extensive research undertaken in East Africa over the period 2010-2014 coinciding with the landing of three fibre-optic cables in the region.

Two countries, Kenya and Rwanda were selected as study sites as they are countries in which connectivity is being strongly driven by governments, with the expectation of internet connectivity having transformative effects (GoK, 2007; GoR, 2009). Thus, they are appropriate sites to explore the impacts of connectivity on firm value. Within these counties, two contrasting economic sectors were selected – tea production with its focus on movements of material commodities and tourism with its focus on services for incoming tourists. Case selection then purposively provided contrasting modes of activity (material, services) from which to better generalise about the effects of connectivity in the region.

Influenced by the literature on globalised production, semi-structured interviews were undertaken with managers of firms in the value chain (as outlined in Table 1). Sampling of interviews was based upon provision of an even spread across value chain roles (see later Figure 1 and Figure 2 for outline of value chain roles) to build a clear picture of the firms in the value chain[4]. Interviews thus generally focussed on firms in Kenya and Rwanda, but were supplemented with analysis of intermediaries, clients, global buyers and retailers in consuming countries, that could be traced back to East Africa. Interviews with managers sought to understand how digital connectivity had changed, how improved connectivity was being used with firms, and if improved connectivity had changed how firms engaged in production, or interact with other firms.

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[3] Or they fall back into digital divide narratives when referring to supply side activity (Gereffi, 2001b)

[4] Thus in the tea sector we interviewed representatives from farmer co-operatives, tea processors, tea processor owners, transporters, brokers, retailers and blends; in the tourism sector we interviewed freelance guides and drivers, hotels, lodges, tour operators and travel agents. Note that some actors rather than being 'firms' were effectively individual entrepreneurs or micro-enterprises.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

107

Sector	Kenya	Rwanda	Total
Tea	38 (2)	37 (2)	75
Tourism	38 (2)	49 (2)	87

Table 1: Interviews undertaken (and focus groups in brackets), broken down by sector and country

Empirical material, was analysed using qualitative software for code-based searching and reporting (Gahan & Hannibal, 1998). Coding work followed well-established techniques of content analysis, which allow interpretations of relations between categories and emergent themes (Krippendorff, 2012).

Analysis from each sector is presented in the section 4. More cross-cutting findings are then presented in section 5 linking back to the literature.

4. ANALYSING CHANGING CONNECTIVITY

4.1. Tea sector

In the tea sector, improved internet connectivity has led to flows of goods in value chains being increasingly accompanied by flows of data. We found activities were increasingly being codified (i.e. logistics data), digitised (i.e. production data) and transmitted through value chains, but access to, and use of such data was often a site of exclusion.

Data in value chains is in demand for two reasons. Firstly, the tea sector is newly privatised and with the private sector focus, there is growing demand for data to improve planning and management. Data allows tea processing firms to more efficiently organise logistics and share availability of processed tea to buyers at the retail end of the value chain (see Figure 1 for value chain outline). Secondly, there is growing demand in the retail market for differentiated products - environmental, fair trade or quality teas. Crucial to the value-add of these products is the 'traceability' of tea, the ability to digitally track and ensure that tea batches have satisfied conditions around location, food safety, chemical use, fair labour etc. Thus, digital data is integral to the ability for firms to capture more value in the tea sector, both in terms of efficiency of management *processes* and for new value-added tea *products*.
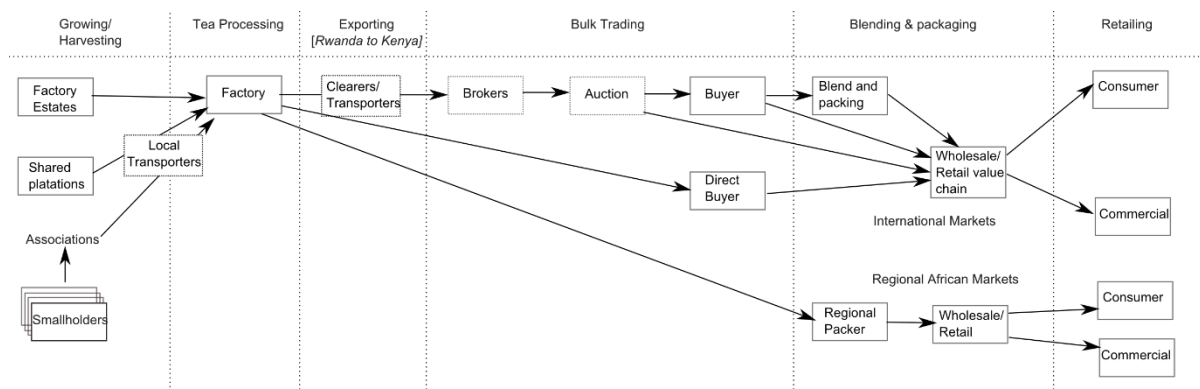
Figure 1: Processes and actors in the value chain for tea[5]

New digital data flows in the value chain were found around tea processing (sharing tea quality, weights, batches), tea trading (sharing auction lots, prices, market information) and tea logistics (sharing location data). The drivers of the new 'data-driven value chains' are emerging private sector tea firms in the region, often owners of multiple tea processing factories, and often

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[5] Note that there are some differences between the Kenyan and Rwandan cases, particularly around relationships between growing/harvesting and tea processing actors. This diagram integrates some typical scenarios.

subsidiaries of multinationals or foreign tea buyers. Digital data flows have been particularly harnessed by tea factory owners who integrate systems across multiple locations, combining disparate tea processing factory data with auction, shipping and logistics data. For instance, the manager of a firm in Kigali managing four tea factories, highlighted how new data flows and more reliable internet enabled improved monitoring of tea.

> *"[W]e have been able to achieve a lot of efficiencies in terms like we have integrated our ERP [Enterprise Resource Planning System[6]] ... so once the factory dispatches ... they are able to see it when it reaches Mombasa [port] ... I think that kind of integration has brought efficiencies."*

For East African firms who are integrated into data flows, integration implies the migration of management and decision making away from the fields and processing facilities to the head-offices of multi-nationals in Kenya, the US or India. These new digital flows and consequent shifts in the geography of command and control poses risks for the sector in East Africa. If large firms continue to build digital networks (which are becoming central to value), is there room for new entrants in the tea sector? How will East African firms have the ability to learn, innovate and upgrade when they are increasingly subservient to management and monitoring from afar?

New flows of digital data are not only affecting relations but have also begun to influence the flows of material goods in the value chain. Traditionally, tea produced in the region has been sold to international firms through a tea auction which occurs twice a week in Mombasa. One solutions provider in Kenya described that with digitisation in tea, the auction is weakening.

> *"You see even for the next five years if you don't automate the auction, growth of private sales will continue. Because of the bandwidth and Internet connection, people from other countries can easily connect with sellers here."*

As this quote highlights, online flows of digital data have encouraged direct sales[7] between tea buyers and sellers that disintermediate the auction, facilitated by digital networks (particularly between subsidiaries of the same firm). However, the fragmentation of value chains is problematic for the region. The auction has long been an open and transparent site for tea sellers, but having been slower to digitise, the growth of direct sales implies more closed and controlled trade. For East African tea the decline in an open trading space like the auction could reduce the ability of those smaller tea producers and processor to capture value, or even sell goods onto global buyers.

Smallholder farmers and their associations[8] were also demanding more data in the tea sector. For farmers, tea privatisation policies and a move to market pricing has facilitated demand for information on prices and tea growing techniques to capture more value. Yet, here data access was problematic. A cooperative leader in Rwanda illustrated internet access at a farmer level is limited,

> *"[we use the internet]... in our offices. But it is still a problem because the workers in the fields are not connected and most of them have little or no skills in using internet"*

Beyond *internet access* limitations, there are also *data access* limitations. Smallholder associations, who typically would have mobile internet access struggle to access data which is often inconsistent and guarded by other value chain actors.

In sum, more reliable and cheaper internet access has enabled new flows of digital data in value chains. Data flows are beginning to have some effects on material flows of goods. Firm value capture is thus intricately linked to digitising and accessing data, but digitising is introducing new exclusions – by making firms subservient to centralised points of management, by

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[6] ERP is a type of IT system that allows operational management and planning based upon production data.

[7] In Rwanda for instance direct sales has grown from a low level to 24% by weight in 2012

[8] Co-operatives who serve to facilitate and support smallholder activities

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

109

diminishing the importance of transparent trading sites like the tea auction and excluding actors such as smaller tea processers and smallholder farmers outside the core data flows.

4.2. Tourism sector

In tourism, improved internet connectivity provides possibility of integration into global online tourism networks and services. These networks and services can improve firms' visibility and improve linkages to international tour firms, increasing customers. However, there are barriers for East African firms to integrate with these services which has limited the ability to improve capture of value in tourism.

In tourism, the value chain (as outlined in Figure 2) often includes multiple services and sights which are packaged together. As the internet has become more viable to adopt and use, there has been growing flows of information between firms in the value chain, and from firms to customer. Key digital data flows enabled by improved connectivity were firm integration into online services (online travel agents, online payments), transmission of tourism data (booking availability, service information) and use of online resources by tourism firms to improve visibility to customers (social media, online recommendation). Yet, a distinguishing feature of our research was that even with growing data flows, simple email communication was the main way that most information was shared online.
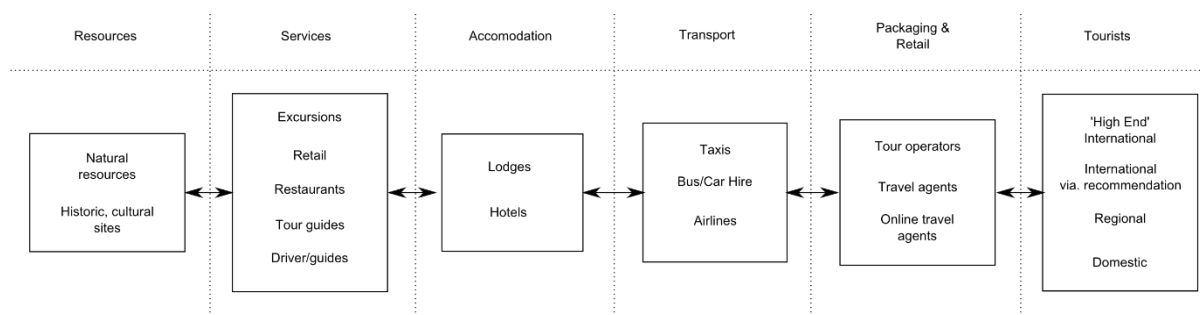
Figure 2: Makeup of tourism value chains

Growing integration into services and online automation of data was found amongst a minority of firms in tourism, mainly larger branded firms such as hotels. Integration included a growth in use of online travel agents (OTA) in the region, global online tourism services which allow direct online booking (such as Expedia, Kiyak, Hotels.com). Where OTA integration and automation occurred firms often found they are able to increase customers. OTA integration offers potential for firms to grow business customers, and provides automated information has been favourable for hotels to gain more bookings from outbound tour companies (in the country of the tourist) who appreciate the ability for quick browsing and selection of tourism activities.

Yet, there were indications that the majority of firms in tourism have not expansively used the improve connectivity. Hotels below the top-tier, tour operators and nearly all tour operators have not integrated or automated. Notably, service use was very low in Rwanda compared to Kenya where established firms tended to have a higher level of skills. Consequently the growth in customers has been limited from online services. For smaller firms, integration into online networks is perceived as unnecessary as described by one lodge owner in Rwanda

> *"... we don't yet have any online booking ... people can't go on the internet and see whether the tents are available for them, they need to email us ... It's only small tent camps, 14 beds so it's not necessary at the moment"*

Even for hotels with availability of higher speed internet, online integration required appropriate internal booking systems and coherent booking management in place, which they often do not have in place.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

110

Use of online tourism services in East Africa was also limited by the nature of tourism activities in the region. Global websites for tourism typically focus on certain discrete components – a hotel, a flight, a review for an attraction. However, in East Africa where high value tourism tends to be packaged, it has been difficult for the common ways of doing things to integrate well with popular online tourism services[9].

Thus, for firms outside those few top firms, new connectivity has mainly offered some marginally improved efficiency and communication. An exception was firms who focussed on niche or new markets of tourism. Niche firms found that even by building basic online resources could provide an important avenue for discovery by customers when their offerings were novel. For instance we found small but successful tour operators offering sports and niche wildlife (e.g. birdwatching) and eco-lodges who were reporting significant proportions of customers coming from online sources. Typically, in such a scenario, customers would gather information from web searches and social media recommendations. Information gathering would result in email or telephone conversations to allow customers to further arrange, reserve and/or pay for activities.

In sum, the benefits of improved connectivity in tourism have been unbalanced and generally not resulted in improved value capture for the majority of firms. The ability to use online systems and services offer more benefits for larger and more established firms who can integrate their East African locations into global tourist markets. If smaller more entrepreneurial actors could also integrate online, improved consumer discoverability could also drive growth, particularly niche firms. However, the nature of global systems – the difficulty for smaller firms to integrate, and the poor fitting of activities in East Africa into systems – has hampered the ability for niche firms to scale. Unlike the tea sector, value chains are more flexible and there are indications that there is room for tourism firms to be innovative and use online resources to reach a small number of customers. But, without more adaptable online platforms there is only modest potential to scale.

5. DIGITAL DATA-DRIVEN VALUE CHAINS

In both sectors, improved digital connectivity has led to changes in economic relations, but the gains made by East African actors appear limited. In the next sections, these findings are explored in terms of their implication on sources of value and the potential for East African firms to upgrade.

5.1. New sources of value in data-driven chains

The persistent finding is that fibre-optic cabling has improved digital connectivity – both in terms of access and speeds. However improved connectivity does not automatically lead to beneficial new economic relationships and upgrading. Good connectivity is a necessary, but not a sufficient condition to upgrade – or even be involved in global production

On the one hand, findings are in accordance with critical studies of the digital divide which suggest that for digital connectivity to have equitable impact, one needs to consider how to consider a wider gamut of social factors (i.e. skills, finance, institutions, geography) result in inequalities in use of connectivity. For instance, across countries we found improved potential for smaller tourism firms to interact in Kenya than Rwanda, with Kenyan firms benefitting from more appropriate education and skills in tourism.

One the other hand, such a functional explanation does not do justice to the more general contestations around digital resources which were found in both the countries and sectors researched. Value is increasingly entwined with the digital, where value is determined by the ability to *codify, digitise and access* digital resources:

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[9] Theoretically, packaged approaches could be undertaken through online tourism services and indeed in Kenya we found several new firms who were attempting to push into this market. These services were still at an early stage.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

111

To provide more comprehensive monitoring and management, ever more elements of production are being *codified*. Certain processes fit more comfortably with the design of digital systems, and so some elements of production are more amenable to codified than others.

Ever more data is being *digitised*, and the ability to digitise and integrate digitised data is a site of exclusion, where the requirements and costs of digitising data can limit the potential for more marginal firms.

The ability to *access* digital data is liable to be uneven within a value chain. Who can access data in value chains can affect the ability to capture value, and serves as another point of exclusion. Inability to access digital data may be down to limitations in internet connectivity and skill to interpret that data, but it may also be down to who has the power to provide or exclude access.

5.2.   Opportunities for upgrading

We did find a number of instances where firms have been able to capture more value through the use of digital resources. Improved capture occurred where East African firms were able to disintermediate and access customers or upchain firms more directly. We saw disintermediation in niche sectors where digital resources were important in helping firms establish themselves in relatively untapped markets. We also saw instances where firms who had built trust were able to gain new customers through online recommendation or rankings. But more positive examples of firms upgrading tended to be confined to a limited number of firms. Even then online activity was marked more by gains from online discoverability than it was by firms necessarily more actively capturing, digitising or accessing digital resources than other firms.

In most cases value remained captured by often more established firms who had the skills, knowledge, finance and power to construct or integrate into data-driven chains. Moreover, more established firms have been able to themselves upgrade through provision of data driven efficiencies, disintermediation, and improved access to customers or new products. However, for most East African firms the ability to capture more value was not realised with limited ability to be part of data-driven networks. In these firms there was often adoption of the internet and ad-hoc use, but use would be limited by ability to integrate into or capture digital resources.

6. CONCLUSION

This paper has set out to explore the role that changing connectivity has played in enabling East African firms to capture more value, drawing on work in two sectors of production. We have illustrated that more reliable and better connectivity enabled by fibre-optic infrastructure is affecting economic relations and the ability to capture value. Most notably, in both sectors as internet connectivity is improving value chains are becoming increasingly digitally 'data-driven' in terms of value. In these data-driven chains value creation is often determined by the ability to control, capture, and create digital resources.

Whilst this work draws on only two countries, and two contrasting sectors, we argue that this empirical work can help us think more generally about the wider trends around the growth of connectivity in East Africa. Contrary to expectations, there is little evidence to suggest that improving connectivity is leading to extensive upgrading for firms in the region. The conditions necessary to control, capture, and create digital assets are more in place for already powerful rather than the marginal. Moreover, as digital networks in East Africa enable wider realms of production to become codified, digitised and transmitted, those with control over the digital are liable to expand control.

Examples of more favourable conditions for East African firms comes in findings that some firms have been able to access and use internet and modestly capture improved value, when firms look to competitive advantages and niches. Thus, rather than looking to digital connectivity to allow firms to compete within well-established global markets, policy makers and firms may want to see what their local competitive advantages are (local knowledge,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

112

techniques, close links to communities) and how digital network use can then enhance these advantages.

In sum, this paper suggests a shift in focus in terms of the role of the internet in production. Work needs to move away from solely questions of internet access, or even around skills, management and finance. Rather, we need to ask who exerts control over the digital and how, when and under what conditions control of the digital might change.

We suggest further research needs to focus on exploring the contestations around digital resources that are associated with economic production. For scholars exploring economic production in the global South, which often lean toward exploring the material flows over digital ones, the growing importance of the digital needs to be brought more actively in arguments around governance, upgrading, value and embeddedness. For practitioners and policy makers focussing on internet connectivity, there need to be a move away from the connectivity as an end to itself and to explore the effects that these digital resources bring.

7. REFERENCES

Benjamin, R., & Wigand, R. (1995). Electronic Markets and Virtual Value Chains on the Information Superhighway. *Sloan Management Review*, *36*(2), 62–72.

Dicken, P. (2011). *Global Shift: Transforming the World Economy* (6th ed.). London, UK: Guildford Press.

Gahan, C., & Hannibal, M. (1998). *Doing Qualitative Research Using QSR NUD* IST*. London, UK: Sage.

Gereffi, G. (2001a). Beyond the Producer-driven/Buyer-driven Dichotomy The Evolution of Global Value Chains in the Internet Era. *IDS Bulletin*, *32*(3), 30–40.

Gereffi, G. (2001b). Shifting Governance Structures in Global Commodity Chains, with Special Reference to the Internet. *American Behavioral Scientist*, *44*(10), 1616–1637.

Gereffi, G., Humphrey, J., Kaplinsky, R., & Sturgeon, T. J. (2001). Introduction: Globalisation, Value Chains and Development. *IDS Bulletin*, *32*(3), 1–8.

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The Governance of Global Value Chains. *Review of International Political Economy*, *12*(1), 78–104.

GoK. (2007). *Kenya Vision 2030: A Popular Version*. Nairobi, Kenya: Government of Kenya.

GoR. (2005). *National ICT Strategy and Plan NICI II*. Kigali, Rwanda: Government of Rwanda.

GoR. (2009). *Rwanda Vision 2020*. Kigali, Rwanda: Government of Rwanda. Retrieved from https://repositories.lib.utexas.edu/handle/2152/5071

Javalgi, R., & Ramsey, R. (2001). Strategic Issues of E-Commerce as an Alternative Global Distribution System. *International Marketing Review*, *18*(4), 376–391.

Kaplinsky, R., & Morris, M. (2001). *A Handbook for Value Chain Research*. Ottawa, Canada: IDRC.

Kibaki, M. (2009). *Speech by his Excellency the President Of The Republic Of Kenya Hon. Mwai Kibaki, CGH, MP, During the Official Launch of The East African Marine Systems Cable (TEAMS)*. Retrieved from http://www.statehousekenya.go.ke/speeches/kibaki/june09/2009120601.htm

Krippendorff, K. (2012). *Content Analysis: An Introduction to Its Methodology*. London, UK: Sage.

Moodley, S. (2002). Global Market Access in the Internet Era: South Africa's Wood Furniture Industry. *Internet Research*, *12*(1), 31–42.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

113

Moodley, S. (2003). The Promise of E-Business for Less Developed Countries. *International Journal of Electronic Business*, *1*(1), 53–68.

Norris, P. (2001). *Digital Divide: Civic Engagement, Information Poverty, and the Internet Worldwide*. Cambridge, UK: Cambridge University Press.

Reilly, K. M., & Smith, M. L. (2014). The Emergence of Open Development in a Network Society. *Open Development: Networked Innovations in International Development*, 15–50.

Smith, M., & Elder, L. (2010). Open ICT Ecosystems Transforming the Developing World. *Information Technologies & International Development*, *6*(1), pp. 65–71.

Warschauer, M. (2003). Dissecting the "Digital Divide": A Case Study in Egypt. *The Information Society*, *19*(4), 297–304.

World Bank. (2005). *World Development Report 2006: Equity and Development*. Washington, DC: World Bank Publications.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

114

USING A "BLENDED" APPROACH TO STRENGTHEN THE ACCEPTABILITY OF E-LEARNING: CASE OF HEALTH INFORMATION SYSTEMS TRAINING IN A GLOBAL CONTEXT

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Abstract: E-learning has been recognized as a useful strategy for mass scale training. For large-scale information systems training, it could provide cost saving, wider coverage and variety in training options. However, convincing a heterogenous group of information systems (IS) experts, researchers, academics and trainers to utilize the same for training IS users is not straightforward. When introducing to such a heterogenous group, e-learning has shown to function as a boundary object although depending on its encapsulated social meaning, inherent properties and various other factors, it can react positively or negatively towards its intended utility. If e-learning continues to assume the state of being a 'negative' boundary object, it will not succeed in penetrating into the practices of its potential adopters; the members of different communities of practice involved in providing training. However, a different ontology of e-learning in the form of blended learning was able to garner epistemic inquiry from the same members and shift the e-learning from being a negative boundary object to a positive boundary object. Through its analysis, the study positions blended learning as an epistemic object and thereby establish a point of departure for researchers in distance learning, and a useful path for IS practitioners to introduce e-learning as a training tool for its trainers.

Keywords: e-learning, blended-learning, boundary object, epistemic object, information systems training, communities of practice

1. INTRODUCTION

When developing a health information system (HIS), the minds of its designers would always wonder whether its intended audience would take up this system or not. As pointed out by Heeks (2006), the gap between what is perceived by the designers and real expectations of the users would ultimately decide the fate of most, if not all, information systems. In order to narrow the gap between design and reality, one important step is to provide rigorous training, which most often than not, is a forgotten factor (Ash, Stavri & Kuperman, 2003, Sellitto and Carbone, 2007).

In reality, it is difficult to say exactly why training remains in the backseat during HIS implementations. However, literature on management information systems suggest that the considerable budgetary requirements of up to 20% of a whole project and the enormous amount of man hours required for training may be two key factors (Robey et al, 2002). As experienced in public health training, in low and middle income countries (LMICs), providing quality training may also be hindered as a result of vast geographical areas to cover and the substantial training demand originating from a large population (Heller et al, 2007). In order to overcome these barriers, organizations have recognized e-learning technologies as a potential solution (Armstrong and Sadler-Smith, 2008). However, as with any other technology, even e-learning can generate both positive and negative reactions from its potential adopters for pedagogic,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

115

technical and political reasons. At the same time, Garrison (2011) points out that in order to fully integrate e-learning within an educational system, it should not be viewed as a replacement for the face-to-face learning experiences. In fact, the power of e-learning is its capacity to adapt to different scenarios without necessarily creating winners or losers amongst its adopters. In other words, one may need to find the right mix of e-learning and face-to-face learning when designing training programs in order to make it pedagogically, technically and politically acceptable. Blending is the term used in education sciences to refer to such mixing of e-learning and face-to-face learning in a pedagogically useful manner.

This paper is motivated by the dynamics surrounding the process of adopting e-learning and the emergence of a blended learning program as experienced by one of its authors as an action researcher in IS. By recognizing the complex dynamics that take place, the paper believes that IS practitioners and trainers can be better prepared for potential adoptions of e-learning to harness the 'best of both [face-to-face and e-learning] worlds'.

In doing so, the paper will next present its theoretical grounding before proceeding to describe the methodology of the study in detail. The intervention on which this paper is based on will then be presented in a case study format, leading to a discussion that will explain the dynamics associated with the emergence of a boundary object in the form of e-learning. The paper will conclude by presenting interpretation of the observed dynamics providing practitioners and scholars a point of departure for using e-learning systems and for future action research.

2. THEORETICAL BACKGROUND

2.1. Dynamics of knowledge creation in a heterogeneous community

In most organizations, there exists a culture, which is typically characterized by the potential shown by some of its members to informally network and form groups. These groups are formed not because of institutional values, beliefs, rules, norms or structures as suggested by institutional theorists (Oliver, 1991, Powell and Dimaggio, 1991), but instead because of their interest towards a certain practice. While some of these groups are short lived, there are others that can last for many years if not indefinitely. Wenger et al (2002, p.4) recognize the latter kind of groups as 'communities of practice' (CoP) and describe it as,

> *"Groups of people who share a common, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis."*

As pointed out by Wenger, the manifestation of a CoP is largely a natural process. However, it is also characterized by the voluntary contributions of its members and the dedication of its internal leadership, which would play a significant role in its sustainability. Therefore, if a CoP is to steward knowledge, it should enjoy informality and autonomy (Wenger et al, 2002).

While organizations can designate people to come together and complete a particular task, it is not possible to deliberately form a CoP out of thin air (Wenger et al, 2002). Wenger points out that one of the important requirements that need fulfilling for a CoP to form is to have a shared domain of knowledge. The shared domain provides a common identity for the members of a CoP, which will thereby guide their thoughts, actions and learning while providing the members with a sense of purpose and value (Wenger, 2002). The next important element characterizing a CoP is the 'community' where interactions and relationships are being built with mutual understanding and trust (Wenger et al, 2002). The third element defining a CoP, and perhaps the most relevant in terms of this paper, is the 'practice'. Wenger (2004, p. 38), defines practice as a set of *"socially defined ways of doing things in a specific domain"*. These include a set of common approaches and a set of standards that forms the basis for actions, communication, problem solving, performance and accountability, which characterizes the said CoP over a period of time. In other words, a CoP becomes a 'mini culture' within the much larger

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

116

organizational context (Wenger, 2010). As pointed out by Wenger (2002), this mini-culture however does not only consist of behaviors and actions, but it also consists of tools and resources for the members to interact in a mutually useful manner. When these tools and resources do not garner unanimity, it may be possible for sub-cultures to emerge within the said mini-culture. In certain instances however, unless these tools or the resources become widespread and interesting for most if not all the members in the CoP, it [the tools, resources and even the CoP itself] may die a premature death.

While it seems harmless enough for any organization to pursue having multiple CoPs, Wenger himself argues that the same CoPs can sometimes restrict learning and innovation due to various 'disorders' (Wenger et al, 2002). These disorders can manifest in relation to each of the three characteristics of a CoP; domain, community and practice. In fact, the tendency to show symptoms related to these different disorders are high at the boundaries where different domains, communities and practices overlap in pursuit of 'commonness'. On the other hand, the same boundaries could spark innovations and new knowledge creation as well (Carlisle, 2002). These arguments shed light to the importance of studying the so-called 'boundary phenomenon' when analyzing interactions and functioning of the CoPs, especially in instances of heterogeneous communities.

2.2. The boundary phenomenon

As described by Akkerman and Bakker (2011), a boundary emerges when the socio-cultural difference between communities causes a reduction or a discontinuity of action and interaction. Interestingly enough, in instances where boundaries are created, there is always relatedness between the so-called 'different sites'. This relatedness may motivate or compel people, practices and objects to perform a boundary crossing (Akkerman and Bakker, 2011). In doing so, even professionals who are highly competent in one context may become unqualified after they cross a boundary (Suchman, 1994). It is with such boundary crossers that CoPs are able to maintain its integrity and most importantly, to keep abreast with modern times. Although scholars such as Amin and Roberts (2008) accept that boundaries such as these are porous, it is false to assume that these pores will easily allow crossover. Rather, there needs to be a 'vehicle' that would allow boundary crossers to claw their way in-and-out.

Boundary objects can be seen as supporting boundary crossers by providing the access that they require. As described by Star and Griesemer (1989), boundary objects can satisfy the informational requirements of each context or site on either side of the boundary. In other words, it [the boundary object] can adapt to the local needs and constraints while being robust enough to maintain a common identity (Star and Griesemer, 1989). However, having the boundary objects per se may not allow boundary crossers to move back and forth and become hybrids of multiple domains. In fact, Williams and Wake (2007) propose that boundary objects are mostly invisible and that they are taken for granted by the boundary spanners. If boundary objects are 'black boxes', this means that there needs to be an active process opening up and utilizing the boundary objects.

2.3. Social meaning of boundary objects

In an elaborate sociological discussion of the boundary phenomena, Fox (2011) argues that technological objects themselves can perform the function of a boundary object in relation to transferring knowledge between communities. This function can be either facilitative or inhibitory towards cross boundary communication or innovation. However, the most intriguing argument made by Fox is that the functional acceptance of boundary objects would depend on the meaning that it projects on to the recipient community. Fox brings in the historical case of innovative surgical sterility where much simpler and perhaps highly effective antiseptic technologies (e.g using carbolic acid to disinfect wounds and hands of surgeons) were disregarded by the surgeon community. The reason being that the antiseptic technologies were

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

117

perceived as encapsulating a social meaning which portrayed surgeons as 'germ carriers', being 'dirty' or being 'infective' rather than as being healers. On the other hand, much complicated and time consuming process of aseptic technologies (e.g. boiling surgical instruments, maintaining a sterile environment in the theatre) were readily accepted by the surgeons as it agreed with the morals and social understanding of cleanliness. In contrast to antiseptic technologies, this [aseptic technologies] projected the image of saviours and 'purity' on the surgeon community.

In line with the arguments made by Fox (2011), Gal et al (2004) had also indicated that boundary objects could also be a resource to construct and communicate social identities in addition to being an agent of knowledge translation and communication. Gal et al (2008) further argues that boundary objects have the potential to alter even the organizational identity through its internal dynamics. Thus, it is possible to argue that communities may react negatively towards a boundary object if it encroaches on a 'sacred' identity associated with the said community.

2.4.   E-learning, blended-learning and epistemic objects

In modern distance education (DE) literature, the terms 'online learning', 'e-learning' and 'distance learning' have been used interchangeably with highly vague and overlapping descriptors (Garrison, 2011). According to Garrison, e-learning exists in two main forms, one being fully online and the other being blended-learning. In fact, the most prevalent form of e-learning in today's higher educational institutions is said to be blended-learning (Garrison, 2011). However, not all agree in considering 'blended-learning' simply as one form of e-learning. Laster et al (2005) points out that in order to be classified as a blended-learning program, it has to; integrate online with traditional face-to-face class activities in a planned, pedagogically valuable manner; and a portion (institutionally defined) of face-to-face time be replaced by online activity. An important aspect of this definition is that it eliminates defining courses utilizing stand-alone media in face-to-face courses as blended-learning. At the same time, Graham (2006) present several models of blended-learning which include instances of combining online and face-to-face learning, combining various instructional modalities and combining various instructional strategies. In any event, there isn't seems to be a clear definition or an agreement among the scholars regarding a taxonomy to describe blended learning' or else to define what or to what degree the elements of learning should be blended for a program to be called a blended learning program (Picciano et al, 2013). This brings to the forefront the importance of establishing a meaningful perception regarding blended learning before trying to unravel its subtle intricacies.

In this regard, one possible approach towards meaningful perception building is to consider blended learning as epistemic in nature. Rheinberger (1997) took the initial step of coining the term 'epistemic objects' by describing the central role played by 'epistemic things'. These objects, according to Rheinberger, have the characteristics of being open, question generating and complex. Through scientific inquiry, these objects can evolve not by losing its complexity but in fact by becoming more complicated than before. Rheinberger points out that the aim of introducing the concept of epistemic objects was to provide an object-centered, materially founded account of knowledge production where epistemic objects are clearly material in nature (Rhinberger, 2005). In fact, as put forward by Rhinberger, what generates interest towards these objects and what keeps them 'alive' as a research focus is the opacity, the surplus and the material transcendence. Furthermore, as pointed out by Cetina (2001), epistemic objects have an element of 'unknown', which intrigues those who come across such objects. At the same time, Cetina emphasize that epistemic objects are incomplete and are never themselves and will continue to unfold indefinitely as it gathers new properties. This gives rise to the question of, to what does an epistemic object can change to? Answering this question, Ewenstein and Whyte (2009) points out that once the epistemic inquiry seizes to exist, the epistemic object could

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

118

acquire a more definitive form, and transform to become a 'technical object', without a boundary function.

3. RESEARCH DESIGN

The setting for this study is the Health Information Systems Program (HISP) established within the Department of Informatics at the University of Oslo almost 20 years ago. HISP has achieved great heights in the development, implementation and research pertaining to its own HIS, 'dhis2'. The HISP program is unique in the sense that its main clients are from LMICs particularly from the African and Asian continents. However, the program is now expanding into wider markets. The objectives of the HISP program however are not profit driven but instead are to provide a cheap and a more robust information system capable of catering to the low resource contexts to uplift its health information processes. Therefore, HISP considers the contribution made by academics and researchers as equally important to that of software developers and implementers giving rise to a truly heterogeneous community.

This particular study was based on the design and deployment of an e-learning system for the training of users, super users and implementers of dhis2 in LMICs. The e-learning solution was based on the Moodle[1] learning management system. As stated earlier, the focus of study was the dynamics of interaction and adoption of the e-learning system by the 'trainers' of dhis2 both within and outside the HISP program.

Given the fact that qualitative research aims at understanding particular social situations, events, roles, groups and interactions, the study aligned itself with the said research approach. Thus, the paper drew from experiences of the authors, observations made during the implementation process and the perceptions gathered through eight face-to-face interviews conducted with members of the dhis2 trainer community in the HISP program. The interviews were protocol based and lasted an average 45 minutes each. The interviews were tape recorded with the consent of the interviewee before the audio-records were fully transcribed verbatim. Among the interviewees, there were three dedicated software developers cum implementers, two dedicated HIS implementers and three researchers/academics who were all involved in dhis2 training. The collected data in the form of verbatim transcripts of audio recordings, email communications and field notes were first looked at for recognizing its general meaning to decide on the potential 'codes' that would be used in the analysis. The coding of the text was done following the eight step process suggested by Tesch (1990). Based on the coded text, emerging themes (Creswell, 2014) were recognized and were then classified into categories, which provided the researchers with an idea about the dynamics taking place around the observed boundary object, the e-learning tool.

At the same time, the study utilized the definition given for boundary objects by Star and Griesemer (1989), which is "*boundary objects are objects which are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites."* For further clarity, the study made use of Wengers' (2000) classification of boundary objects in which one of the categories was recognized as 'artifacts' such as tools, documents and models. Together, these descriptions, theorizations and classifications allowed the study to name the e-learning tool as a boundary object and therefore utilize the same as the object of study. As described by Miles and Huberman (1984), this enabled the study to contrast, compare and classify the said object of study.

In addition, the perceptions generated through the study were largely guided by a pragmatic worldview. It is worth mentioning that the lead author of the study had been engaged with the said trainer group for several years and was part of an action research approach towards

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[1] A free, open-source PHP web application for producing modular internet-based courses that support a modern social constructionist pedagogy, Moodle,org

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

119

developing and implementing the said e-learning solution. Thus, as suggested by Creswell (2014), the author is capable of utilizing a pragmatic worldview in drawing conclusions.

4. DHIS2 ACADEMY AND ITS ADOPTION OF E-LEARNING

In 2011, the HISP – University of Oslo (referred to as the 'organization' hereafter), decided to try out e-learning as part of its training strategy for dhis2. Dhis-2 is an Open Source HIS, which came into being in South Africa in the early 1990s before it organized itself into an autonomous organization established within the university system. The organization itself has become an incubation medium for researchers who are studying HISs. Being backed by a reputed academic institution, the organization has been able to attract considerable number of students from LMICs particularly through its collaborative projects. From 1990s up to now, the aims, the functioning, organization and the strategies adopted by the organization has changed dramatically as a result of the growing demand and technical strength, shifting funding sources and the ever-expanding research and business network.

At present, the organization is involved in implementing multiple dhis2 instances in many different countries out of which most are LMICs. The sheer size of these implementations and collaborations meant that it has to utilize enormous amounts of resources to fulfill the training demands. The reason being that the designers and implementers of the HIS were dependent on face-to-face training workshops, named as 'academies', which were held several times a year in Africa and Asia. These academies usually last for 10 days and have been designed as residential workshops attended by users and implementers of HISs. In general, around 50 to 70 participants attend these academies which were usually funded by international donor agencies, respective governments or else by the HISP itself. The resource personnel however were usually funded by the organization.

From the organizations' point of view, it was vital to maintain the quality of training and the opportunity for networking through such academies. In the beginning however, around 4 to 5 members of the organization took part in these training programs although with time, as the costs rose, the local partners and rather limited representation from the organization became the norm.

The e-learning system was launched in late 2011 and its first iteration was as a parallel learning tool to the East African dhis2 academy. Given the technical constraints and the lack of preparation from the side of both the trainers and the participants, in its first iteration, the e-learning system merely functioned as a data repository and a self-learning tool for those who desired so. Since then the e-learning tool became part of the dhis2 academies on a regular basis. With each "blended-learning" iteration [1/2 week(s) of e-learning and 10 days of face-to-face learning], the design and its approach was adjusted based on the feedback and the requirements from the face-to-face academy. In general, the e-learning tool was accepted as a sensitizing and community building method supplementary to the face-to-face academy. Over time, this approach and the e-learning tool gained interest from regional partners of HISP in Asia and in South America who used it to facilitate regional and country specific training initiatives.

During each iteration, steps were made to attract members of the organization towards the design and moderation of the e-learning tasks. Before each academy, relevant members of the organization had informal discussions on-site and via email in order to determine the requirements expected to be met through the e-learning system, which further contributed to the design alterations of the e-learning tool.

5. DYNAMICS OF INTRODUCING AN E-LEARNING TOOL

Before the introduction of the e-learning tool in 2011, the e-learning system (the Moodle) was already in place although it was not utilized for training purposes due to time constraints required for its development, and the lack of understanding with regard to its functionality. Or

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

120

else, it might be that Moodle was perceived as just another IT artifact, which did not encapsulate an acceptable social meaning to the trainer community.

5.1. Encapsulation of social meaning

In fact, some of the statements made by interviewees did indicate a potentially undesirable social meaning projected by the e-learning tool as they were classified into themes such as misinterpretation, conflict, intrusiveness, doubt and bad faith. One example is the statement made by one of the developers,

> *"...Moodle looks promising but it has to compete with others...such as mailing list for instance."*

Another is,

> *"it would be difficult for Moodle to even think of giving the participants the sense of togetherness as in face-to-face training",* which was expressed by one of the implementers.

And also the statement given by one of the researchers,

> *"its nicer to have the training material within the software itself, I mean then the users don't have to be at a different location [pointing to Moodle] to learn",*

among several others, which misinterpreted the pedagogical approach used in e-learning with a 'user guide'. On the other hand, statements such as,

> *"...you know I work one to one with these people and I don't think I could teach them how to use [the HIS] without physically being there...",*

stated by another developer, indicated that the e-learning tool had been perceived as being intrusive on the ongoing practices. In addition, the intrusive nature of the e-learning tool became further apparent from the statement made by one of the implementers/academic,

> *"e-learning has the potential to replace what we have been doing and in reality, that means that some would not be able to gain experiences going to the field or else gain an extra income doing such work",*

which shed light to a more humanistic aspect of the potential adopters. Such statements and the fact that most adopters being well conversant in IT and capabilities of Moodle, made a strong case for projecting a poor social meaning by the e-learning tool. This may be one reason for the sluggish early adoption as experienced by the lead researcher.

In a way, this was a scenario comparable to that of Lord Listers campaign described earlier. In that, Lord Lister promoted the antiseptic technology by dwelling on killing the germs, which in his words were brought into the wound by the surgeons. However, he did not emphasize on the susceptibility of the patient (Fox, 2011). This story re-iterated an important aspect of the boundary phenomenon, which is the possibility of a boundary object to exist in two morphologies, positive and negative. In a way, the e-learning tool also attracted a negative social meaning which made it to be a negative boundary object for certain members of the group.

5.2. Implications of the encapsulated social meaning and inherent qualities of the e-learning tool

In a scenario such as that described earlier, which remained unchanged throughout the study period, it wouldn't have been viable for e-learning to rise against the tide and project itself as a standalone training platform. If that was the case, it may have had to suffer the same consequences as the antiseptic technology in its early days. In fact, members of the training community within the organization had their own individual perceptions regarding the usability of e-learning and what it is capable of doing. For instance, one of the academics asserted that

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

121

> *"e-learning can be used as a tool to build the culture of IT use among those who are suppose to be trained in HISs through academies"*,

while another implementer expressed that

> *"it [the Moodle] will be a great place to store learning material....like a repository...for the academies and for later use"*.

In fact, in many iterations of dhis2 academies discussed earlier, the e-learning platform was used particularly for this purpose, as a repository of training material. In addition, organizers of these academies also used the e-learning setup to hold quizzes and capture feedback from the academy participants. These represented unintended consequences or side effects of the e-learning system. In other words, these side effects may be interpreted as efforts by its users towards finding solace with the training tool, which is now at their disposal. In the analysis, these efforts were classified as 'negotiation' with the e-learning tool.

However, it may not only be the social perceptions that leads to a boundary object being classified as 'negative,' but also certain characteristics of the object itself. Prout (1996) describes the introduction of the metered dose inhaler (MDI) for asthma patients, which at the beginning gained widespread criticism from the doctors. The reasons was that unsupervised use of the MDIs would harm patient safety. However, at a later stage, the innovators of the MDI made necessary changes to its structure and functioning which contributed to its successful adoption. Similarly, with regard to the e-learning system, modifications such as inclusion of video demonstrations, online assignments, and awarding of certification to its participants were done during its iterative implementation. These actions can be claimed as efforts towards preventing it from being a negative boundary object because of its artifactual properties.

5.3. The emergence of 'blended-learning' as an epistemic object and the perceived 'solidity' of the boundary object

From a different point of view, situating e-learning as part of the dhis2 academy, which was a face-to-face training, changed its image from being an IT artifact to a learning tool. This can be understood through statements such as the one made by an implementer cum academic,

> *"the e-learning is basically competing with the e-mail lists...however, because it can be customized to different contexts, it provides us [the organization] with the potential to address different issues through the e-learning system and allow the face-to-face academy to focus on more important aspects needing close interactions."*

In fact, positing the e-learning system as a blended-learning strategy, which supplemented the face-to-face academy, made it a positive boundary object. It not only enabled the e-learning system to run successfully hand-in-hand with the face-to-face training but also attracted external trainers. As pointed out by Fox (2011), the social meaning projected by the e-learning system alone could have been somewhat intrusive on the training community while its re-organization as 'blended-learning' made it less intrusive on the existing practices without necessarily losing its credibility as a potential replacement for future training, as and when necessary.

At the same time, when looking at the process of introducing the e-learning tool, there were two main propellants. One was the practical need of the organization to have the capability of teaching at a distance and the other was the research purposes of the lead author. Therefore, the e-learning tool was at the centre of scientific inquiry. While at the beginning, the e-learning form generated tensions as described earlier, it managed to operate at the intersection between various communities. By doing so, it [the e-learning tool] gained the properties that would define it as a boundary object. However, with the re-interpretation of the e-learning tool as blended-learning, it generated more questions as to what should be blended? How should the blend take place? In

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

122

what proportion?...etc, which indicated the openness and the complexity associated with the conceptualization of 'blend'. Some of the statements made by the interviewees such as,

> *"...it is interesting to play around with Moodle in different academies in order to see what is the right blend"* [by one of the developers]

and,

> *"...you never know how we might be able to use Moodle with our workshop [referring to the face-to-face academies] and...you know that's one strength of the online learning platform"* [by one of the academics-cum-implementers], also highlighted this fact.

When considering these questions, its associated openness and the unintended consequences discussed earlier, it can be argued that the so-called 'boundary object' gave rise to a different ontology, which is the 'blended' epistemic object (Rheinberger, 1997, Cetina, 2001). Amidst the epistemic inquiry and the materialization of blended-learning, the e-learning tool however, remained rather 'solid' evolving with the changing needs. In fact, the materiality of the e-learning tool did not change throughout the exercise but instead, its utilization in the form of blended-learning (a knowledge object), continued to dominate and unfold in different forms.

6. CONCLUSION

Taken as a whole, the e-learning tool could be seen to have traversed several boundaries formed as a result of a group of professionals belonging to several CoPs coming together to provide training. Its role as a boundary object varied from being negative to positive throughout the study period. However, the emergence of the epistemic ontology of the object in the form of 'blended-learning' meant that its acceptability, usability and adoptability improved over time. As a result, it [the e-learning tool] can now 'float' easily with less tension but with the added potential to benefit from the continuous evolution of its epistemic metaphor [the blended-learning]. This however was not the end of the story as the boundary object is now 'burdened' with the fact that it may never achieve its true potential [being able to replace the existing methods of training] unless its epistemic counterpart evolves to a degree in which the two acquire the same morphological characteristics.

For the practitioners of HIS implementations and training or else for those who are intending to use e-learning for training in similar contexts, the findings would provide a theoretical underpinning for an almost reflexive acceptance of e-learning as just a 'supplementary' training tool. This would mean that the time spent on dealing with the tensions of adopting e-learning can be minimized and that the path towards developing an acceptable e-learning program would be clearer. In addition, the findings contribute to a different conceptualization of blended-learning as the paper positions the same in a different plain [epistemic in nature] to that of e-learning. This conceptualization opens up a new avenue for further research as it deviates from the rather simplistic perception of blended-learning being just a mix of e-learning and face-to-face learning.

7. REFERENCES

Akkerman, S. F., & Bakker, A. (2011). Learning at the boundary: An introduction. *International Journal of Educational Research*, *50*(1), 1-5.

Armstrong, S. J., & Sadler-Smith, E. (2008). Learning on demand, at your own pace, in rapid bite-sized chunks: the future shape of management development?. *Academy of Management Learning & Education*, *7*(4), 571-586

Ash, J. S., Stavri, P. Z., & Kuperman, G. J. (2003). A consensus statement on considerations for a successful CPOE implementation. *Journal of the American Medical Informatics Association*, *10*(3), 229-234.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

123

Bhuasiri, W., Xaymoungkhoun, O., Zo, H., Rho, J. J., & Ciganek, A. P. (2012). Critical success factors for e-learning in developing countries: A comparative analysis between ICT experts and faculty. *Computers & Education*, *58*(2), 843-855.

Carlile, P. R. (2002). A pragmatic view of knowledge and boundaries: Boundary objects in new product development. *Organization science*, *13*(4), 442-455.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage.

Ewenstein, B., & Whyte, J. (2009). Knowledge practices in design: the role of visual representations asepistemic objects'. *Organization Studies*, *30*(1), 07-30.

Gal, U., Lyytinen, K., & Yoo, Y. (2008). The dynamics of IT boundary objects, information infrastructures, and organisational identities: the introduction of 3D modelling technologies into the architecture, engineering, and construction industry. *European Journal of Information Systems*, *17*(3), 290-304.

Gal, U., Yoo, Y., & Boland, R. J. (2004). The dynamics of boundary objects, social infrastructures and social identities.

Garrison, D. R. (2011). *E-learning in the 21st century: A framework for research and practice*. Taylor & Francis.

Heeks, R. (2006). Health information systems: Failure, success and improvisation. *International journal of medical informatics*, *75*(2), 125-137.

Heller, R. F., Chongsuvivatwong, V., Hailegeorgios, S., Dada, J., Torun, P., Madhok, R., & Sandars, J. (2007). Capacity-building for public health: http://peoples-uni. org. *Bulletin of the World Health Organization*, *85*(12), 930-934.

Knorr Cetina, K. (2001). Objectual practice. In *The Practice Turn in Contemporary Theory*, eds. T. R. Schatzki, K. Knorr Cetina, & E. von Savigny. New York, NY: Routledge.

Oliver, C. (1991). Strategic Responses to Institutional Processes, Academy of Management Review, Vol. 16, 191: pp.145-179.

Powell, W. W. & Dimaggio, P. J. (1991). The new institutionalism in organizational analysis. Chicago, University of Chicago Press.

Rheinberger, H. J. (1997). Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube (Writing Science).

Rheinberger, H. J. (2005). A reply to David Bloor:"Toward a sociology of epistemic things". *Perspectives on Science*, *13*(3), 406-410.

Roberts, J. (2006). Limits to communities of practice. *Journal of management studies*, *43*(3), 623-639.

Robey, D., Ross, J. W., & Boudreau, M. C. (2002). Learning to implement enterprise systems: an exploratory study of the dialectics of change. *Journal of Management Information Systems*, *19*(1), 17-46.

Sellitto, C and Carbone, D (2007), Success factors associated with health information systems implementations: A study of an Australian regional hospital, Journal of Business Systems, Governance and Ethics, 2 (4), pp 39-54.

Star, S. L., & Griesemer, J. R. (1989). Institutional ecology,translations' and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social studies of science*, *19*(3), 387-420.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

124

Welsh, E. T., Wanberg, C. R., Brown, K. G., & Simmering, M. J. (2003). E-learning: emerging uses, empirical results and future directions. *International Journal of Training and Development*, *7*(4), 245-258.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge university press.

Wenger, E. (2010). Communities of practice and social learning systems: the career of a concept. In *Social learning systems and communities of practice*(pp. 179-198). Springer London.

Wenger, E., McDermott, R. A., & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Harvard Business Press.

Williams, J., & Wake, G. (2007). Black boxes in workplace mathematics.*Educational Studies in Mathematics*, *64*(3), 317-343.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

125

CIVIL REGISTRATION AND VITAL STATISTICS: A NEGLECTED AREA IN INFORMATION SYSTEMS RESEARCH

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Abstract: Civil Registration and Vital Statistics (CRVS) are key institutions of a country as well as the basis for assessing a country's status and development in general. Most low and medium income countries have inadequate CRVS information systems, contributing to a situation where many births and deaths are not being registered, the "scandal of invisibility". With the aim to explore possible ways in which we can improve this situation in low and medium income countries - through the modernization of the CRVS information systems - we suggest several design principles based on the well-functioning CRVS information system of Norway. The principles relate both to the strategic (public goods and institutional incentives) and operational (holistic approach, building on existing CRVS business relationships and the tactics of integration and interoperability) levels. The significance and applicability of this framework is discussed in the light of the current situation and ongoing attempts of modernizing CRVS in Tajikistan.

1. INTRODUCTION

Civil Registration and Vital Statistics (CRVS) can be argued as being a foundation for assessing the status of a country's development in general. Most developing countries have inadequate CRVS systems with many births and deaths not being registered, contributing to what has been called as the "scandal of invisibility" (Setel et. al 2007). A well-functioning CRVS information system has in recent times been recognized as a key ingredient in strengthening CRVS systems in general, and the United Nations Commission on Information Accountability (COIA) for Women and Child health have especially mandated that countries would need to strengthen their CRVS information systems (WHO, 2011).

Most developing countries have CRVS information systems that are primarily paper based, and the potential value of information and communication technologies (ICTs) have been recognized as key in the reform and modernization process. Various developing countries have undertaken ICT based CRVS reform initiatives, with support from different donor agencies, such as Bangladesh, Liberia, and Albania. But a recent survey of eHealth and mHealth initiatives in low and medium income countries (LMICs) (HMN, 2013) have indicated that many of the ICT based initiatives have not delivered to the promised potential and the impact on actually reforming the CRVS systems remains marginal. Why is this case and what can be done about it are the twin questions this paper is concerned with.

CRVS systems at the outset seem a characteristic development scenario requiring a multi-sectorial approach, including Ministries of Health, Justice, Finance, Home Affairs and others. This, arguably, would call for an 'architecture' kind of approach where the different systems in place, such as those for health, statistics and civil registration, talk to each other and share data (Braa and Sahay, 2012). But enabling talking and sharing data is not enough – the different

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

126

components in the architecture must be interdependent in an 'ecological' framework that mutually incentivize the production, sharing and consumption of quality data. However, such thinking, unfortunately we may add, has escaped both the CRVS and Health Information Systems (HIS) reform efforts, and projects carried out have been piecemeal and fragmented. This is 'lost opportunity' in the way that data on births and deaths being captured in the routine HIS of a country does not necessarily find its way automatically into the CRVS registration records (HMN, 2013).

As argued by the information systems (IS) research literature, building integrated architectures and ecologies is a non-trivial project (as for example discussed by Walsham (Walsham, 1993) and Hanseth and Lyytinen, 2010). Equally important is for example the building of political agreements between the institutions involved. As the HMN report noted, such thinking is not currently found in the CRVS reform efforts and also in the supporting literature. The reason for this could be the neglect of this CRVS by the IS research field. This paper thus represents an attempt to bring in some learning from the IS research field around integration and architectures explicitly to the field of CRVS information systems.

Our empirical cases are drawn from two contrasting countries of Norway and Tajikistan. The aim is to through this contrasting analysis to try to identify some elements of the systems in Norway, institutional and technical, which may be useful and relevant to develop design principles for use in Tajikistan, and also other LMICs potentially. The choice of comparing these two cases is not based on any assumption of Norway having a superior technical solution, but rather that Norway has a well-functioning eco-system with a history that can be linked centuries back in time. While civil registration also includes events such as marriages and adoptions, the focus in this paper is on births and deaths, their registration and generation of vital statistics. Specifically, this paper addresses two research questions:

What are important generic features of a well-functioning CRVS system, drawing upon the case of Norway?

What design principles for CRVS information systems reforms can be derived from these generic features that have been identified?

The rest of the paper is structured as follows. In the next section, we describe our research approach and the methods applied. Following this, in section 3 we summarize the experiences of CRVS information systems discussed in the literature to discern some of the trends in use. In section 4, we present the case of Norway with a focus on identifying some characteristics in their design of the CRVS information system. In section 5, we present the Tajikistan case, and the current efforts towards their reform and modernization. In section 6, we attempt to develop design principles for CRVS systems that can be useful in the context of LMICs. Finally, section 7 presents our application of these principles in the case of Tajikistan.

2. METHODS

Our research is based on a combination of action research and case studies. The basic foundation was "action research" inspired by the Health Information System Programme (HISP) strategy of "networks of action" (Braa et al., 2004). This approach is based on designing and creating action that aims at enabling collaborative linkages both nationally and globally. Various forms of actions have been and are currently being carried out towards CRVS in Tajikistan. For example, one of the authors is involved in the system design and development of a modernized CRVS information system in Tajikistan. In parallel, and as a part of this network, one of the authors have made an analysis of the state of the art of mCRVS and eCRVS systems in developing countries commissioned by the Health Metrics Network (HMN, 2013). In this broad context, two more particular case studies were conducted. In Norway, we studied the existing CRVS information system and its history to develop design principles and in Tajikistan the focus was

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

127

on establishing the grounds to discuss the applicability of the principles in the context of a LMIC.

Data collection involved in both cases multiple methods. In Norway, interviews were conducted with two experts from Statistics Norway. They both had a long experience with and a broad understanding of the Norwegian CRVS information system. Further, one of the author familiar with the Norwegian language studied documents and reports on the CRVS processes and the related information systems, institutions, laws and regulation etc. in Norway (e.g. Norwegian Directorate of Taxes (2011) and Skiri (1995)), its history (e.g. Backer, 1947) as well as ongoing processes of modernization (e.g. Norwegian Directorate of Taxes, 2013). In the case of Tajikistan, two of the authors (one of them, a native Tajik living in Tajikistan) have since 2007 been deeply engaged with the modernization and reform of the national health information systems as well as the CRVS information systems. In addition to his in-depth contextual knowledge, two interviews were conducted with a CRO specialists and a senior officer from the The State Statistics Agency of Tajikistan (SSA). The SSA officer was interviewed with a particular focus on data exchange and the SSAs requirements and expectations from a modernized CRVS information system.

Our analysis and interpretations of the two cases were an iterative process. The design principles from the case of Norway were framed based on our broader understanding of the challenges of CRVS information systems in developing countries. Ongoing discussion on the particularities of Tajikistan in light of the design principles led us to return to the data to explore certain issues more in depth. This led to further refinement of the design principles as well as a more focused discussion on how the principles were relevant in Tajikistan.

3. CRVS INFORMATION SYSTEMS

Civil Registration (CR) is defined by the United Nations as the universal, continuous, permanent and compulsory recording of vital events provided through decree or regulation in accordance with the legal requirements of each country (Setel et al. 2007). Vital Statistics (VS) represents the statistical output of a well-functioning CR system (WHO, 2010). Civil registration includes births, deaths, marriage, divorce, fetal death, annulment, judicial separation, adoption, and through the registration process these events are made legitimate. The vital statistics that can be derived from CR systems can arguably be treated as public goods needed for the generation of health outcome data and creating an evidence base for health related decisions (Mahapatra, 2007). Without an effective CR system, reliable VS cannot be produced and health improvements are hard if possible at all to measure efficiently. In the public health domain, while HIS have gained in importance over the years as an object of research (Haux, 2006), CRVS systems, arguably due to their multi-sectorial nature, have slipped between the cracks and not been systematically studied within one domain – be it public health or information systems. As a result, research findings in the IS domain such as those emphasizing the architecture approach (Braa and Sahay, 2012), socio-technical networks (Hanseth and Lyytinen, 2010), and flexible standards (Braa et al., 2004) have not been applied to the understanding of the domain of CRVS systems.

Arguably, little is known about ISs supporting CRVS systems from a systemic and architecture perspective. For example, there has been limited research on how computers and mobile supported IS can strengthen the entire process of CRVS from recording the event, its notification and registering, the issuing of the legal document surrounding the event, to its consolidation into vital statistics. The literature presents various examples of descriptions of particular ICT interventions relating to limited parts of the overall whole, such as on birth notification (Ngoma, 2011), death registration (Ohemeng-Dapaah, 2010), cause of death recording (Kariyawasam (2011) and Campione (2011)), and compilation of VS (Kahn, 2007). While these specific examples provide stories of both successes (for example Campione, 2011) and failures (for example Ngoma, 2011), for the particular intervention they address, they do not and cannot by

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

128

design help to illuminate issues relating to the transformation and scalability of the overall CRVS system, as they do not address issues of relations with other flows and with the broader context. For example, Kariyawasam (2011) provides interesting insight on how ICT can help to provide more accurate cause of death information, it does not describe how this links up with systems for death registration, and thus has limited value in understanding the role of ICTs in strengthening the overall CRVS system. Similarly, Toivanen et. al (2011) describes a mobile birth registration system using GPRS technology and smart phones without discussing how this system can be scaled to a national level.

4. CRVS SYSTEM IN NORWAY

In this section, we briefly introduce the CRVS system in Norway, and the current status of the supporting information system. This summary helps to develop a set of CRVS information system design principles.

From 1685, Norwegian churches reported aggregated births, deaths and marriages. In 1876, a new law required all births, deaths, and marriage information on an individual basis to be sent to the Norwegian Central Bureau of Statistics on a yearly basis. The information was used for statistical purposes only and was generally not available to the public. Even if population censuses were regularly done, running CR was first introduced in municipalities in 1905 on a facultative basis. These registers were inaccurate, in particular since people were registered as they moved into the municipalities, but not out. Under the German occupation of Norway during World War II, the Germans introduced compulsory communal registration and the responsibility to register births, marriages and deaths were transferred from the churches to the authorities. In 1945, a central national register was established and managed by national statistics office, Statistics Norway. A new Act for CR was formulated in 1946 mandating local registers. In 1964, a computerized Central Population Register (CPR) was introduced based on the 1960 census. In the same year, a Personal Identification Number (PIN) was established. Only in 1994, all local registration offices were fully computerized and had an on-line connection with the CPR database.

Vital statistics in Norway dates back to 1735 with figures on births and deaths. The first census based on individual data was undertaken in 1801, and from 1815 censuses was made approximately every 10th year until 1990. The 1946 census was the basis for local population registers and the 1960 census for the CPR. From 1968, annual vital statistics has been produced based on the CPR. Statistics Norway was formally established as an entity in 1876, and produces today approximately 90 percent of all official statistics in Norway.

The Norwegian Tax Administration under the Ministry of Finance has since 1991 had the role to ensure that the CPR is accurate and up to date. A statistical 'copy-register' rests with Statistics Norway and similarly with a distributor (a private company). While the CPR is updated real-time, the 'copy-registers' are kept up to date with batches every night. The central registry has data about people that are born and/or is or has been a Norwegian resident. The CPR is used for population statistics, but also acts as the foundation for tax administration, elections, and public administration in general as well as by the private sector. At the same time, access to the CPR is strictly regulated. Public entities are granted access if necessary for administrative purposes, while private only have access to non- confidential information if it is necessary to ensure their legal rights.

Keeping the national registry up to date is based partly on notifications from the authorities, like birth notification and death notifications, but also notification from citizens. For example, Norwegians are obliged by Law to report to the central registry if they are changing address. Doctors and midwives are obliged by Law to notify the local tax office no later than a week after a child is born. The local tax office forwards this paper-based birth notification to the CPR, which subsequently requests the issuing of a PIN from the Office of the National Registrar and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

129

registers the baby in the central database. Finally, the tax authorities are issuing birth certificates. When a person dies, it is the responsibility of the next of kin to send a notification of death to the probate court and the local police in the municipality where the person was living. The probate court will forward the notification to the CPR. At the same time, a doctor will issue a death certificate, whether the death occurs in a hospital, at institution or at home.

According to an assessment done in 2006, the quality of the data in the Norwegian CPR is very good, both in the sense that the data is according to the notification received as well as legally correct. At the same time, challenges have been identified related to delays in e.g. issuing of PIN and updates on deaths in the CPR. This has been attributed to the flow of information being paper based, and it is argued that a modernization based on computerization of forms would solve this.

5. CRVS IN TAJIKISTAN

Tajikistan has a well-established CRVS information system, though almost totally without support of ICTs (Latifov, 2012). Civil registration is handled by the Civil Registry Offices (CRO) which is located in all the 68 districts of countries, organized under the Ministry of Justice. While being used as an example of strong routines and an institutionalized system, a significant portion of neonatal deaths are not being recorded, as these typically happen within the Ministry of Health facilities. Since the CRVS system relies mainly on paper records, there is no easy way of accessing and sharing such data. There are also other challenges, like dis-incentives to report early deaths and payment requirements for citizens when interacting with the CRO. There are plans for computerizing the system, and starting from 2013, support for CRVS will be included in the new European Commission supported Health Management Information System. A key aim with this approach is to support the integration of the health and judiciary systems and enable mutual data flows.

The CRO of Tajikistan is entirely undertaken by the Ministry of Justice. At the municipality level, municipality government Secretariats are recording vital events for their catchment areas and on monthly basis reporting to the CROs. The secretariat is responsible for registering birth, death, marriage, divorces, and other CRO related procedures like issuing birth and death certificates. Since the majority of Tajikistan's population lives in rural areas, the bulk of data comes from the municipalities. Civil registration in Tajikistan is based on several acts and civil events are seen as result of personal actions of citizens, and are a prerequisite for social life of citizens and for the State and public well-being. Events subject to compulsory registration are births, deaths, marriages, divorces, adoptions, filiation and change of names. These events are mandatorily recorded in the CRO offices.

The State Statistics Agency (SSA) produces vital statistics such as censuses, household surveys, demographic statistics and a wide range of economic statistics such as establishment and enterprise surveys. Statistics service of Tajikistan was formed in 1924, and by 1935 all districts and cities of the republic had their statistics divisions (49 offices). In 1943, the Statistical Office of Stalinabad (now Dushanbe) was formed. The SSA receives consolidated and aggregated CR data along with copies of the original records. SSA codifies CRO records of vital events and generates aggregated reports. The SSA as the official body for publishing national statistics can share demographic data with other government and non-government organizations and make publications.

CROs register civil events on the basis of documents issued by various entities or reported in person by citizens. For example, health care institutions provide documents with proof of births and deaths. CRO maintains the archive of vital events and provides accurate information to citizens and government entities, which have the right to access. Such services are available in all CRO offices. All civil event records are registered in two exemplars. The original is stored in the district CRO and a duplicate is sent to the province SSA for vital statistics calculations. Civil

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

130

event records must be archived for 75 years. After this period of storage, both copies of civil event records are matched to check consistency and accuracy of the records. After the original is sent to the national archival system for storage and the duplicate is disposed.

In many ways, the CRO system of Tajikistan is marked to be satisfactory, but there are some obstacles for the timely registration of vital events such as lack of knowledge of how/where to register; lack of marriage certificates; migration; home deliveries; requirement to report the events in the district of residence regardless where it occurred (Ivdity, 2011 and World Bank, 2011). Some of these shortfalls are coming from procedural and legal requirements set by CROs; others from community members' perspective including cultural, social and economic factors. The discrepancy in birth and death reports of the healthcare system and CROs is estimated to be as high as 20 percent (Ivdity, 2011). Because CRO reports are taken for SSA indicator calculations, it leads to under-reporting. With ongoing reform processes of CRVS and HIS, this adverse situation is expected to improve. In 2006, CROs received computers, but so far no software has been used or developed to computerize the civil registration system. Computerizing the information systems of the CROs has faced a number of challenges, mainly related to handling legacy data and use of different IDs. The current system uses unique IDs for recording each civil event and certificates issued. There is no personal ID (PIN) assigned to citizens. A major decision here will be whether or not to use current ID system for each event or shift to a PIN based system, where each individual is assigned a unique and permanent ID. PIN will be useful for the CRO information system to be integrated with vital statistics system and number of other administrative entities.

6. ANALYSIS AND DISCUSSION

In the first part of this section, we discuss insights from the Norwegian case, based on which we develop a few design principles at the strategic and operational levels. In the second part, we discuss if and how these principles may or not be adapted in the Tajikistan case.

Developed over centuries, the Norwegian CRVS information system is based on strong mutual interests in keeping a central personal registry with updated and high quality data. This data is based on inputs from the public sector, the private sector as well as citizens, and is made easily available for Statistics Norway, enabling the production of high quality vital statistics. The 'architecture' or 'ecology' of these information systems, organizations, institutions, practices and so forth is not the result of the implementation of a master design plan. Rather, it has developed over time as new actors and usages have emerged, and key factors have been established along the way based on current needs and emerging opportunities. Drawing design principles as implications from these factors is thus not straightforward. Based on our interpretation of the case of Norway, we argue that we can infer five key design principles at the strategic and operational levels to support the modernization of CRVS in Tajikistan in the following section.

6.1. Strategic level

Principle 1: Establish CRVS as a public good

Public or collective goods are goods that all members of society will benefit from, regardless of whether they contribute in creating or sustaining it. Of particular relevance to CRVS is how public goods support and strengthens the dependencies between the citizens, the private and the public sector and between public sector entities. While CRVS as a public good may have benefits for all actors in a society, establishing it will entail costs and investments that are not equally shared among them.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

131

Principle 2: Establish institutional incentives

Citizens, public and private sector need incentives to take part in assuring the functioning of the CRVS. Besides this institutional practice of registering vital events, civil registration is for Norwegian citizens an obligatory passage point to accessing rich social services. For example, registering a birth will trigger the payment of family allowances and registering a change of address will grant citizens the right to receive public services in the vicinity of where they are living. Further, many public registries and private corporations are using the CPR for address information. Thus, citizens will save the efforts of informing all these institutions independently by informing the CPR and the different public entities can keep track of the citizens to assure correct collection of taxes and payment of pensions. The CPR has achieved the status of being the central register, having high quality data and operating in an independent fashion and thus being trustworthy.

6.2. Operational level

Principle 3: Establish a holistic approach to CRVS design

The vital statistics system in Norway is of high quality in terms completeness, reliability and actuality. This is at least partly a result of a close integration with the CPR. The obligation to register all events (births, deaths, marriages, separation/divorce, and migration) and the use and sharing of data and statistics is regulated by law, and reflected in a range of different acts. The acts are mandating the CPR to secure the privacy of the citizens while at the same time offer wide access to the registry and support the sharing of data between authorities as well as to private enterprises to the benefits of the citizens. Modernizing a CRVS system must not only be based on an understanding of these existing institutions and the interrelationships between them, but also carefully build on them. A CRVS information system must necessarily relate to these different factors in a holistic way.

Principle 4: Establish the business relationships of information flows with the CPR

The way in which the information in the CPR is updated by citizens and public entities and used by other public and private entities must be established and supported by the CRVS. For example, in Norway, births are registered by hospitals and midwives, deaths by probate courts, marriages by clergy/principals, divorces by count commissioner and migration by the migrants by informing the local population registry on various forms. On the output side, daily updates of the CPR are forwarded to Statistics Norway and access is granted to other entities. There is no costs attached to registering information in the CPR and citizens can request issuing of certificates and print outs of their data for free. Changing a CRVS information system must carefully be design to support these flows of information as well as establish the flows necessary.

Principle 5: Use tactics of integration

All Norwegians and residents of Norway have a unique PIN issued by the office of the national registrar. This 11 digit number is extensively used by the authorities and private companies and in practice is the primary key enabling the linkage of not only CR and VS, but also the CPR with a range of public and private entities. On the input side, only notification of changed address within Norway is electronic and all other notification is reported on paper. The third party distributor makes data available either as batch updated files daily as direct look-ups in the database, or based on cleaning lists. The Norwegian CRVS information system is based on the integration of independent public sector information systems with the CPR for reading and updating information. And the private company in charge of distributing information to other private and public entities. Different approaches of integration are used to support the different relationships.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

132

7. APPLYING THESE PRINCIPLES FOR TAJIKISTAN

In this section, we discuss the relevance of the derived design principles from Norway in the Context of Tajikistan.

7.1. Strategic level

Principle 1: Public Good

In Tajikistan, information collected and stored by the authorities is not commonly handled as a public good. A move towards open information will thus require making institutional changes. Further, the supporting technology and infrastructure must enable the establishment and maintenance of relations amongst the different stakeholders of the CRVS information system. A key area of concern in this respect is to establish a central database, ensure quality assurance mechanisms, an open access policy, access routines and legislations, the technology necessary to serve multiple purposes and users, and to be able to deal with the changes required over time.

In Tajikistan, there tends to be a strong bureaucracy, centralized and slow changing systems which make information access an inefficient task. This requires a strong political will, and a multiplicity of coordinated initiatives towards customs control, standardization, certification, and quality inspection. Learning from such experiences, and also maybe similar others from other central Asian countries which shared the same history of being a Soviet Republic, coupled with a strong political mandate, gradually institutional norms would need to be created to treat CRVS as a public good.

Principle 2: Institutional Incentives

From the perspective of the citizen, there are few direct incentives for registration of vital events as they occur in Tajikistan. Payment of significant fees for issuing certificates and other paperwork act as a kind of dis-incentive and deterrent to timely registration.

While at the individual level, incentives have to be created for citizens to register timely the vital events, simultaneously the existing disincentives of them making payments would need to be eliminated. Along with this, at the institutional level, the different organizations contributing to the CRVS system and database would need to have incentives to share their respective data, ensure good quality, ensure compliance to data, and participating in processes involving the collective. Like in the Norwegian case, the central database can be made as the obligatory passage point which all other agencies must necessarily use to be able to carry out their mandatory tasks. For example, a passport office would only use the identification details included in the central database to issue a passport. While some additional information may be stored locally at the passport office, identification details should not be duplicated. In such a structure, the passport office has an institutional incentive to keep the central database efficient. The important challenge here would be to develop the legal and institutional frameworks, such as making it law that the CRVS identification number will be the sole one to be used for various institutional transactions.

7.2. OPERATIONAL LEVEL

Principle 3: Holistic approach

To make the ensemble or 'ecology' of a CRVS information system work in Tajikistan, there are a few key areas to be attended to at multiple levels. At the first level is the legal basis regulating the registration of vital events which are of equal importance for the government and the population. Tajikistan has a well-established legislative framework regulating CRVS activities. This will need to be modified to reflect the new demands coming from a coordinated CRVS information system. At the second level are the organizational and institutional arrangements that are directed towards unification of the CRVS with the other public and private stakeholders.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

133

At the third level is the technology, which will enable and support the unification of CRVS and the other related public and private systems. These three levels will need to be designed for enabling inter-linkages and mutual support. For instance, a networked and online system can potentially allow many institutional actors to join and by the same way create incentives for the population. If the Address Bureau gets connected to CRVS system, it creates incentives for the population to register in the CRVS in order to use also the Address Bureau services. So technology can enable the data exchange, which in turn generates larger user base, founded on the principles of a public good. Again, it is emphasized the need for a well-coordinated and holistic approach both in the design and operations of the CRVS information systems.

Principle 4: Business relationships

In Tajikistan, the different CR related activities are under the responsibility of different public entities. For example, addresses are registered by the Address Bureau at the Ministry of Interior and its Passport Desks at the districts. Upon reaching the age of 18, each citizen is obliged to obtain a national passport. Once the passport is issued, the citizen is registered into the Ministry of Interior system. Mapping the business relationship would then require defining the norms of the inter-linkages between these entities, including how data should be shared and what are mutual benefits. Similarly, business relationships will need to be defined to support the ongoing attempts to introduce personal IDs. For example, the Tax Committee of Tajikistan has its own taxpayer identification number (INN), Labor and Social Welfare has introduced social security number (SIN). INN is mandatory for all citizens above 18 years, and there are incentives both related to INN as requirement for employment and for doing private business. Unifying these and related data flow through introduction of a national personal ID would be advantageous for all.

Principle 5: Technical approach

First would be establishment of full featured computerized CR system linking all CRO divisions with central database. Next would be introduction of national identification number. Once the system is fully implemented and operational, other public actors could be attracted by the means of providing (limited) access to the database and making them involved in CRVS. This unification is a long political, legal and institutional process, though ICTs could be used to catalyze these processes. Establishing a centralized database of vital events generates incentives for other public actors to join and benefit from it and at the same time contributing to the sustainability of the system by improving data quality and availability.

8. CONCLUDING REMARKS

We have in this paper suggested five design principles for a well-functioning CRVS system and discussed these in light of the situation and ongoing attempts of modernizing the CRVS in Tajikistan. CRVS systems are discussed as parts of larger 'architectures' and 'ecologies', crucial for their well-functioning and the quality of the data they hold. While central authorities can introduce major changes as they may control larger parts of these 'ecologies', they still have to engage the wider network of private entities and citizens to assure the necessary information sharing and reporting practices. Further, conflicts of interest between different public entities must be eliminated and replaced by a mutual interest in information sharing and open information. This will further require changes in laws and regulations.

Through our discussion, we have illustrated how CRVS modernization requires changing existing and supporting the establishment of new institutions and assuring their sustainability. Modernizing a CRVS information system is a long-term process that needs a strong political mandate over time. Thus, it has to be a process based on top-down initiatives from the government that triggers bottom-up participation by public and private entities as well as citizens.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

134

9. REFERENCES

Backer, J. 1947. Population Statistics and Population Registration in Norway. Part I. The Vital Statistics of Norway: an Historical Review. Population studies. 1, 2, 212-226

Braa, J. and Sahay, S. 2012. *Integrated health information architecture: Power to the users*. Matrix Publishers, Delhi, India

Braa, J., Monteiro, E. and Sahay S. 2004. Networks of action: sustainable health information systems across developing countries. *MIS Quarterly*. 28:3, 337-362.

Campione, A., Goncalves, C., Nhampossa, J., Sitoi, A., Rocha, C., Machiana, J., Covane, A., Machava, L., and Seebregts C. 2011. Use of appropriate technology in the development of ICD-10 based informatics systems for hospital mortality notification in resource limited settings. Mozambican team experience. Report from MOASIS, Mosabique

Hanseth, O and Lyytinen, K. 2010. Design theory for dynamic complexity in information infrastructures: the case of building internet. *Journal of Information Technology*. 25, 1, 1-19.

Haux, R. 2006. Health information systems? Past, present, future. *International Journal of Medical Informatics*. 75, 268-281.

HMN. 2013. Systematic Review of eCRVS and mCRVS Interventions in LMICs. Draft Report commissioned by the Health Metrics Network, World Health Organization, Geneva.

Kahn, K., Tollman, S., Collinson, M., Clark, S., Twine, R., Clark, B., Shabangu, M., Gómez-Olivé, F., Mokoena, O., and Garenne, M. 2007. Research into health, population and social transitions in rural South Africa: Data and methods of the Agincourt health and demographic surveillance system. *Scandinavian Journal of Public Health*. 35, 69, 8-20.

Kariyawasam, N., Weerasekera, V., Dayaratne, M., Hewapathirana, R., Karunapema, R., and Bandara I. 2011. eIMMR: the future of health statistics in Sri Lanka. Sri Lanka Journal of Bio-Medical Informatics. 1, Suppl 14,1

Ivdity, C., Chkhatarashvili, K., and Rukhadze, N. 2011. Assessment of Child Birth and Death Registration in Tajikistan. Report from Curatio International foundation, Dushanbe

Latifov, M. and Sundeep, S. 2012. Data Warehouse Approach to Strengthen Actionability of HIS: Experiences from Tajikistan. *The Electronic Journal of Information Systems in Developing Countries*. 53

Mahapatra, P., Shibuya, K., Lopez, A., Coullare, F., Notzon, F., Rao, C., and Szreter, S. 2007. Civil registration systems and vital statistics: successes and missed opportunities. *The Lancet*, 370, 9599, 1653 - 1663.

Ngoma, C, Marlen, S. and Herstad, J. 2011. Adaptation of Mobile Application to Improve Flow of Birth Information from the Community to the District Level". E-Infrastructures and E-Services for Developing Countries. *Lecture Notes of the Institute for Computer Sciences*, Social Informatics and Telecommunications Engineering. 64, 79-92.

Norwegian Tax Administration. 2013. New Personal Identification Number in the Central Personal Registry. Report from impact study. In Norwegian

Norwegian Directorate of Taxes. 2011. Handbook on Civil Registration. Version 1.7. In Norwegian

Ohemeng-Dapaah, S., Pronyk, P., Akosa, E., Nemser, B., and Kanter, A. 2010. Combining vital events registration, verbal autopsy and electronic medical records in rural Ghana for improved health services delivery. *Studies in Health Technology and Informatics*. 160:1, 416-420.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

135

Setel, P.W., Macfarlane, S.B., Szreter, S., Mikkelsen, L., Jha, P., Stout, S., and AbouZahr, C. 2007. A scandal of invisibility: Making everyone count by counting everyone. *The Lancet.* 370, 9598, 1569-1577.

Skiri, H. 1995. Role and Status of Civil Registration (Population Registration) and Vital Statistics Systems in Norway. Note from Statistics Norway. 95/41

Toivanen, H., Hyvönen, J., and Wevelsiep M. 2011. Mobile birth registration in Liberia. Report from VTT Technical Research Centre, Finland.

Walsham, G. 1993. *Interpreting information systems in organizations*. Wiley, Chichester.

WHO. 2011. Keeping promises, measuring results: Commission on information and accountability for Women's and Children's Health. Report. World Health Organization, Geneva

WHO. 2010. Civil registration and vital statistics. WHO collaborating centers for the family of international classifications (FIC). World Health Organization, Geneva

World Bank. 2011. Improving Statistics for Children's Births and Deaths. Human development sector unit, Central Asia Country Unit Europe and Central Asia Region

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

136

TOWARDS A RESEARCH AGENDA ON HIS FOR UNIVERSAL HEALTH COVERAGE: IMPLICATIONS FOR IT4D RESEARCH

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Abstract: The paper argues for the development of a research agenda including theoretical and empirical approaches for studying Health Information Systems (HIS) for supporting progress towards achieving Universal Health Coverage (UHC) in Low and Middle Income Countries (LMICs). The research agenda is proposed over three areas: use of information, technological choice and innovation, and institutions of HIS governance. Specific research questions identified of importance relate to understanding requirements through contextualized participatory design techniques, development of appropriate and "frugal" software systems through prototyping methods, implementation challenges and strategies in varying contexts and required governance and institutional mechanisms to ensure effective use. Methodologically, the use of comparative and longitudinal case study designs adopting action research and realist evaluation is discussed as appropriate approaches to study this multi-sectorial and complex problem.

Keywords: HIS, UHC, LMICs, Health Reform, Research Agenda

1. INTRODUCTION

This paper proposes a research agenda towards understanding issues and approaches to the design, development, implementation and evolution of Health Information Systems (HIS) to support Universal Health Coverage (UHC) in Low and Middle Income Countries (LMICs). UHC, described by Dr. Margaret Chan, Director General, WHO, in a speech to the 2012 World Health Assembly as " the single most powerful concept that public health has to offer" seeks to provide citizens with financial risk protection in accessing effective and equitable health care. Today more than 150 million people in LMICs have gone bankrupt whilst incurring catastrophic health expenditures in accessing care, while financial barriers exclude many poor and marginalized families from receiving care. UHC is being promised by Global Health experts as a potential solution to the twin problems of poor access to needed health care due to inability to pay for it and impoverishment due to exorbitant expenditure for necessary health care services.

In this paper, we first discuss key characteristics of UHC and their implications for HIS. Following this, we analyse how HIS for UHC (referred to as UHC-HIS) represent a radical departure from existing systems in LMICs. This helps to outline research challenges that emerge, providing a basis for building an agenda for IT4D research.

1.1. Key Characteristics of UHC and Their Implications for HIS

Earlier World Health Reports (WHR) emphasized UHC and a renewal of the Primary Health Care (PHC) services as a vehicle to achieve UHC (WHR 2008). The 2010 report outlined strategies to achieve financial protection to citizens by reducing out of pocket expenditures. It also provided a conceptual framework (see figure below) to measure progress towards UHC across three dimensions: service coverage representing the range of services covered; financial coverage representing the proportion of total costs covered through insurance or other risk

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

137

pooling mechanisms; and, population coverage representing proportion of the population covered and the distribution of service coverage across various population sub-groups.

Figure 1 – Measuring universal coverage (Source – World Health Report – 2010)
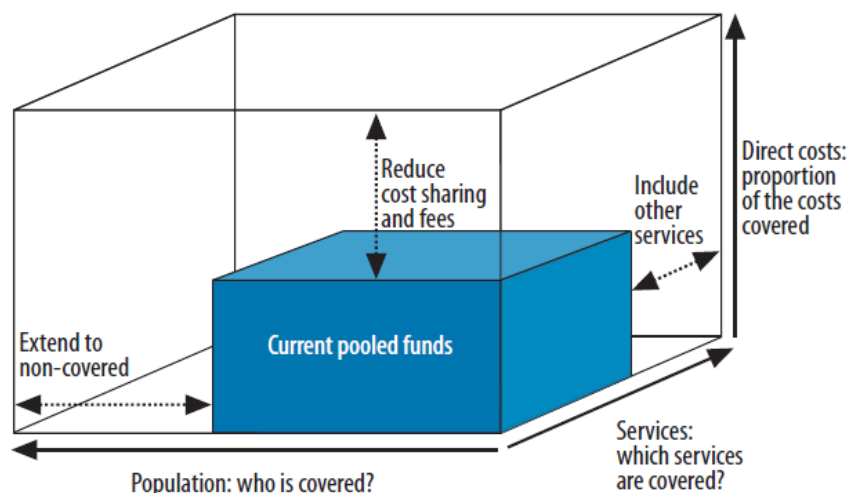
Though visually attractive and conceptually elegant, this "UHC cube" presents considerable measurement challenges especially in mixed systems where there is state based free care along with public and private insurance mechanisms (Sahay et al 2014a). Both coverage and financial protection could vary widely with the service studied. For example, immunization services would typically have complete financial protection and almost universal population coverage, whereas a very limited proportion of diabetics may be able to access free care. In the financial protection dimension represented by the height of the cube, whereas out of pocket expenditure is relatively easy to measure, it is not so for public expenditure on a specific service. With coverage represented by the breadth of the cube, the difference between nominal and effective coverage and service utilization poses severe measurement problems. While the entire population is financially covered for immunization, only a small proportion of children may have actually received it. Or the entire population may be covered by accident insurance, but only a small proportion may access free care, due to complex financial reimbursement mechanisms. Conversely increased utilization is not necessarily more effective coverage, for example a higher proportion of C-section services amongst pregnant women may simply reflect a propensity for C-sections amongst obstetricians to save time and increases income, rather than implying improved parturition care. More effective measurement models of progress would require measurement of the proportion of persons in need of health care who are able to access the requisite services which are proven effective, that are provided with high quality in an efficient manner without the recipients facing financial hardship and which result in improved health outcomes.

The various reform measures that have been envisaged under UHC include:

1. Expanding the basket of services: UHC entails expanding the basket of services provided at the PHC level from its current primary focus on maternal and child health services to include causes of morbidity including common NCDs such as mental health, hypertension, obesity, diabetes, asthma, chronic respiratory diseases, epilepsy, depression, substance abuse, cancer, and blindness.

2. Population based proactive care provision: UHC requires proactive population based care as contrasted to the current focus on care to those who primarily seek it. UHC services need to be provided within frameworks which measure success by a reduction of NCD rates and complications, and in cost of care.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

138

3. Providing continuity of care: Treatment of NCDs and other chronic diseases involve specialist consultation and secondary care diagnostics within a continuity of care framework, including in continuity in medication and testing based on regular follow up. This continuity requires primary, secondary and tertiary providers, both private and public, to be electronically and institutionally bridged to serve as a single entity providing care based on agreed upon standard treatment guidelines and operating procedures.

4. Budget allocation based on needs: Financial allocation would need to be made within the district which is responsive to caseloads and the actual package of care provided. This would include contracting arrangements as well as to public facilities handling different case-loads.

5. Ensuring care with minimum out of pocket expenditure: UHC will need to support affordable or no out of pocket expenditure on care and drugs without any form of social exclusion for any section of the population. Free care by government providers or purchase through insurance will need to be so governed and managed to ensure value for money and appropriate use of public expenditure.

These reform efforts will require specialized information support, with the following implications for HIS:

1. To help the health system to expanding the basket of services, the UHC-HIS will need to record and process information on a wider range of diseases (eg NCDs and mental health) as compared to its current primary focus on maternal and child health services.

2. To enable population based proactive care provision, the HIS would need to process information within frameworks which measure success by a reduction of infection, trauma and NCD rates and complications, and in reduced cost of care (or improved cost benefit ratio). This framework would need to cover population based information and not just those to come to the facilities to access care, emphasizing those typically not covered by traditional systems.

3. To help providing continuity of care, UHC-HIS would need to link services provided in primary care to individuals with their referral and treatment information of infections, trauma and chronic diseases which involve specialist consultation and secondary care diagnostics. Primary, secondary and tertiary providers, both private and public, will need to be electronically and institutionally based on information which conforms to standard treatment guidelines and operating procedures.

4. To support budget allocation based on needs, the UHC-HIS would need to measure needs-based case-loads and the actual package of care and costs provided. This should help determine payments to the private sector as well as to public facilities handling different case-mixes and loads at varying levels of quality of care.

5. From the population side, the UHC-HIS should help ensure care without out of pocket expenditure, and to monitor that no section of the population is excluded. It should also help strengthen governance of free care by government providers or purchase through insurance needs to ensure value for money and appropriate use of public expenditure.

Taken together, these different implications help to conceptualize UHC-HIS as under.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

139

Figure 2 – Conceptualizing information flows for UHC-HIS
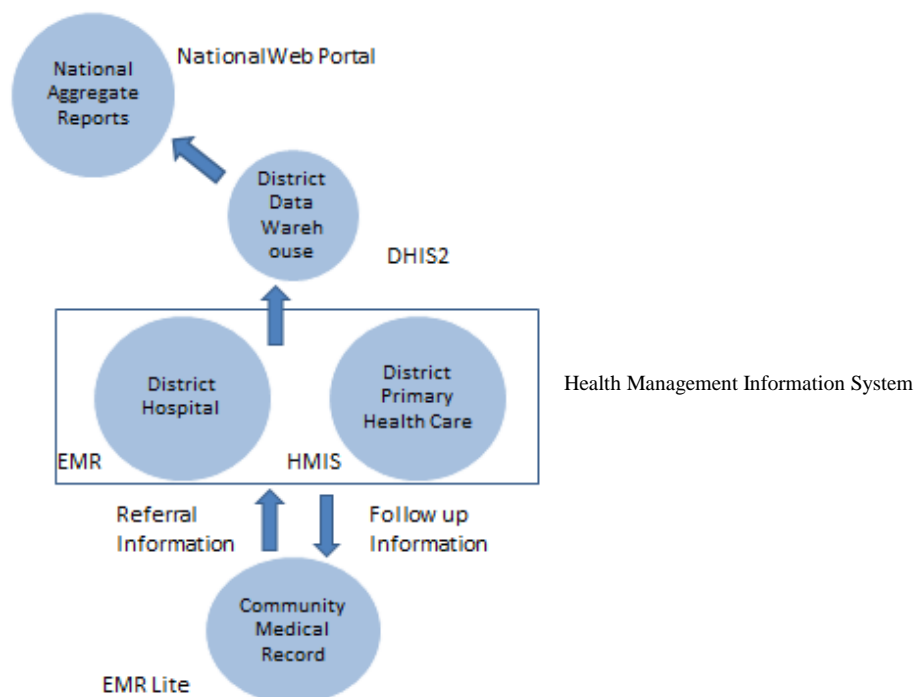
In the above figure, there needs to be a community medical record system (or EMR lite) which will process name based details of the population, their encounters with the PHC level, and referral information of those needing secondary care to be sent to the district. Here, information from the districts hospitals based on a full EMR and other aggregated information from the HMIS (Health Management Information System) would be aggregated into a district data warehouse which will transfer required indicator based information for Monitoring and Evaluation to the national level. Further after secondary treatment and consultations, follow up information would need to be sent back to the PHC providers, both public and private.

However, achieving such a cost-effective and sustainable architecture is a non-trivial challenge, involving infrastructure, capacity, regulatory and many other hurdles. The research agenda being argued for would need to be able to both conceptualize these issues and develop practical and context-based solutions to address them. A key aspect of the context which needs to contended with is the existing traditional HIS which presents significant challenges (and also opportunities) to transition to UHC-HIS. These are now discussed.

1.2. How does Traditional HIS Relate to UHC-HIS?

Traditional HIS has focused on data collection and upward reporting of statistics primarily on maternal, child health and family planning services, mainly of a symptomatic nature. Typically care in a LMIC context is largely provided by a network of public primary care facilities supported by community health workers, and networked with district and sub-district hospitals for referral support. This network primarily provides a population based coverage for care in pregnancy and child immunization and to some extent for Tuberculosis and HIV, but not for most other morbidities, for which people typically access private health care. District hospitals provide a full range of primary and a substantial part of secondary care. Private and publicly financed insurance covers a minority of the population for some types of hospitalization.

In the table below, key characteristics of traditional HIS are detailed and contrasted with a reformulated UHC-HIS. Implications for research to enable this transition are also summarized.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

140

Table 1: Transitional challenges: Traditional HIS to UHC- HIS

Traditional HIS in LMICs.	Reformulated "UHC-HIS"	Implications for research
Information Content Focus on maternal and child health services and few disease control programmes of national importance.	Need to expand to cover all areas of health care provisioning, financing and morbidity and mortality information.	Design for expanded informational content, including NCDs. Design for de-duplication in aggregating patient data.
Information Characteristics Focusing primarily on facility based data- in the form of aggregate numbers for public providers of care.	Provision for name/encounter-based data to enable continuity of care. Need to aggregate data to compute population based statistics. To expand data processing to enable follow up for NCDs. To integrate information from private providers, especially when publicly financed.	Design of electronic health record versions on tablets, mobiles in periphery levels. Design to generate appropriate denominators for population-based measurements. Ability to integrate public sector data with purchasing of care from private sector
Periodicity: Monthly and quarterly reporting of aggregate information, not longitudinal.	Based on real time data as and when the encounter takes place, and longitudinal in nature	Design for real time reporting with granularity of patient level.
Measuring Progress to UHC: Focus only on service delivery data, inadequate to measure progress towards UHC.	Should measure % needs satisfied for service groups, and in relation to financial hardship. Detailed monitoring of morbidity and mortality data. Population based utilization data to measure coverage across range of services provided. Measure institutional readiness and gaps, and support resource allocation decisions.	Design models to aggregate data from health care system and triangulate with data from other sources like CRVS, surveys and hospital information systems. Integration strategies with other information systems. Design governance: systems to provide for data security to institutionally enable integrated information flows across public and private providers.
Financing and Payment Mechanisms: Financial data not in focus	Focus on individual cost of care and household expenditure data. Include population data on poverty and financial exclusion. Resource allocation to close gaps and equity concerns.	Enable integration with financial data; .Support resource allocation- budgetary and purchasing care responsive to volume and types of services and equity issues.
Use(r)s of information: Upward flow of data primarily for enabling centralized monitoring and policy-making.	Need for multi-level flows, including for referrals (upwards), continuity of care (downwards), and horizontal (across programs); Need to enable facility and mid-level managers for evidence based decisions.	Design for catering to this multiplicity, involving different data types. How to inculcate a different kind of information use culture based on "big data".
Technology Innovation and Choice: Limited to procuring single vendors through competitive process as a one-time event.	To support approaches of innovation and technology choice and uptake based on inter-disciplinary collaboration.	Develop participatory design approaches involving inter-disciplinary communities to share information on specific problematics
Governance of HIS: Primarily involving only Ministry of Health.	Involving multiplicity of stakeholders, including private, public and other ministries. Establish and maintain multi-sectorial governance models.	Establishing mechanisms to procure and maintain open platforms and standards to enable integration. Need for HIS policy and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

141

	Address concerns of privacy, confidentiality, ownership, data storage, and disclosures.	authority to maintain governance mechanisms.

The above table identifies the multi-faceted nature of research challenges involved in making a transition from traditional HIS to UHC-HIS. These are now discussed.

2. FORMULATING RESEARCH CHALLENGES AROUND UHC-HIS

Drawing from the above discussion, it is evident that design, development, implementation and evolution of UHC-HIS will be fraught with multiple challenges. We categorize the challenges into three broad research domains: Use of information; Choice of technology and innovation; Institutions of governance. Within each domain, there are key research questions to be addressed which provide the basis of a future research agenda.

2.1. Use of Information

Some key questions to be addressed under this domain are discussed.

How can HIS contribute to priority setting and measurement of progress towards UHC?

This requires an understanding of which diseases are more prevalent and their contribution to the burden of disease and out of pocket expenditure. This involves challenges relating to measurement of coverage, utilization of different health care services and out of pocket expenditure on different drugs. There will be different gaps in institutional capacity to take action based on priorities that will need to be identified.

How can HIS supporting measuring health equity towards UHC?

This includes understanding the criteria to identify exclusion and marginalization, in relation to services and population sub-groups. There are ongoing challenges of designing and linking equity measures to guide resource allocation.

How can HIS add value at all levels of the health hierarchy?

This requires an understanding of informational needs for primary care providers, mid-level managers, and policy makers. Designing appropriate ICTs to provide appropriate value is a key challenge, plus building capacity of users to make effective use of them.

2.2. Technology Innovation and Choice

Some key questions to be addressed in this domain are:

What are the eco-systemic determinants of innovation and technology choice in development of HIS?

This requires an understanding of the different stakeholders and their influence on technology choices. This depends on the ability of the eco-system to consider available alternatives, and of the infrastructural conditions in shaping technological choices.

What are appropriate design strategies for low-cost and frugal innovation based applications?

This requires an understanding of how social, technical and institutional conditions can shape frugal choices where you seek to do more with less.

Another important determinant is the existing institutional and human capacities and their potential for strengthening. There are key implementation challenges involved in adapting new technological options

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

142

What are appropriate strategies for integration and interoperability?

This requires an understanding of how historical systems and data be effectively integrated with the new, and the technical and institutional strategies. Modern ICT solutions need to be appropriately leveraged to address these challenges.

2.3. Institutions of Governance

Some key questions to be addressed in this domain are:

What are appropriate hybrids of centralization and decentralization required?

This requires understanding existing models of centralization and decentralization of the health care systems, and how these shape trajectories for the new. The challenge is to design appropriate hybrid models that are appropriately contextualized.

What is the regulatory environment required to secure privacy of information?

This requires an understanding of the existing regulatory environment and gaps with respect to UHC-HIS. A design challenge is to develop appropriate incentives and sanctions for private sector providers with respect to data, and the related question of who should own personal data?

What is appropriate decision making structures required around technology?

This requires understanding of the existing decision making models around health system issues, and how can these be modified and make more responsive to local priorities within the UHC framework. This will necessarily require multi-sectorial models for HIS governance.

Answering the questions posed above in these three research domains will require strong conceptual foundations. We reflect on this issue next.

3. CONCEPTUAL APPROACHES REQUIRED

The conceptual approach to address identified research questions will necessarily be informed by multi-disciplinary theoretical perspectives. Relevant disciplines which can inform this effort will include informatics, public health, science and technology studies, and development.

From public health, inspiration can be drawn from the World Health Report, 2013, titled "Research for Universal Health Coverage" which emphasizes the urgent need for supporting research, even though they have largely ignored the informational dimension. We also draw upon health systems and policy research which situates HIS as one of the six building blocks of health systems strengthening (WHO, 2007, see figure below). We argue that similar importance of HIS must also be attributed to UHC-HIS which is necessarily a health systems rather than an isolated technological one, requiring serious consideration of institutions, capacities, financing arrangements and infrastructure.

From Science and Technology studies (Latour, 1999), we learn that "airplanes don't fly, but airlines do" implying that technology on its own cannot achieve much, but requires the alignment of socio-technical heterogeneous networks including institutions, culturally situated work practices, technical systems, infrastructure and many others. A direct implication of this for UHC-HIS analysis is that technology on its own cannot provide effective solutions, but rather that appropriate technology will need to be seamlessly integrated with institutions, governance, regulation infrastructure, people's aspirations, disease requirements and many other factors.

Figure 3 – The WHO Health Systems Framework

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

143
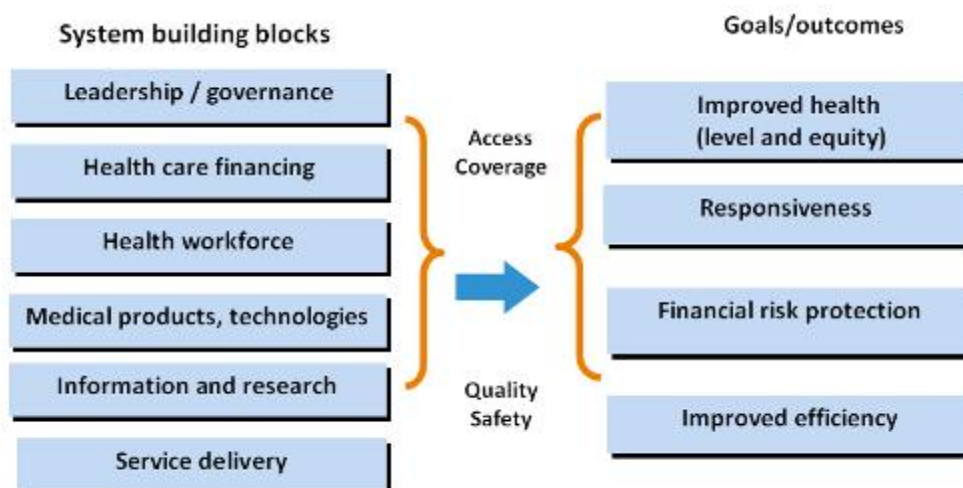
Informatics research provides key inputs to addressing identified questions. Theories of information infrastructure (Hanseth and Monteiro, 1996, Ciborra and Hanseth, 1998, Hanseth and Lytinen, 2010) with multiple supporting concepts are directly relevant for this purpose. Information infrastructure concerns complex, large and networked systems, rather than singular ones, which represent characteristics of UHC-HIS which necessarily are large scale, constantly evolving, and spanning inter-connected domains of health, civil registration, household and demographic surveys, facility audits, finance systems and various others. This theory provides an underlying perspective to the challenge of UHC-HIS.

Use of information: Many research studies from LMICs have lamented the dominance of data-led systems, and the contrasting absence of action-led systems. While information is a necessary condition to ensure action on it, it is by no means sufficient (Latifov, 2013), and the need is to cultivate use through an ongoing institutional process. An approach provided by Kelly et al (2013) emphasizes the role of "conversations around data" between different stakeholder groups in order to raise awareness about the importance of information, and gradually over time to take small steps to build a larger information culture. Braa and Sahay (2012) have described tools (such as the TALI tool and Readiness to use information for action tool) to help measure increasing levels of maturity of the HIS with respect to using information for action. These insights can help to both design data collection, and also enable building appropriate measurements of interventions.

Technology choice and innovation: Information infrastructure theory provides significant design implications for UHC-HIS. One concerns the concept of the installed base which emphasizes the need to acknowledge history and to seriously account for it in the design of new systems rather than adopting clean slate approaches (Aansted, 2002). Another design implication concerns the need to balance the needs of the global with locally situated circumstances, so that systems are both locally specific whilst also allowing generalization to other contexts (Rolland and Monteiro, 2002). The role of "flexible standards" (Braa and Sahay, 2012) are key in the development of these infrastructures, where any level in the heath hierarchy will need to comply with the information requirements of the levels above while having the freedom to add more data for their own level and below. Information requirements gathering would be significantly informed by advances in participatory design research where techniques of mediation and gateways between developers and users help deal with changing contexts of web-based development and the distributed nature of work (Braa and Sahay 2012). Important implications for building scalability of systems (Sahay and Walsham, 2006) and also sustainability (Braa et al, 2004) inform UHC-HIS research to develop appropriate implementation models. Given the extremely resource constrained environments in which UHC-HIS will be developed, cost-effective and "frugal innovation" models (Bhatti, 2012) are required.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

144

Institutions of governance: Governance concerns the institutional structure within which decisions around UHC-HIS are made (Sahay et al, 2014a and b). Traditional institutions are historically and socially embedded and thus difficult to change (Latifov and Sahay, 2012) and respond to the multi-sectorial and flexible structures required for UHC-HIS. Policies made at the top without hearing the voice of lower levels are bound to fail because of the limited overlap between formal institutions and informal constraints existing at the local sites for interventions (Piotti et al, 2006). Findings from neo institutional theory can inform about the stability of institutions, and within this the challenge of change through highlighting the contradictions between the old and the new (Nicholson and Sahay, 2009). Strategies around deinstitutionalization (Nicholson and Sahay, 2009) and institutional entrepreneurship (Hardy and Maguire, 2008) can help design of appropriate governance models in new institutions.

While these different conceptual inputs to the UHC-HS design and development dimensions are paramount, insights from development theorists like Sen (1999) urges to look at the developmental impacts, such as 'does the HIS enable individuals to pursue the health care they value'. Taking up the UHC-HIS research challenge within this broader development framework, can help to address the question of "how can ICTs contribute to building a better world" (Walsham, 2012).

4. WHAT CAN UHC-RESEARCH CONTRIBUTE TO?

Key contributions from such a research agenda can help support the development of new theoretical and empirical approaches to understand UHC-HIS needs and implications for LMICs which can feed into processes related to the design, development, implementation and evolution of UHC-HIS. Specific contributions include:

Use of information

1. Development of detailed understanding of requirements for use for different stakeholder groups around UHC-HIS in particular contexts.
2. Development of strategies to support effectively the visualization and use of information to develop appropriate models to measure progress towards UHC.
3. Development of practical guidelines that health systems can adopt to nurture a culture around use of information.

Technological choices and design

1. Development of new theoretical models for UHC design in LMIC contexts.
2. Development of design strategies on how to effectively build upon the existing installed base of technical-institutional systems, and incorporate them into new UHC-HIS models.
3. Develop models of frugal innovation so as to make systems appropriate to resource constrained environments typically found in LMICs.

Governance

1. Development of hybrid models of HIS centralization and decentralization, appropriate for supporting different UHC approaches in varying contexts.
2. Development of regulatory environments to provide for data security and privacy appropriate for LMIC contexts, and to enable information exchange across a variety of stakeholders spanning public and private domains.
3. Establishing standards for data and interoperability across systems to enable smooth and protected exchange of information across multiple stakeholders and health administration levels.

Together, these contributions can help to articulate a new research paradigm around UHC-HIS, support the opening of focused programmes of research, as well as develop significant contributions towards policy and practice around design, development, implementation and governance of UHC-HIS models for LMICs.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

145

5. SUGGESTED METHODOLOGICAL APPROACHES

Methodologies adopted should seek to address research questions such as: What are different information use cases for multiple stakeholder groups that UHC-HIS needs to support?; How can information requirements for HIS for UHC be understood based on appropriately contextualized participatory design techniques?; How can prototyping methods be used to develop HIS for UHC which are flexible, locally relevant, and able to evolve with emerging needs?; What are appropriate governance models for UHC-HIS to best support UHC aims of financial inclusion and poverty reduction in accessing health care?; What are socio-technical implementation challenges around UHC-HIS and appropriate strategies to address them?

To address these, data collection should then focus on: information requirements for UHC to generate inputs to HIS design; cultivation of scalable prototypes involving "frugal" design that is flexible and evolves with changing needs; HIS Implementation and governance challenges and strategies shaped by a dynamic context; Information use cases for different stakeholder groups.

Methodologies required would typically involve combinations of action research and realist evaluation within comparative case study frameworks. An approach to action research can be of "networks of action" approach (Braa et al 2004) successfully demonstrated by the HISP research programme developed over 15 years spanning HIS strengthening efforts in more than 40 LMICs (Braa and Sahay 2012). A key principle underlying this approach is that we learn better in collectives than single units. Networks would need to be enabled at global and country levels comprising of university departments, Ministries of Health, policy making bodies, technology providers and civil society organizations. Collaborative action to enable learning and sharing across the actors in the network would need to focus on research and practice in HIS design, development and implementation. Action would be required to try and make each network node self-organizing and sustaining, to be able to contribute and draw upon learning and resources from the collective. Interpretive approaches (Walsham 1993) would be useful in understanding the different stakeholders' perspectives towards their UHC information needs and how the HIS is supporting it.

Realist evaluation methods (Pawson and Tilley 1997) are especially relevant for new public management. It represents a new form of strategic thinking and critical analysis of public managers' action with respect to decision making (Barzeley 2001) and to help identify 'what works in which circumstances and for whom?', rather than merely 'does it work'? This perspective helps to analyze the underlying generative mechanisms that explain 'how' the outcomes were caused and the influence of context. This approach can help to understand how interventions have implicit programme theories that specify how a set of mechanisms generate key outcomes, intended as well as unintended. This approach helps to analyse particular situations and the kinds of knowledge that is entailed, with a specific emphasis on the participant of individuals and how they contribute or not to the success of the program. Rather than being scientific which tends to be incomplete, the focus is on evaluating a situation through the lens of objectivity and detachment. Methods and tools of data collection would be guided by the types of data needed to answer the evaluation questions and test the initial programme theory in all its dimensions, quantitative or qualitative to guide understanding of implementation challenges and approaches.

Methodologically, comparative case study analysis can help to develop unique research insights across countries, districts or provinces currently engaged in developing models. Within each site, data collection can be carried out in a research design of comparative case studies, which is longitudinal and multi-level spanning the global to peripheral levels of the health facility and community. Mixed methods of data collection would be required including secondary data analysis, interviews, observation, participatory design, software prototyping, and realist implementation evaluation. While secondary data analysis will help to understand the contextual conditions of UHC models, interviews and observations can provide insights to informational

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

146

priorities of stakeholder groups, existing flows and gaps of information, and challenges of managing the transition to the new HIS. Participatory design techniques, appropriately contextualized, can help to ensure appropriate needs and local knowledge are included as essential inputs into prototyping methods and in evolving the HIS. Data analysis can involve inductively developing research themes from the data for each case, generating cross themes analysis across the cases, and developing theoretical inferences around the themes of use of information, technology choice and innovation, and governance of HIS.

6. CONCLUSION

The paper has argued for the information systems research community, particularly those in IT4D to work towards developing a futuristic research agenda concerning HIS for UHC. UHC represents a global phenomenon which is being promised as a panacea towards addressing challenges of poverty and financial exclusion due to health care which many poor people in LMICs are experiencing and expected to rise in the future. Some areas of research and methodological approaches have been presented as being relevant towards developing this research agenda.

REFERENCES

Aanestad M (2002) Cultivating Networks: Implementing Surgical Telemedicine, Ph.D thesis, University of Oslo, Norway.

Barzeley, M. (2001), The new public management, 1st Edition, Berekely: University of California Press.

Bhatti, YA (2012), What is Frugal, What is Innovation? Towards a Theory of Frugal Innovation, Available at SSRN: http://ssrn.com/abstract=2005910 or http://dx.doi.org/10.2139/ssrn.2005910

Braa, J., & Sahay, S. (2012). Health Information Systems Program: Participatory design within the HISP network.

Braa, J., & Sahay, S. (2012). Participatory Design within the HISP network.Routledge International Handbook of Participatory Design, 235.

Braa, J., Monteiro, E., & Sahay, S. (2004). Networks of action: sustainable health information systems across developing countries. Mis Quarterly, 337-362.

Ciborra, C. U., & Hanseth, O. (1998). From tool to: Agendas for managing the information infrastructure. Information Technology & People, 11(4), 305-327.

Hanseth, O., & Lyytinen, K. (2010). Design theory for dynamic complexity in information infrastructures: the case of building internet. Journal of Information Technology, 25(1), 1-19.

Hardy, C., & Maguire, S. (2008). Institutional entrepreneurship. The Sage handbook of organizational institutionalism, 198-217.

Kelly et al (2013) re-framing evidence-based public health: from Scientific decision-making to occasioning conversations that matter, Proceedings of the 12th International Conference on Social Implications of Computers in Developing Countries, Ocho Rios, Jamaica.

Latfov, M.A (2013). Global Standards and Local Health Information System Applications: Understanding their interplay in the context of Tajikistan (Doctoral thesis), Department of Informatics, University of Oslo.

Latifov, M. A., & Sahay, S. (2012). Data Warehouse Approach to Strengthen Actionability of Health Information Systems: Experiences from Tajikistan. The Electronic Journal of Information Systems in Developing Countries, 53.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

147

Latour, B. (1999). An essay on the reality of Science Studies, Harvard, MA.

Monteiro, E., & Hanseth, O. (1996). Social shaping of information infrastructure: on being specific about the technology. Information technology and changes in organizational work, 325-343.

Nicholson, B., & Sahay, S. (2009). Deinstitutionalization in the context of software exports policymaking in Costa Rica. Journal of Information Technology, 24(4), 332-342.

Pawson, R., & Tilley, N. (1997). Realistic evaluation. Sage.

Piotti, B., Chilundo, B., & Sahay, S. (2006). An Institutional Perspective on Health Sector Reforms and the Process of Reframing Health Information Systems Case Study From Mozambique. The Journal of Applied Behavioral Science, 42(1), 91-109.

Rolland, K. H., & Monteiro, E. (2002). Balancing the local and the global in infrastructural information systems. The Information Society, 18(2), 87-100

Sahay, S., Sundararaman, T., and Mukherjee, M (2014a), Building locally relevant models for Universal Health Coverage and its implications for Health Information Systems: Some Reflections from India, Accepted for HELINA meeting to be held in Accra, Ghana, October 2014.

Sahay, S. (2014b). Universal Health Coverage, financial inclusion and technological intervention: A new paradigm for public health care delivery in low and middle income countries, IFIP 9.4 Latin America Regional Meeting, Belo Horizonte, Brasil, August 18-19.

Sahay, S. and Walsham, G. (2006). Scaling of health information systems in India: challenges and approaches. Information Technology for Development 2006, 12, 3, 185-200.

Sahay, S., Sundararaman, T., and Mukherjee, M (2014a), Building locally relevant models for Universal Health Coverage and its implications for Health Information Systems: Some Reflections from India, Accepted for HELINA meeting to be held in Accra, Ghana, October 2014.

Sen, A. (1999). Development as freedom. Oxford University Press.

Walsham, G. (1993) Interpreting Information Systems in Organizations. Wiley, Chichester, UK

Walsham, G. (2012). Are we making a better world with ICTs? Reflections on a future agenda for the IS field. Journal of Information Technology, 27(2), 87-93.

World Health Organization. (2007). Everybody's business--strengthening health systems to improve health outcomes: WHO's framework for action.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

148

CAPACITY STRENGTHENING IN A DEVELOPMENT CONTEXT: INSTITUTIONAL CHALLENGES AND APPROACHES

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Abstract: There are so few fixes for ICTs in international development that it is worth noting any when any is encountered. This paper describes human and institutional capacity strengthening as as a means to address some of the problems in supplying information technology in developing countries. At the same time, the paper describes why this is also challenging. To achieve the aims of the paper, the authors draw on lessons learnt when building and implementing data management software for the Government of Bangladesh. The technology requirements involved were simple by software development standards, being more about adaptation of existing software than starting from scratch. We found that the real challenges lay elsewhere, focusing particularly on the institutional context of a public sector setting. Ultimately, solution of these challenges did not rest on technological advancements, but on the capacity of the institutions and individuals who would ultimately use the technology to understand, interact with and articulate technology problems and solutions – all of which lead to consideration of human and institutional challenges and their interactions.

1. INTRODUCTION- THE CAPACITY STRENGTHENING PROBLEM

Most evaluation reports of information technology for development projects (IT4D) involving public sector institutions in low and middle-income countries (LMICs) end up with the recommendation of the "need for more training." Next time around, there would be more training and more trainers, and still the end result tends to remain the same: "need for more training." Why is the case? Is our approach to capacity strengthening flawed? Or are the trainers used not up to the mark? Or are there inherent complexities in the public sector institutions involved which constrains conventional training approaches to not deliver on optimal results? In this paper, we discuss some of these issues in the context of a project for food security and nutrition information systems in Bangladesh where the UN FAO (Food and Agriculture Organization) were responsible for the capacity-strengthening component, including relating to the supporting information systems.

Capacity strengthening in information systems projects in a public sector institution of a developing country is indeed challenging. Capacity strengthening involving participatory approaches has become an important strategy employed by development organizations to try and deal with some of the existing challenges. While not discounting the usual challenges of resource constraints, poor ICT infrastructure, unreliable power supply, and many others, these participatory-based approaches tend to encounter three key sets of roadblocks. The first concerns the broader existing institutional environment of public sector organizations in LMICs which tends to be hierarchical and contrary to what is required for a participatory approach (Sahay and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

149

Walsham 1996). The second relates to staff for which a primary motivation for engaging in self-development are reasons, which are extrinsic rather than intrinsic. This implies a desire to grow driven by reasons of obtaining more degrees and a higher status in the organization rather than to enhance their personal knowledge and skill sets (FAO Coaching Programme 2012-13). The third challenge relates to a "person" based style of leadership, ending up in a lottery kind of situation of who is the leader, how long he/she stays in the post, and whether he/she favours a participatory approach to capacity strengthening. These challenges lead to articulating the following research question, which this paper will seek to explore:

1. What are key challenges associated with traditional capacity strengthening efforts in a IT4D context and how can these be best addressed?

We examine this question in the context of a case of an information system for food security and nutrition (we call FSNIS) for the Ministry of Food in Bangladesh.

The rest of this paper is organized as follows. In the next section, we discuss some traditional approaches to capacity building based on participatory approaches in IT4D projects. In section 3, we provide some details of the methods used in this study, followed by case study details in section 4. In the analysis and discussion section that follows, we seek to answer the research question posed in the introduction. Finally, some brief conclusions are presented.

2. A CONCEPTUAL PERSPECTIVE ON CAPACITY STRENGTHENING

Capacity building is an important feature of development projects coming into prominence in the 1990's. As Fanany et al (2011: 89) put it, capacity is an 'amorphous' term referring to the ability of individuals and organisations to cope with all aspects of their existence. Building capacity refers to approaches to develop this ability which enables them to manage their own affairs (Fanany et al 2011; Potter and Brough, 2004). Capacity building is a central plank of development activity seen for example in World Bank and UNDP programmes (UNDP, 2009; Otoo et al. 2009). In the IT4D literature, capacity and capacity building has attracted surprisingly limited interest. According to OECD statistics, ICT only projects are relatively uncommon in donor given aid, and are rather embedded as an aspect of wider programmes (Gevaert, 2012), thus raising an important need to pay more interest and attention to this aspect of development.

Capacity is a convenient way to help make sense and organise the world(s) of development, and a key mechanism to influence a successful development project. In doing so, capacity strengthening programmes can potentially help articulate theories of how development works. Arguably, the skilled use of concepts, such as capacity, often found in the work of individuals or institutions, are crucial in making development projects work.

The term capacity is thus multivalent, used differently by people, researchers and institutions. As the Paris Declaration on Aid Effectiveness states: capacity to plan, manage, implement, and account for results ... is critical for achieving development objectives. The OECD defines capacity development as follows "'*Capacity' is understood as the ability of people, organizations and society as a whole to manage their affairs successfully. ... 'Capacity development' is understood as the process whereby people, organizations and society as a whole unleash, strengthen, create, adapt and maintain capacity over time.*" (Otoo et al. 2009:1). Morgan (2006:8) proposes that capacity is that emergent combination of attributes that enables a human system to create development value. Sen (1999) allows us to take these ideas further in terms of developing capabilities and removing unfreedoms, as well as Chambers' arguments of development as 'good change' (Chambers, 1997).

A systematic analysis of capacity can enable knowledge to arise from the experience of IT4D. For example, "provide more training" is a mechanical approach that does not address the challenge of capacity in its broader context. Frequently it is assumed that existing users and systems are without capacity, and these can (and should) be replaced by new ICTs. For example,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

150

Braa and Sahay (2012) writing in the domain of ICTs for public health, describe capacity as the potential which the health system possesses, and which needs to be nurtured using ICTs to be able to address health problems at hand. Instead, it is often assumed that there is non-existent or counter-productive capacity in the health system, and thus needs to be replaced with new ICTs. This assumption then directs the capacity strengthening efforts to the technical systems and how they can be used, rather than the humans and the inherent potential they possess.

3. METHODS

The analysis is based on a 3-year project (2012-2014) where an Indian NGO (called INGO) was engaged with the design, development and implementation of a national Food Security and Nutrition Information System (FSNIS) for the Ministry of Food, Bangladesh. While the project involved multiple components, in this paper, the focus is only on capacity strengthening. The project was divided into three phases with the following focus: one, on the design of the database and import of legacy data; two, to build on the database designed to create functionalities for generating two routine reports; and, the third was focused towards institutionalization of the systems and building state ownership. Capacity strengthening was a key component running through all the three phases, and comprised of workshops, one to one training, providing hand-holding support, building of resource materials (eg user manuals, data dictionary and organizational guidelines for data management), and different forms of informal support through phone and email. Conducting this exercise was primarily the onsite INGO team with back up support from their Delhi team. Data sources were varied including one to one meetings, evaluation reports, feedback on training, emails from staff and various others. Analysis was based on making overall sense of the capacity strengthening experience and discussions with one of the UN FAO staff (an author on this paper), who helped to critically discuss the issues, challenges and possible approaches. Two of the other authors were key actors in the project, one as an advisor to UN FAO, and the other as the INGO project coordinator. . The fourth author was a "knowledgeable outsider" who though not involved directly in the project, had researched and studied development projects from the perspective of capacity building.

4. THE EMPIRICAL EXAMPLE: FSNIS IN BANGLADESH

The Food Programme and Monitoring Unit (FPMU) is a policy unit within the Bangladesh Ministry of Food with responsibilities to monitor the national food situation condition on a daily and fortnightly basis, and provide inputs to policy. The monitoring of food situation is carried out within the framework of food availability, access, and nutrition. To enable this monitoring, FPMU receives data from a variety of sources including departments of Agriculture, Food production, National Bank, Metrological department, the National Bureau of Statistics, Regional and Global websites dealing with food grain prices and exchange rates, and various others representing 17 different sources. The supporting FSNIS becomes a key element to enabling the national monitoring function across such tremendous diversity.

The complexity of FSNIS is contributed to by the intensive nature of the data needs, covering great variety including commodity prices daily, food production weekly, and rainfall data daily and other data which stretches back to even 75 years. Data comes in different formats ranging from Excel sheets to faxes to phone calls and paper reports raising the challenge of weak standards and structure of information. Historically, the information system has been manual and paper based, where data collection has taken place through various formal and informal means, often relying on phone calls or personal visits to pick up data. Inherently, the nature of food security is dynamic with constant changes in the commodities to be monitored, the influence of markets and seasons, and the highly volatile nature of the global and regional food markets. All this has implications on the information flows from the input and output perspectives, requiring constant modifications and evolution. Different individuals in FPMU had saved data relating to

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

151

their work in Excel sheets and Word documents on their desktops creating their own little islands of information, leading to a historical accumulation of individual data that was not really visible as an organization resource.

From an information systems point of view, the above situation posed significant technological and institutional challenges. Technically, the challenge was of firstly understanding and mapping the complex flows of information to the system, designing a database to accommodate the extreme diversity of data and its historical nature, while being flexible enough to evolve with future information needs. Introducing modern technological solutions based on a data warehousing approach and modular architecture posed challenges related to the infrastructure required, and also the human capacity required for using, maintaining and evolving the systems. Institutionally, the challenges ranged from creating common standards to enable data flows into a common repository, limitations of human resources capacity, and systems of procurement for equipment and technical support. Donor driven technical support was another key challenge with respect to creating dependencies, which would impede the sustainability and scalability of systems. Most importantly, was the challenge of existing deeply embedded information practices in the institution which necessarily needed to be redefined in order to take on the new system and required style of work.

FPMU initiated an intervention in partnership with INGO to design and implement the FSNIS, within the context of a larger and long term technical support project of the UN FAO to the Ministry of Food, Bangladesh for broader capacity strengthening in the food security domain. . Early attempts to build FSNIS were through a global project coordinated by a technical group in FAO, Rome. After having waiting a few years for the project to deliver, FPMU not satisfied by the results, undertook a formal evaluation of this system.

The evaluation covered two broad areas. One, does the system have the capacity and existing functionalities to effectively support their existing needs? And, two, are the future plans for the development for this system with the needs of FPMU within the existing project framework. The evaluation recommended inadequate suitability of the global project with respect to both these questions, and that a new development effort should be initiated. The recommended platform was the open source DHIS2 which had found extensive use within the public health domain of multiple developing countries including Bangladesh. This choice had both advantages and disadvantages. The advantage was that this platform supported some of the key required data management functionalities, and was easily customizable to support new needs. Further, there was a global community behind this platform, including a well-supported group in Norway coordinating the core development, implying an active and free source of technical support. This platform was also being used successfully in the Ministry of Health in Bangladesh, providing confidence to FPMU that this system has been used in a similar context to theirs. To design, develop and implement this system in FPMU, through the broader FAO support agreement, INGO was selected who had been active for more than a decade in providing similar services in India and also for the mentioned health project in Bangladesh. The flip side to this choice was the use of a platform designed and developed for the health sector, in another domain where the informational requirements were different on at least 2 fronts. One, the health sector requires a Management Information System to aggregate data in a hierarchical structure of information flows, while the FSNIS was a policy support tool that needed to process horizontal information flows from multiple agencies at the national and global levels. Two, the nature of data was significantly different. While health data relates to statistical numbers requiring aggregation, FSNIS data involved a deep degree of different types of statistical analysis.

The novelty of the application raised two key challenges related to capacity. One, INGO who were unfamiliar to this domain relied fundamentally on FPMU users to participate and elicit their "requirements" in order to develop an appropriate design. Two, for INGO, the primary frame of reference was public health, and this required a great degree of unlearning and new learning of food security.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

152

The project was structured over 3 phases of 6, 4 and 3 months respectively carried out over a total period of about 3 years. The breaks in the middle were to facilitate closure of one set of activities, evaluate progress and provide time to complete contractual formalities to commence the next phase which necessarily needed to build on the earlier phase. Capacity strengthening and institutionalization were key elements of the project in all three phases by design.

The first phase, primarily involved two key elements. One, the design and development of a database capable of serving as an organizational data repository for FPMU with respect to both their historical data and future data needs. Two, all historical data in FPMU needed to be identified, and imported into the database being designed. The model adopted for capacity strengthening was through the vehicle of 6 workshops over the six month period, where in a meeting mode, INGO would provide short reports on progress, elicit feedback from the FPMU staff present in the meeting, and try to build on that feedback in their subsequent phase. While in design, these workshops sought to be participatory, they proved to be limited for two reasons. One, aspects related to data model and database design was technical in nature and rather alien topics for the FPMU staff to actively contribute towards. Two, the meetings were chaired by the Director General Food, FPMU and also the Chief Technical Officer of the FAO project, and usually it was their inputs which dominated proceedings, and in their presence the juniors were reluctant to voice their opinion. A plus side however, was that both these senior staff were visionaries and had strong mastery over the subject, and provided important and positive inputs at all times to move the process forward within the very tight deadlines of the project. This phase ended successfully in that the database was designed, legacy data was identified, catalogued and imported although needing subsequent corrections, and the first versions of two output reports were designed. Further, to support institutionalization, INGO started to develop various organizational resources, including a meta data dictionary which described all data elements now in the database with its definition including a description of the source, units of measurement, periodicity and other relevant details; and, two, organizational guidelines which tried to frame institutional norms on how data should be managed including a description of the different roles and responsibilities relating to data access, collection, security, back up and various others.

The second phase which ran over about four months had a shift in the capacity building approach. Rather than using the vehicle of workshops, there were one-to-one training sessions to the users to orient them to the overall system, teach them to use the existing functionalities, and elicit their feedback on the system. Some formalized and quantitative means of pre and post assessment were carried out to observe progress, which were limited given the very short time frame of this phase, and the small sample sizes (of about 10) involved. Nevertheless, this analysis was useful in identifying some areas of future analysis. This process was also hampered by the political environment in the country where there were significant hartals (strikes) which prevented the INGO team to be onsite and carry out face-to-face trainings. Improvising to this situation, they innovatively used the Skype to provide structured training sessions to users on the functionalities of the system. This of course had its limitations in shaping the effectiveness of capacity strengthening. One of the institutional outputs of this phase was the development of an organogram, which tried to detail what responsibilities individual FPMU users had towards the system, and their respective roles with respect to the system. For example, it implied for a user to understand which datasets he or she was responsible for, and the accountability for data updation and ensuring data quality.

The third phase of the project ran over 3 months, and it represented the closing phase. Activities in general were rushed and focused on closure and project deliverables. The work became necessarily dominated by technical considerations of releasing the final system and a web portal, which were seen as the flagship deliverables. Another key aspect to be dealt with was the question of "how does FPMU continue with the system once the NGO leaves at the end of the phase?" INGO also realized the limits of their existing capacity building approach where they had focused primarily on the use of the functionalities of the technological artefact, rather than

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

153

how it works as an information system? This implies how the users see the system to be supporting their everyday work, rather than being external to it and the institutional responsibilities they have towards the system. INGO then formulated a shift in the capacity building approach from the earlier technical one on how to use system functionalities to a clear focus on getting the users to understand their roles with respect to the system (defined in the organogram), what do these roles entail (as detailed in the organizational guidelines), and how the particular FSNIS functionalities can help them to fulfill their defined roles and responsibilities. This shift in focus coupled with the pressures on project closing, enabled users to take more direct responsibility of their datasets, update them, and some of the more proactive ones started to explore how the system could help them with their analysis and reports.

The project closed on largely a positive note, with INGO's work and outputs being widely appreciated and possibilities of continuation if a new project was initiated.

5. SOME REFLECTIONS ON CAPACITY STRENGTHENING: SOME CHALLENGES AND APPROACHES

5.1. Key challenges

Drawing from the empirical work, we discuss three key challenges experienced with respect to capacity strengthening. .

a. Challenge of conducting capacity strengthening when there were simultaneous processes ongoing of requirements, production, and use.

This project represents a particular case when there were three simultaneous processes ongoing. First, was the process of requirements analysis, which was underlined an attempt to facilitate participation from users in shaping design. Second, was the process of the actual production of the system which INGO was engaged with, and they kept releasing incremental versions of FSNIS for use trials and feedback from users as inputs to improve the system. Third was the actual use – where users continued to use the manual system to generate their routine reports whilst waiting for a "perfect" computerized system such that they can make the transition. There were two challenges here. One, users were extremely busy with their everyday tasks, and they did not want to experiment with an incomplete system which would add to their work load. Two, in the process of use of the manual system, they kept coming up with fresh requests. For example, in the last phase it had been agreed that there will be four rounds of revision of development of the routine reports, and by then we should reach a stage of final transition. In practice, more than 6 such rounds took place and the perfect system for the users still did not come. This led to a vicious cycle where users were reluctant to make the final transition, and the developers were frustrated with the constant changes requested, some of which were non-trivial.

Finally, it came to the head of FPMU to lay a strong mandate to his staff that we must make this transition to the computer based system as the contract with INGO was reaching an end date. The fear of this galvanized the users to rapidly update the databases they were responsible for, and start using the application in earnest. The learning from this process was that at some point it is important to cut off the support line to reduce user dependency, and for users to take ownership. Else, it may be likely that similar processes of users demanding for the perfect system would continue and with it the dependencies.

b. Challenge of capacity strengthening in an environment where the primary motivation for individuals to engage is extrinsic rather than intrinsic

Often staff in public sector organizations in LMICs have a permanent position, with well-defined paths of promotion based on years of service, and with limited incentives to engage in new initiatives such as computerization. The motivation for self-development is largely "extrinsic" in nature, for example for them to be sent abroad for conducting masters and doctoral

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

154

studies. The FAO project did have this component of capacity development inbuilt in its design, and various staff had got these opportunities which was attractive to them gave an opportunity to go abroad. From the perspective of enabling meaningful processes of participation in capacity strengthening, it was important for users to be "intrinsically" motivated where they have an inner desire to learn about the system, and proactively engage to do so. In the absence of such intrinsic motivation, capacity strengthening runs the dangers of being reduced to a mechanical exercise, and is only called upon when there is a mandate from the seniors to do so. Similarly, from the point of view of INGO, they needed to learn on their own more about the food security domain, and not just see their task as one of building a technological artefact. But constraints of project timelines and deliverables assumed this knowledge as pre-existing.

These issues of intrinsic versus extrinsic motivation are larger issues and out of control for the system developer to influence or change. Without attempting that, INGO sought to try to build a degree of intrinsic motivation amongst users by emphasizing how the system will help them in their everyday work. For this, they tried to inter-relate three aspects. First, what were user responsibilities with respect to the system, as formally defined in the organogram. Second, describing what user responsibilities in these roles as had been detailed in the organizational guidelines. Third, how the computerized application can with its inbuilt functionalities help them to execute these responsibilities better, for example ensuring improved quality of data for the datasets they were responsible.

In this way, intrinsic motivation was tried to be developed within the framework of their everyday work. As of now the system has been delivered, it would be the acid test for users in the intervening period (if there was a project continuation) to use the system and assess for themselves what is the value of the system for them. However, it is important during this process, someone to mentor and cultivate use, and to be able to reinforce the link between the system, the organizational resources being provided, and their work. The role of the mentor is crucial, to serve as a coach, and help to emphasize how this conceptual framework comprising of these linkages can be put to everyday practice.

c. Challenge of a participatory approach to capacity strengthening in an environment which is by design hierarchical in nature running contrary to the bottom up needs of a participatory approach

Often, the decision making style in public sector organizations is hierarchical and person dependent. These characteristics may run contrary to the needs of participation which is ideally built on mutual sharing, be driven bottom up, and involve a collaborative process. While this person dependent style may be a plus when the person on the top is a visionary, and is respected for his/her status and technical expertise, and people comply with the instructions. This was the case in this project. However, this configuration may run contrary to the needs of institutionalization and ownership of the capacity strengthening processes in the long run.

While again these characteristics and style of working represents larger conditions, which the system developer is not able to influence, however, they need to see how to leverage on the positives that such a condition offers and try to foster participation in capacity strengthening. The model of being bottom up and collaboratively driven may need to be duly adapted to fit into the prevalent institutional context.

After discussing in this section, some key challenges experienced with respect to participation in capacity strengthening, and some of the ways in which INGO tried to deal with them within the framework of the project, we discuss the approaches adopted and also possible to address the challenges.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

155

5.2 Approaches to deal with the challenges identified

In this section, we discuss approaches for dealing with the challenges identified, based on empirical experience and the benefit of hindsight.

1. Design for "unlearning" and mutual capacity building

Often the assumption in a capacity strengthening exercise is that the providers are the holders of expert knowledge and the users the passive end-recipients. However, as seen in this case, INGO were not equipped with adequate knowledge about the food security domain and had a dominant frame of reference of public health. This required INGO to unlearn health and learn food security. This required more time and space for both INGO and the users to mutually learn from each other, something not possible in the confines of project schedules, tight deadlines and requirements of producing deliverables. However, trying to push through with a participatory approach to capacity strengthening, in conditions which are not supportive can become a formidable challenge and an unreachable goal. A suggested intervention here would be to provide more space and time contractually in the project design phase to develop an environment for unlearning and mutual learning.

2. Strengthening processes of coaching and mentoring

Often when users go abroad for Masters and other courses, they come back to their home organization with knowledge, but this becomes alien in the environment they now encounter.

It becomes extremely important then to identify a "coach" or a "mentor" in the organization who understands the importance of capacity strengthening. They need to be able to dialogue with the users and understand what is the new knowledge they have now acquired, and be able to provide mentoring and coaching support to convert this knowledge into mental models which the organization is trying to support – for example a participatory approach towards capacity strengthening. Without this buffering role, it is likely there will be a clear gap between what the system developers seek to find, and what actually exists. It could be akin to "finding a needle which does not exist in the haystack."

3. Leveraging upon the opportunities the institutional environment provides

Key challenges to institutionalize participatory approaches for capacity strengthening exercises in such public sector organizations are manifold, and inherent to their historically existing styles of working. Broadly, a culture of such approaches remains limited, and the dominant style is of persons doing what they are being told to do so. The challenge for the system developers is to see how these conditions can be leveraged upon to initiate a different model of participation, rather than them as condemning it as being a futile exercise. For example, how a hierarchical style of decision-making can be spun to the advantage of helping to create spaces wherein users and developers can engage with meaningfully, and develop some bottom up processes. As many such spaces get created, and more users engage in such processes, there is the potential of such a style of work permeating everyday work practices in the organization. As noted earlier, such changes are complex and take years rather than months to introduce, typically not offered within the framework of a well-defined and finite project. Internal champions and mentors need to be created to take these processes forward.

6. CONCLUSIONS

This paper has reflected on the challenges and approaches in carrying out capacity strengthening exercises based on a participatory approach within the context of a modern ICT introduction project in a public sector setting of a LMIC. While the institutional environment provides some inherent challenges to carrying out such an exercise, there are also some opportunities and approaches which may work. The paper has identified three such approaches. By relating the institutional environment with individual level capacity strengthening needs, which goes beyond

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

156

traditional prescriptions of providing more training, the paper arguably makes a contribution to this important and neglected field of capacity strengthening in IT4D projects.

7. REFERENCES

Braa, J., Sahay, S., 2012, Integrated Health Information Architecture: Power to the Users : Design, Development, and Use Matrix Publishers

Chambers, R. 1997. Whose Reality Counts? Putting the first last Intermediate Technology: London.

FAO Executive Coaching Programme, CSH. Progress Report on Implementation of the Human Resources Strategic Framework and Action Plan 2012-13

Gevaert R., 2012 A sustainable model for ICT capacity building in developing countries 26th Large Installation System Administration Conference (LISA '12)

Heeks, R. 2006. Health information systems: Failure, success and improvisation. International Journal of Medical Informatics, 75(2), 125-137.

Latour, B. (1994). On technical mediation. Common Knowledge, 3(2), 29-64.

Morgan, P. 2006. The concept of capacity. Maastricht, The Netherlands: European Centre for Development Policy Management May.

Otoo, S., Agapitova, N. and Behrens, J. 2009 The Capacity Development Results Framework: A strategic and results-oriented approach to learning for capacity development. World Bank.

Potter, C., & Brough, R. 2004. Systemic capacity building: a hierarchy of needs. Health Policy and Planning, 19(5), 336-345.

Sahay, S., and Walsham, G. 1996. Social structure and managerial agency in India, Organization Studies, 18(3), 415-444.

Sen, A. 1999. Development as freedom. Oxford University Press: Oxford.

Taylor, P., Clarke, P. 2008 Capacity for a change IDS, Sussex, UK.

UNDP 2009, Capacity Development: A UNDP Primer UNDP:, New York.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

157

ICT4D RESEARCH AND SOCIAL NETWORK ANALYSIS

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Abstract: ICT4D is a complex socio-technical phenomenon. Repeated calls have been made for diversification in the theories, methodologies and methods used in this field. This paper investigates the potential of social network analysis (SNA) as an approach for ICT4D research. Very few studies in the field have used SNA to date which led us, in the first instance, to provide an overview of core SNA concepts, network research design considerations, and analytic approaches. Based on the distinct principles underpinning SNA, we then outline three arguments for the relevance thereof in ICT4D: i) it is conceptually relevant to ICT4D practice; ii) it is methodologically and epistemologically relevant to the present and future state of ICT4D research; and, iii) it is instrumentally relevant to the future ICT4D research agenda. The paper concludes with an illustrative example, demonstrating the network research design and a few SNA procedures utilised in exploring the relationship- and resource-orientations of an ICT4D champion. By introducing and illustrating SNA it is hoped that this overview would contribute towards the broadening and strengthening of ICT4D research.

Keywords: ICT4D Research, Social Network Analysis, SNA, Research Methodologies, ICT4D Champion

1. INTRODUCTION

Calls for diversification in the theoretical and methodological repertoires of ICT4D researchers are commonplace (Walsham and Sahay, 2006; Heeks, 2008; Weber, 2009; Andersson and Hatakka, 2013; Gomez and Day, 2013). These authors argue that employing information and communication technology for the purpose of supporting socio-economic development (ICT4D) is by its very nature a complex endeavour. And ICT4D researchers therefore need to utilise an assortment of perspectives and tools to adequately engage with this complexity.

This diversity and complexity of ICT4D can be illustrated by drawing attention to its socio-technical nature. Like water is to plumbing, so is information - with its various formats, processes, flows and timings - at the core of ICT4D (Davenport, 2000). Following an onion ring analogy, the next layer would consist of the 'harder' technological aspects – hardware, software, networks, etc. Wrapped around the information core and hard inner layer would be the 'softer' social aspects – people, culture, politics, etc. All these elements, both hard and soft, need to be balanced and in their rightful place for any chance of succeeding with ICT4D initiatives. It is this complex and hybrid socio-technical nature of ICT4D that signals the need for diverse, multidisciplinary research approaches.

While in agreement with these calls, it is beyond the scope of this paper to analyse and synthesise the details and merits thereof; suffice to highlight the largely agreed-upon notion that ICT4D research would benefit from, and is indeed in need of diversifying the theories and methodologies we use. In response to these calls, the aim of this paper is to introduce social network analysis (SNA) as a theoretical and methodological approach for researching ICT4D.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

158

SNA is currently a 'hot topic' in the social sciences as is evidenced by the exponential growth in published articles, which have more than tripled since the turn of the millennium (Borgatti et al., 2009). Social science in general, and sociology in particular, is one of the cognate disciplines of ICT4D (Heeks and Molla, 2009) and therefore a promising pond to fish from in our search for usable theories and methodologies. It is indeed the intention of this paper to demonstrate the potential usefulness of SNA to investigate ICT4D topics, including those which have been identified as future research priorities.

It is acknowledged that SNA has been used in ICT4D research on the odd occasion (Gryc, 2009; Bailey and Ngwenyama, 2010; Baron and Gomez, 2012; Taylor, 2012; Siribaddana, 2014) but, as will be argued in the paper, the potential of SNA is still largely untapped. Hardly any cross-referencing has taken place between those ICT4D papers that apply it and any substantive building of knowledge or accumulation of experience is thus so far absent. Additionally, it is common practice in the few SNA ICT4D studies to only provide a partial overview of the basic concepts, theories and analytical approaches in SNA. This is understandable since these studies aimed at using SNA to help answer specific research questions and not at exploring the potential of SNA in the wider ICT4D arena, which is intended in this paper. We therefore perceive both a gap and need to further explore the theoretical, methodological and practical potential of SNA in ICT4D research, and here we would like to offer a more substantial introduction.

The paper is structured in three main parts. In the first two sections we offer an overview of SNA – the rationale behind studying social networks, its basic tenets, different research designs, analytic goals, and reflections on theory building and use – and argue for the potential usefulness thereof in ICT4D research, based on four core ideas that differentiate SNA. Building on these initial parts, an illustrative example of the fruitful use of SNA in ICT4D research (in this case, a study of ICT4D champions) follows, before concluding with a summary and recommendations.

2. OVERVIEW OF SOCIAL NETWORK ANALYSIS

The basic notion behind studying social networks[1] is that much of culture and nature is structured as networks. This networked configuration leads to two hypothetical views underlying social network research (Borgatti et al., 2009). Firstly, the notion that the position of an actor in a network has a bearing on the constraints and opportunities they are likely to encounter; hence studying the network topology enables one to predict potential behaviours, assumptions and outcomes for the actor. Secondly, the notion that individual behaviour has an influence on the underlying structure of network connections between group members. Social networks therefore shape behaviour, but networks are also shaped by individual behaviours. But what are the basic concepts of social networks? How can these networks be researched? How can social network data be analysed? What are the core social network research ideas? These questions will now be attended to in the same sequence.

2.1. Core Constructs of Social Networks

In order to conceptualise such networks, the two basic constructs - *nodes* and *ties* - will be explained (see Figure 1).

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[1] The term was coined by John Barnes in 1954.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

159
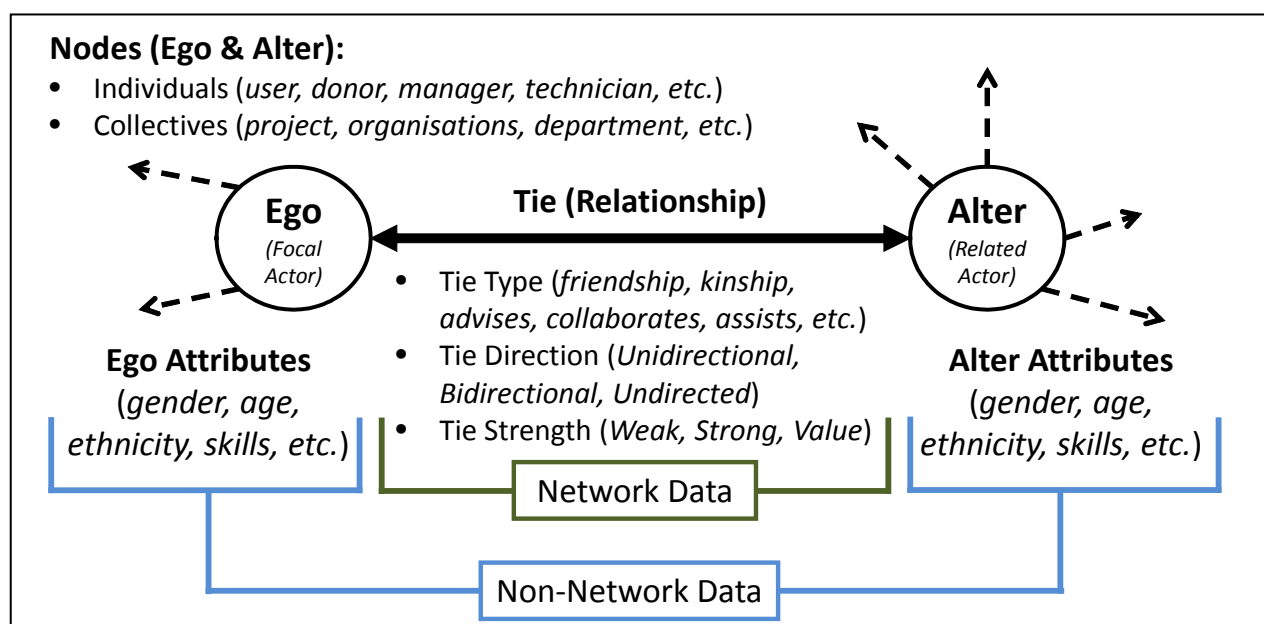
Figure 1. Key Constructs of Social Networks (Source: Authors)

Viewing networks from a social science perspective, *nodes* are normally individual people or collectives as per the examples in Figure 1. Both nodes and ties have characteristics known as *attributes*; node attributes are *non-networked data*, while the attributes associated with ties form part of *network data*.

Of particular interest is the types of relationships – this is determined by the type of network one is interested in studying. Borgatti et al. (2013) offer a useful taxonomy of relationship types between individuals, presented in Table 1.

Relationship States							Relationship Events	
Similarities			Roles		Cognition		Interactions	Flows
Location	*Participation*	*Attribute*	*Kinship*	*Other*	*Affective*	*Perceptual*		
Same place	Same team, club, event	Same gender, skills, attitude	Mother of, sibling of	Friend of, boss of	Likes, loves, hates	Knows, knows of, sees as happy	Sold to, talked to, assisted	Information, beliefs, money

Table 1. Taxonomy of Types of Ties (Source: Adapted from Borgatti et al., 2013:4)

In this taxonomy, *relationship states* refer to the enduring nature of ties – not that these types of relationships will never end, but they are persistent over a period of time: people stay in the same place or participate in the same project for a while. *Events* can also constitute a relationship; it can either be based on interactions that occurred, or flows of things like information and money. Accurately identifying and understanding the relationships of interest are key considerations in designing a SNA study – the taxonomy in Table 1 would be of help with this task.

Both network and non-network data are needed for analysis. The types of data required are determined by the phenomenon of interest. To illustrate, in one of the few ICT4D SNA studies, Taylor (2012) was interested in the professional networks among Internet café owners in Ghana, as well as with IT firm managers locally and abroad, and how international mobility of these actors may contribute to lowering barriers to Internet penetration. The nodes were people – owners of Internet cafés – and attribute data such as demographic information, socio-economic status, international exposure and work history were collected. To construct this network, data were collected about professional contacts that provide the café owners with 'advice on' or who they 'talk to' about technology problems, innovative ideas, finances and investment or new jobs (Taxonomy: *relationship event > interactions*). Combining this data provided the 'professional

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

160

network' ties that formed the basis of analysis. It also yielded tie attribute data such as tie strength and direction.

2.2.   Designing Network Research

The phenomenon of interest would also play a determining role in the research design. There are essentially two different approaches: whole networks and personal networks (Borgatti et al., 2013). In whole networks, the study proceeds from the premise that all nodes in the network are known and the set of nodes has clear boundaries. Staff in an NGO, members of a society or of a project team are examples of such bounded sets. The network researcher would aim at collecting data from all nodes, or use an appropriate sampling strategy to identify participants. Data would be collected using a questionnaire that can be completed during a face-to-face interview, self-administered or even electronically and online[2]. Siribaddana (2014), for example, followed a whole network design when studying the interactions between online distance learning participants in District Health Information Systems training programmes; all interactions amongst participants fed into the construction and analysis of the network.

In personal networks, also known as egonets, the study would commence with any number of *egos*, also called 'index nodes', who will be asked to nominate relevant *alters* whom they relate to in a specified way. The result will be a collection of ego networks that can be analysed. In this instance, the links *between* egos, if any, are not of interest; the ego networks will be individually analysed and compared with the others. Three of the referenced ICT4D SNA studies (Bailey and Ngwenyama, 2010; Taylor, 2012; Baron and Gomez, 2012), used a personal network approach, but additionally aimed at a network-level analysis – they were interested in tie structure between egos. This can be accomplished through an alternative approach, beginning with a single focal ego and developing the network through a snowball-type sampling procedure – the first ego will nominate a number of alters, who will in turn be interviewed and asked for more nominations (Uehara, 1994). This approach would yield a network of connected egos which enables a number of additional techniques usually only used in whole-network designs (e.g. cohesive subgroups). This approach was followed in the demonstrative example later in the paper. A variety of this approach would use other types of non-purposive sampling to identity egos; this approach was followed by Taylor (2012) and Bailey and Ngwenyama (2010) in their ICT4D SNA studies.

The types of ties can essentially be the same in both approaches, but careful observation would reveal that the whole-network approach not only includes data about existing ties, but also absent ties; egonets only have information about existing ties. The implication is that whole-network designs benefit from a larger set of SNA techniques, but it should be noted that the potential cost (to researcher and participants) rises exponentially with increase in network size – more nodes mean more interviews as well as more data items per interview (ideally each participant should comment on the relationships between all other nodes). Personal-network designs, on the other hand, do not have this problem with escalating cost and also have the advantage of yielding rich contextual insights around the ego. In sum, the research design depends in part on the phenomenon of interest, but as a general rule of thumb, a whole-network design would be followed if the network boundaries are clear; otherwise a personal-network design would be required.

2.3.   Analysing Social Networks

Analysis can commence with any amount of data, but would mostly proceed in all earnestness once data collection is completed. The goal of analysing social networks can fit in one of two categories: applied vs. basic. Firstly, in applied analysis, the research might be aimed at solving a problem or answering a question which can be directly implemented in practice. At the time of

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[2] Borgatti et al. (2013) cover the various strategies and techniques in their Chapter 4.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

161

writing, the Ebola crisis in Western Africa was an issue of global concern. An applied analysis could be used to identify good places to resource disaster interventions with the hope that the impact of such resources would be optimally diffused through the personal networks of those intervention hubs. Applied analysis can, on the one hand, also seek to describe the structure of the network, or on the other, to describe individual nodes and their positions in the network (as in the Ebola example) using SNA measures.

Secondly, a basic analysis can be followed where the aim is primarily explanatory. Basic analysis can, on the one hand, use network measures (as explanatory variables) to explain an outcome of interest. Such an approach would, for example, seek network-based explanations for the success of one telecentre and the failure of another. On the other hand, network measures could be used as outcome variables which one would try to explain with non-network variables. For example, one would seek to explain the connectedness of an influential individual (such as an ICT4D project champion), in terms of their personality traits or work history. In its most rigorous form, this type of analysis could lead to theory building. Continuing with the example above and using network measures as outcome, a network theory of ICT4D champion success could be developed.

Analysis can also be classified in terms of the level on which it takes place. Node-level analyses seek to answer questions about individual nodes in the network. For example, 'do users with more friends tend to adopt mobile money applications more readily?'. Users will therefore be the focus of analysis against the backdrop of network characteristics. Network-level analysis seeks to answer questions such as 'do well-connected networks tend to mobilise more effectively against social injustices?'. At this level, the characteristics of the networks are analysed in order to predict behaviour. A third and intermediate level of analysis takes place at the dyad level; here the pairwise relationships between nodes are studied in order to answer question such as 'Are individuals with strong family ties more likely to engage in ICT micro-enterprise with each other compared to those with weak or no ties?'.

A vast amount of mathematical techniques and procedures are available to analyse social networks; introducing all in the short space of this paper would be impossible. Only a few of the more common metrics that would be of initial interest to ICT4D research are summarised in Table   2.

Bonding and Bridging. Bonding refers to the strength of ties. For example, the ties between friends or family members are stronger than between acquaintances. Bridging signifies ties with diverse others. Studying social networks from a social capital perspective has long been known for the strong tie / weak tie debate (Granovetter, 1983).

Density. This is a simple measure of cohesion in a network – the total number of ties divided by the total possible number of ties. The measure is useful and commonly used in the process of identifying clusters in a network, and subsequently comparing the connectedness within and between clusters.

Clusters. These refer to groups of nodes in a network that are highly connected and/or similar. Different types of clustering analysis (usually based on density and links per node) can be used to identify such cohesive groups. This is important from the perspective of understanding and predicting individual and group behaviour. It is also important to identify nodes that function as bridges between clusters as this may enable access to more resources.

Core and Periphery. This points to the structure of a network and such an analysis enables the identification of those who are highly connected and central to the network, and those who are loosely connected or unconnected (Borgatti and Everett, 2000). Core/periphery could be used, for example, when analysing power relations.

Bridging and Centrality. Centrality is a measure of position in the network and is related to the amount of times a particular node would have to be included as a connection between any other two nodes in the network. It is therefore the extent to which a node acts as a mediator or bridge and therefore controls the

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

162

information in a network (Haythornthwaite, 1996). Finding bridgers is an important activity in several applications of network research such as in leadership networks (Hoppe and Reinelt, 2010).

Structural Equivalence. This is a positional approach to analysing social networks. Two actors are said to be structurally equivalent if they send/receive ties to/from the same third parties. The theoretical reason for doing this analysis is that structurally-equivalent actors could have similar attitudes and behaviours, as is evidenced by much empirical evidence (Borgatti et al., 2013: 207).

Homophily and Heterophily. As with structural equivalence, these concepts also relate to the similarity of nodes in a network, but based on node attributes and the social process by which actors choose whom they relate to. Homophily is a measure of the similarity of nodes, while heterophily is the opposite, pointing to the degree of dissimilarity (McPherson et al., 2001).

Table 2. Common Metrics Used in SNA

2.4. Core Principles Driving Social Network Research

A good question to ask when exploring a new research approach, such as SNA, would be 'What makes this approach distinct?'. There are four core principles that one can find in practically all social network research; these principles are central theoretical ideas (Kilduff et al., 2006; Balkundi and Kilduff, 2006). We will briefly introduce these here and then proceed to outline the potential overlaps with ICT4D research focus and directions in the section following.

Firstly, the *primacy of relationships*. This is the most common notion in network research and states that individuals are not defined by their attributes only, but also by their relationships. "Studying such relationships is therefore the study of human nature itself" (Balkundi and Kilduff, 2006: 420).

Secondly, the *ubiquity of embeddedness*. The underpinning principle of embeddedness is that people (as individuals) or collectives (such as organisations) naturally tend to build relationships with similar others and not with complete strangers; hence the earlier introduction of homophily as an important SNA metric. Cluster formation is a primary outcome of this theoretical notion.

Thirdly, the *social utility* of network connections. This principle is based on the belief that network ties have value – social capital (Burt, 2000). The arrangement of a person's social connections provides access to value that the individual can decide to extract. Two immediate network implications are apparent. First, there is a correlation between a person's access to resources, the attributes of those they relate to, and the structure of their network connections. The study of social capital can thereby be made more tangible through SNA. Second, this principle draws attention to the relationship-building activities within and outside the group – the building and maintaining of social capital. Changes in the network over time can be studied in order to understand these activities, and subsequently predict or manipulate them for favourable outcomes.

Finally, the *structural patterning of social life*. Social life is complex and difficult to study. The structural patterning principle posits that patterns exist in underlying networks, which can be used to analyse and explain social life. The structural characteristics of how people are connected are therefore important to study. For example, these structures can indicate the leaders or change agents in a network (Balkundi and Kilduff, 2006).

3. SNA AND ICT4D RESEARCH

Having explored the distinct principles that underpin SNA we will, in this section, argue that it has a particular relevance within the field of ICT4D research:

    - a conceptual relevance to the nature of ICT4D practice;

    - a methodological and epistemological relevance to the present and future state of ICT4D research; and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

163

- an instrumental relevance to the future ICT4D research agenda.

We turn first to examine the resonance of SNA principles with ICT4D practice:

Primacy of relationships: human relationships are universal and foundational to all human behaviour. Hence, of course, they are a foundational factor impacting ICT4D initiatives. Yet the conventional frameworks used for ICT4D analysis (e.g. Heeks and Molla, 2009) offer no means to measure nor insights into those relationships. Thus, while "*there is no shortage of ICTD research that demonstrates the importance of human relationships and connections to successful technological endeavor*" (Sambasivan and Smyth, 2010), very little published work has been able to analyse those relationships (Gomez, 2013). SNA will be able to offer insights into questions such as:

- What relationships matter in ICT4D initiatives?

- What is the nature of the relationships that matter in ICT4D initiatives?

Ubiquity of embeddedness: homophilous groups abound in ICT4D – the small Cambridge-based team that created the M-Pesa mobile money system (Morawczynski, 2009); the group of classmates that created India's second-largest IT company, Infosys (Barney, 2010). Conversely, heterophilous groups are seen to undermine performance (e.g. Heeks et al., 2001). Reversing the directionality of relationship, we also have evidence that ICTs can help strengthen groups with common interests such as indigenous tribal groups or diasporic communities (Landzelius, 2006). SNA can thus help our understanding of two types of question:

- How does the embeddedness of groups affect ICT4D initiatives?

- How do ICT4D initiatives impact group embeddedness?

Social capital: just like the fact of human relationships, interaction and exchange within those relationships are foundational to all human life including the fraction labelled "ICT4D". Looked at specifically from the perspective of social capital, we know that social capital is a key mobilising factor in ICT4D projects (Alkalimat and Williams, 2001); and, vice versa, that ICT4D applications have impacts – generally argued as positive – on social capital (e.g. Goodman, 2005). However, work on social capital remains very limited within ICT4D – particularly considering the "*abundance of research ... in fields such as sociology and economics*" (Thapa et al., 2012: 9); and such work as exists has often lacked a clear and operationalisable conceptualisation of social capital. Social network analysis offers this, enabling a response to questions such as:

- How does the nature and mobilisation of social capital impact ICT4D initiatives?

- What effect do ICT4D initiatives have on the formation and maintenance of social capital?

Structural patterning: the particular structural patterns that networks adopt can be viewed in various ways. For example, one approach would be to identify key nodes with a particular number or strength of ties. Interpreted in terms of individuals, we can then recognise the importance of nodal actors within ICT4D projects; for example in bridging between a local and a global cluster (Heeks et al., 2001; Andrade and Urquhart, 2008). As in the other cases, one can explore the reverse relation – ICT4D impact on structural patterns – but here we restrict ourselves to summarising possible questions about the relation from pattern to ICT which SNA can help address:

- What overall network patterns are associated with different ICT4D initiative outcomes?

- What particular key node patterns are associated with different ICT4D initiative outcomes?

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

164

Despite the central role of these social network principles in ICT4D practice, the only network-related conceptual frame found in reviewing ICT4D journal-published research was actor-network theory (Andersson and Hatakka, 2013); and even that, found in only 10 of 469 papers reviewed. Given ANT does not address all the principles – indeed, takes an entirely different worldview on networks – this leaves a large conceptual hole for network-oriented ICT4D research that SNA could help fill.

As well as the conceptual insights it offers, SNA has a methodological value for ICT4D research. There have been concerns expressed (e.g. Johanson, 2010; Heeks, 2014a) about the lack of methodological rigour within this field, and SNA brings such rigour. The lack of quantitative methods within ICT4D research and the poor quality of qualitative methods has also been noted (Weber, 2009; Gomez, 2013).

We see SNA application could help answer these shortcomings as part of a potential growth in the use of "qualitative metrics" in ICT4D research; that is, the application of quantitative measures and analytical methods to variables traditionally the subject of purely qualitative approaches. Examples include the use of Q-sort methodology to investigate motivations behind mobile phone use in post-conflict contexts (Best et al., 2010), the use of qualitative comparative analysis to study the relation between international mobility and ICT diffusion in Africa (Taylor, 2012), and the use of comparative text analysis to research the fit between current ICT4D policy/practice and the post-2015 development agenda (Heeks, 2014b). Growth in ICT4D's use of qualitative metrics is likely to be spurred by increasing scope of ICT4D-relevant datasets (to cover "qualitative" variables) and by the growing availability of qualitative analysis software.

Qualitative metrics techniques like SNA have a particular epistemological relevance to the future of ICT4D research because of their consistency with critical realism. Critical realism is a research philosophy increasingly used in cognate disciplines of ICT4D such as information systems (Mingers et al., 2013). A "middle way" between positivism and interpretivism, it posits the real generative mechanisms of the world are subject to value-laden observation. Yet, while its relevance to this field has been recognised for some time (Smith, 2005), critical realism has barely been used as a philosophical underpinning for published research on ICT4D (Gomez, 2013).

SNA is one (among other) approaches that can help address this lacuna by operationalising critical realism. Taking social networks as the generative mechanisms that cause outcomes – such as ICT innovation, ICT adoption and ICT impact in the global South - SNA provides the means to readily capture the empirical experiences of those networks; inherently triangulating evidence sources – a key requirement of critical realism. It can thus help understand ICT4D from a critical realist perspective.

As well as having a methodological and epistemological relevance to the future of development informatics as a sub-discipline, social network analysis also has an instrumental relevance to knowledge gaps that have been identified as priorities for future ICT4D research. For example, significantly-more research is required on the relation between ICTs and development management (Heeks, 2014a); covering issues such as use of digital technology to support multi-partner actions, and the dyadic relation between ICTs and leadership. Constituting clusters, interactions and nodes, these topics are ideally suited to SNA-based analysis. Likewise, in terms of unit of analysis, it has been argued that much more work is needed to help understand the role of the individual, family and group in ICT4D (Walsham and Sahay, 2006; Gomez, 2013). As discussed above, social network analysis is perfectly placed to carry this agenda forward.

Section 4 provides an illustration of SNA application to address exactly these gaps; showing how it can help better understand the role of individual champions in ICT4D initiatives.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

165

4. ILLUSTRATIVE EXAMPLE: ICT4D CHAMPIONS

An ICT4D champion is "*any individual who makes a decisive contribution to the ICT4D project by actively and enthusiastically promoting its progress through critical stages in order to mobilise resources and/or active support and cooperation from project stakeholders*" (Renken and Heeks, 2013: 129). To date, little empirical work has been done around these important individuals. This prompted a study to explore how an ICT4D champion, from a rural South African village, used her relationships to obtain resources in order to contribute to the success of a local broadband connectivity initiative.

The initiative was launched in 2009 by a parastatal organisation aiming to provide affordable broadband connectivity to a number of rural, underserviced communities, of which the focal community for the case study forms a part. Low-cost, locally supported wireless mesh network infrastructure is used and aims to support socio-economic development and create commercial opportunities. Poverty is widespread and social problems such as substance abuse, unemployment and crime are commonplace. It is within this context that the presence of one or more local, inspirational change agents – ICT4D champions – can potentially make or break the success of the initiative.

Relatively little is known about ICT4D champions. However, three orientations – towards results, relationships and resources – cut across the literature on champions of IS innovations (Renken and Heeks, 2014) and led to the following questions that seemed appropriate to explore in the context of this broadband connectivity initiative, using SNA: 1) *Who are ICT4D champions?;* and 2) *Who do ICT4D champions relate to and draw resources from?*

SNA was utilised, as part of a larger mixed-method design, to explore these questions and will now be used to illustrate how the concepts in Section 2 can be applied to address some of the ICT4D gaps outlined in Section 3.

Returning to the two questions, observe the parallels with the basic notions behind studying social networks: that one's position in the network has a bearing on the resources one can access, and that individuals' behaviour is inseparable from the networks in which they are embedded. The aim was therefore to explore and describe an ICT4D champion from a network perspective.

Furthermore, it is important to note that all four of the core principles driving social network research are visible in this case. The *primacy of relationships* is acknowledged because both individual and network characteristics of the ICT4D champion were studied – not just the individual characteristics that would otherwise be the sole focus. Studying the champion within the force-field of her relationships enables comparison with other stakeholders in the initiative – similarities and differences (homophily and heterophily) – thereby adhering to the *ubiquity of embeddedness* principle. Theoretically, the research was underpinned by social capital theory. The fundamental principle behind social capital is that value can be derived from the relationships between people, which can be used for various purposes if and when needed. It essentially relies on the "*goodwill*" of people towards each other (Portes, 1998:18). Social capital fundamentally differs from other forms of capital, such as human or physical capital, in that it "*resides in the fabric of relationships between individuals and in individuals' connections with their communities*" (Wasko and Faraj, 2005:38). One can readily recognise the relevance of social capital to champions; it holds the potential to describe and explain how they manage to mobilise people and resources to advance initiatives, and it thereby focuses on the principle of *social utility* of network connections. The *structural patterning of social life* principle is also studied in the example case and will be demonstrated with a comparative analysis between the actual structure of the network, and how the ICT4D champion perceives the network, thereby revealing more about the workings of the underlying social networks. All four principles are therefore present and will be demonstrated in the analysis; but first the research design will be outlined.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

166

4.1. Research Design

A personal-network design was followed (McCallister and Fischer, 1978), with stakeholders in the initiative (individuals) as nodes. The reason for following this approach, as opposed to a whole-network design, is that the boundaries of the stakeholder network were not clearly identifiable (Heath et al., 2009). The unit of analysis in the study was individual people, beginning with the champion, and not the larger local broadband connectivity initiative. Mandisa[3], the ICT4D champion[4], is part of a tiny group (six people) of official stakeholders participating in the initiative, that was too small for any meaningful network analysis on its own. Besides, initial interviews revealed that the champion relied on numerous people that are not officially involved with the initiative. It was therefore decided to follow a snowball approach, beginning with the champion as index node to enable identification of both official <u>and</u> unofficial stakeholders (Uehara, 1994).

A single network question was used for collecting relationship data: *Who did you rely on for assistance to obtain resources needed for the ICT4D initiative?* Face-to-face interviews were conducted using a semi-structured survey. The approach followed when using a name generator survey, as in this case, is to develop a list of names – people who assisted – that can subsequently be used to discuss the nominees and the ties between them (Borgatti et al., 2013:263; Heath et al., 2009). Network and non-network attributes were collected during the interview. For the nodes, attribute data included gender, age, ethnicity, level of formal education, and ICT skills level. Analytically these would be used to compare and contrast the ICT4D champion and other stakeholders. Network attributes included the relationship type (family, friend, colleague), relationship duration, the direction of the flow of assistance, and the types of resources that were exchanged. These tie attributes would be used to derive tie strengths, which were subsequently used in analysis.

4.2. Analysis

An applied analysis approach was followed, as opposed to basic analysis; the main aim was to explore the relationship and resource orientation of the champion in order to describe the individual. Additionally, analyses were primarily on the dyad level – exploring the characteristics of pairwise relationships in the network as well as exploring the network as a whole.

A sociogram, or network graph of the combined ego networks of all the relevant stakeholders is presented in Figure 2. Four explanations are offered to assist with interpreting the network diagram: i) this is a directed graph – arrow heads point to the recipients of assistance; ii) ties are weighted – the thickness of the line is an indication of tie strength; iii) size of nodes is proportionate to their social capital – that is the sum of the weights of all incoming ties; and, iv) the layout of the graph is not significant – nodes are positioned for clarity of presentation only.

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[3] 'Mandisa' is a pseudonym that will be used to refer to the ICT4D champion.
[4] The champion was identified through multiple peer nominations, verification interviews, and adherence to a list of criteria originating from the definition.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

167
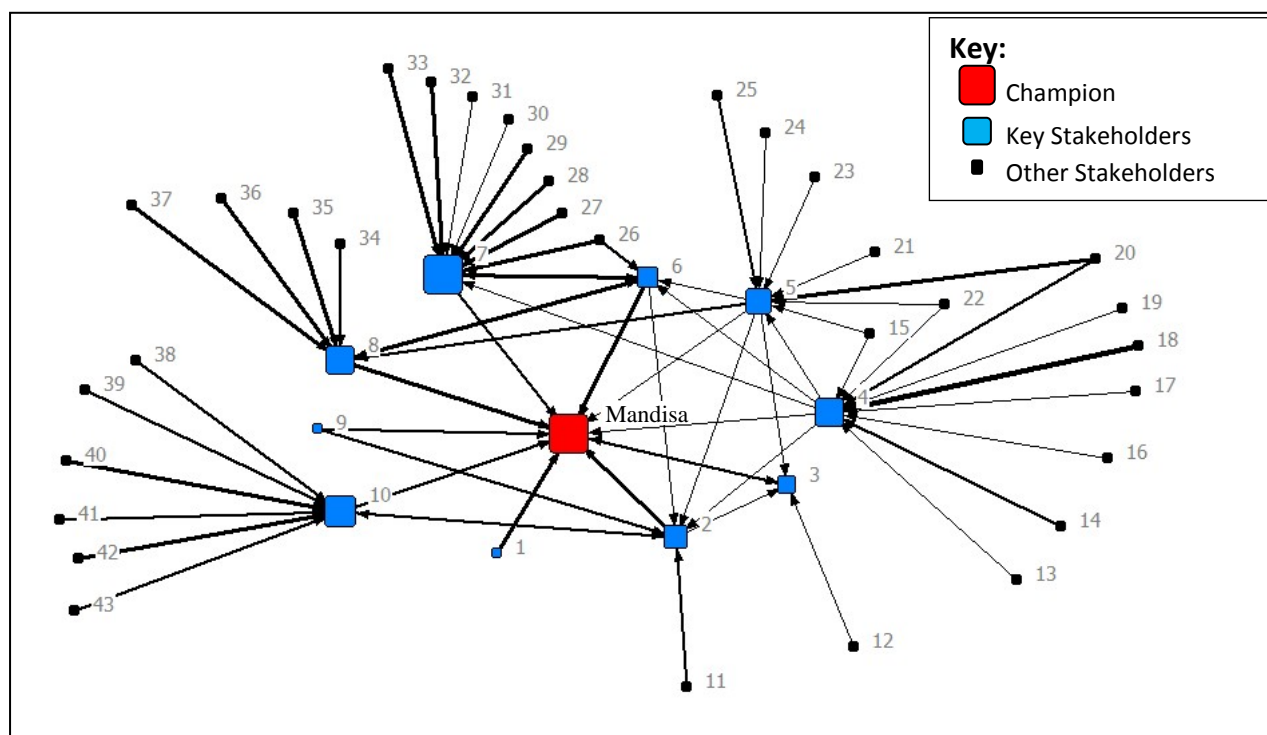
Figure 2. Combined Network Diagram for the Village Broadband Initiative[5]

A cursory glance at the diagram already reveals a few interesting things about how the ICT4D champion, Mandisa, compares to other key stakeholders. One can see that Mandisa is the biggest node in the network pointing to the fact that she has a larger store of social capital than all the other stakeholders. It is also apparent that some nodes are more connected than others; Mandisa is relatively well connected, although less so than 4, 5, and 7 – stronger average tie strength explains her larger store of social capital. The debate in the social sciences about whether fewer strong ties or more weak ties are better, has been ongoing for a long time (Granovetter, 1983) and is clearly relevant to this ICT4D situation. It seems as if Mandisa has struck a balance between stronger ties that give her more secure access to resources (with 1, 2, 6, 8), but require more maintenance, and weaker ties that broaden her access to a diversity of resources, less securely, but with low maintenance. This initial observation needs further exploration from the qualitative data.

Analysis 1. Homophily is a measure of ego-alter similarity based on node attributes. In this case, the analysis aimed at revealing the similarity of the ICT4D champion with other stakeholders. A commonly-used measure, the E-I Index (External-Internal Index), was used for this purpose. The procedure would start by grouping nodes according to a particular attribute – ethnicity for example. Individual level E-I Index values are then calculated for each ego on the basis of their ties with those in other groups (e.g. different ethnicity, hence *External*) and ties with those similar to them (e.g. same ethnicity, hence *Internal*). The E-I value ranges between +1 and -1 with a positive value indicating more ties outside ego's group (heterophily), and a negative value indicating more ties within ego's own group (homophily). Table 3 presents the individual E-I Index values for three node-level attributes.

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[5] The network diagram was created with the free software NetDraw 2.131

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

168

	Gender	**Age**	**ICT Skills**
Mandisa	0.600	0.200	0.400
1	-1.000	1.000	1.000
2	-0.500	0.500	0.250
3	0.500	1.000	0.000
4	-0.429	0.571	0.143
5	-0.538	0.385	0.385
6	-0.714	-0.143	-0.143
7	-0.636	-0.636	-0.455
8	-0.714	-0.714	-0.143
9	0.000	0.000	0.000
10	-0.750	-0.500	0.500

<- ICT4D Champion

Table 3. Individual E-I Index[6]

Mandisa's characteristics – who she is – can be explored by interpreting her individual E-I value for each attribute, and also comparing her score with those of the others for the same attribute. Three things are worth pointing out. In terms of gender, Mandisa has a rather high positive score indicating a willingness to engage with male stakeholders[7]. The literature is rather clear that gender homophily is not such a strong tendency (compared to ethnicity, for example) in the workplace (McPherson et al., 2001). Interestingly, however, she has the highest positive score compared to others, with only one other person (3) with similar gender heterophily. In terms of age, Mandisa has a rather balanced network with similar amounts of ties within her own and with other age groups. Setting aside outlier 9, only one other person (6) has similar relatively balanced approach on age, which may be suggestive that Mandisa, as champion, has a particular approach in dealing with age in her network. Finally, Mandisa's own perception about her ICT skills align with what alters reported – she has 'Good' ICT skills[8]. However, her pivotal role in the village broadband connectivity initiative requires access to 'Very Good' skills. The rather high, positive E-I value (0.4) on her ICT skills indicates that she definitely relates to those with different skill levels – particularly those with 'Very Good' ICT skills (6, 7, 8). This is a clear indication that she compensates for her lack of skills by relating to those with better skills.

Analysis 2. Next, the ICT4D champion was explored from the perspective of the structural shape of the network. This analysis is different from homophily as it is based on an ego's tie structure as opposed to node attributes. Structural equivalence was introduced, in Table 2, as a metric that analyses the similarity of tie patterns between an ego and their alters. It is based on the notion that similar social environments provoke similar behavioural responses. Structural blockmodels provide the mechanism to search for groups (blocks or clusters) of alters that are similar in terms of who they relate to and how, and by implication, points to similar attitudes and behaviours. For ICT4D champions, this could provide a tangible empirical base to explore attitudinal and behavioural similarities and differences with other stakeholder in the initiative. In UCINet the 'Structural Equivalence Blockmodel' procedure is used with the combined network as input. The number of blocks to look for can be decided upon, beginning with two (which would simply lump all actors in one of two groups based on structural equivalence). Having

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[6] Analysis was done with UCINet 6.475

[7] Care should be taken when interpreting these results since the values are not normalised for groups of different sizes as in this network (37 male, 7 female).

[8] The ICT4D champion rated her own ICT skills level as part of the personal attribute data collected with the SNA survey. Participants also had the opportunity to provide perceived attribute data, including ICT skills level, about the alters they have nominated during the interviews. Hence the ability to compare their perceptions about the champion's ICT skills, with her own.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

169

tried two, three and four groups, it was found that three groups yielded an interesting and potentially useful clustering[9]. The result for this is presented in Table 4.

Block Assignments (R-square = 0.230):

First Block: *Mandisa*; 2; 6; 7; 8.

Second Block: 1; 3; 9; 10; 11 - 43

Third Block: 4; 5.

Table 4. Structural Equivalence Blockmodel with Three Blocks

The structural block analysis revealed an interesting pattern that corresponds to underlying formal organisational structures. The focal ego and ICT4D champion, Mandisa, is one of six official stakeholders included in the network; four of them are responsible for operating similar initiatives, although in different villages. The First Block consisted of these four individuals (Mandisa, 6, 7, 8) together with one other individual - the ICT4D Champion's husband (a partner in the business), 2. These individuals were identified as being structurally equivalent (the tie patterns and the people whom they relate to are similar). Two individuals have responsibilities that cut across operations in different villages: the project coordinator (4) and project support operator (5) and the analysis grouped them together as another structurally equivalent group (Third Block). Together, the First and Third Blocks are formal stakeholders in the larger initiative (with the exception of ego 2). All the remaining people in the network were grouped together by the analysis into the Second Block - this is interesting because they are all external stakeholders. In sum, findings from this analysis support the notion that the formal hierarchical organisational structure influences the underlying social network: actors on the same hierarchical level have similar structural patterns in their goal-oriented social capital relations (structural equivalence) in this ICT4D initiative. This finding is interesting because it deviates from other organisational SNA research about the correlation between organisational structures and underlying social networks. It is often found that the structure of the social network is less hierarchical than the formal organisational network (Cross et al., 2002). This anomaly might relate to the national or sectoral setting of this particular ICT4D initiative, and needs to be further explored in the qualitative case data.

Analysis 3. The final analysis is known as cognitive social structures (CSS) in which the correlation between an individual's perception of a network and the actual network structure is explored (Krackhardt, 1987). This is important because Krachardt (1987), for example, found that managers who had more accurate perceptions about the network were more powerful in the organisation. Mandisa was also asked about perceived ties between alters which enabled a simple CSS analysis on her egonet and is demonstrated in Figure 3.

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[9] This judgement was based on: i) the value of R-square, which was much higher for three groups than for two or four groups; and, ii) the researchers' familiarity and in-depth knowledge of the case and context.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

170
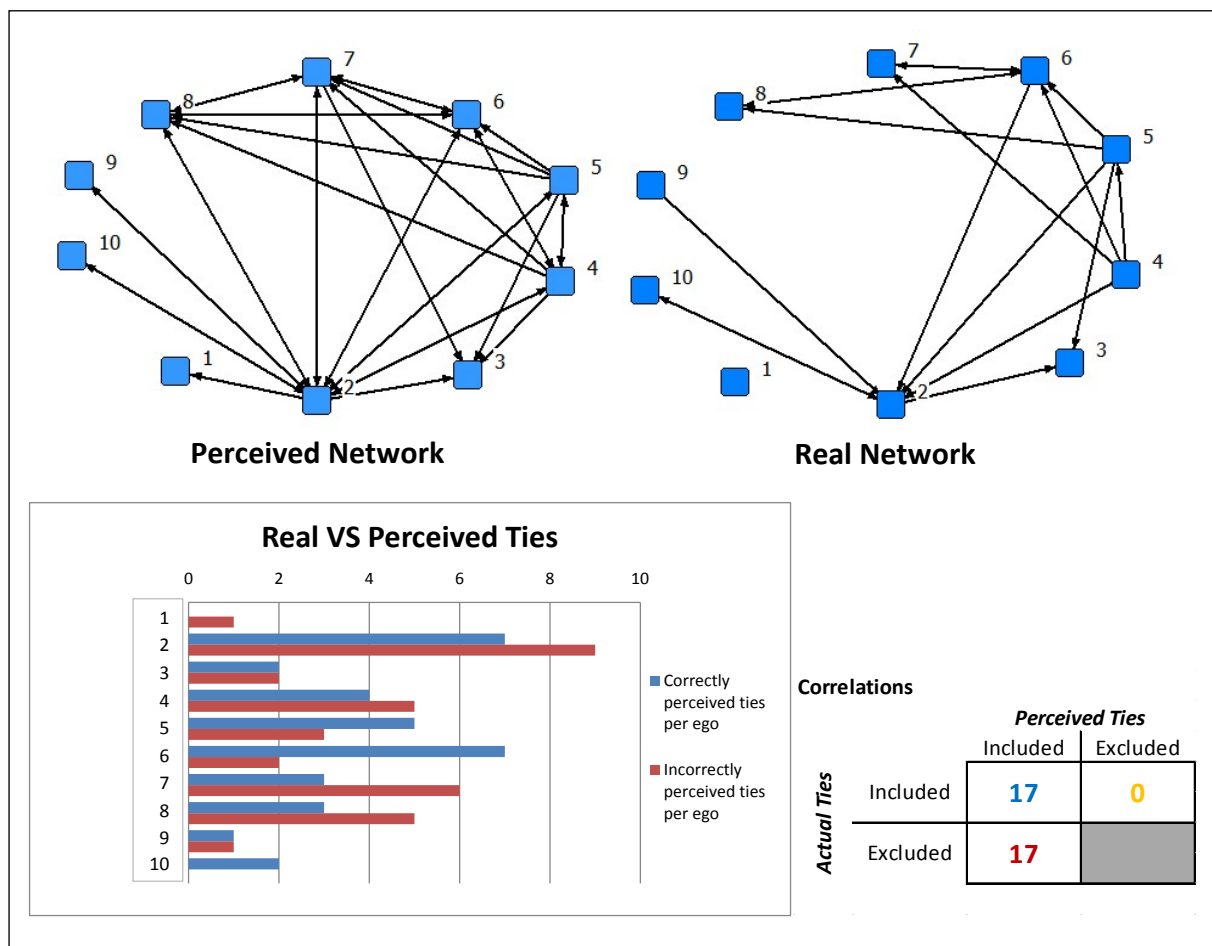
Figure 3. ICT4D Champion Perceived vs. Real Network Comparison

Both the network diagrams in Figure 3 exclude Mandisa, the focal ego, because the analysis aims at ascertaining her perceptual accuracy of ties *between other actors* in her egonet. A first observation is that the perceived network is much denser than the real network. This is a common phenomenon in cognitive networks and is often referred to as the balance schema (Krackhardt and Kilduff, 1999). The basic notion behind the balanced schema is: if ego A has ties with both B and C, then A would like to think B and C would also be connected – no connection between B and C is perceived as an uncomfortable imbalance by A. Furthermore, the correlation table in Figure 3 shows the extent of Mandisa's misperception of the real network: 17 ties were accurately perceived, while another 17 were absent in the real network. So, she perceived the network density to be double the actual density.

The bar graph in Figure 3 delineates the accuracy of perception further by separating correctly perceived ties from incorrect ones per alter in Mandisa's egonet, thereby taking the analysis one step further. It can be seen from this presentation that her perception about ties for some alters was more accurate than for others. Most notable was the over-estimation of ties for three alters (2, 7, 8) in the First Block, according to the structural block analysis outlined earlier. One possible explanation for this is the emotional closeness with these alters (strong ties between them: in addition to being work colleagues, Mandisa is also personal friends with each of them) that resulted in non-existing ties being perceived as a means of bringing balance to the network. Krackhardt and Kilduff (1999) explored several perspectives that could explain this social phenomenon, including the emotional tension explanation mentioned here. In this case, however, it would require further exploration of the qualitative data which falls beyond the scope of what we hope to demonstrate at this point.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

171

4.3. Case Findings

The first question explored in this illustrative example asked 'Who are ICT4D champions?'. Through SNA it was found that the champion has, compared to other stakeholders, a larger store of goal-oriented social capital which is used to obtain needed resources. The ability to optimise her social capital with a balance of weaker and stronger ties, became evident. This finding provides support for a notion that the ICT4D champion is relationally intelligent – she has been able to accumulate more social capital in spite of having fewer ties than some of the other stakeholders.

The unique glimpse that SNA provides into the social capital of ICT4D initiative stakeholders affords the opportunity to establish some practical implications. Knowing a bit more about who these key individuals are, can be used to identify such individuals – those with the potential to champion ICT4D initiatives. It also points to the more general utility of SNA in ICT4D initiatives. Firstly, it offers new approaches to monitoring and evaluation (M&E) (Durland and Fredericks, 2005). If applied to stakeholders, it can reveal who the important actors are (via bridging and centrality measures). Those individuals can be prioritised for engagement with M&E or for further SNA-based analysis which could offer new evidence for issues such as resource or communication breakdown. Secondly, and even more practice-oriented, SNA can be used to identify capacity (on the node level) – needed knowledge and skills – required to advance the initiative. This can practically inform project managers about human resources at their disposal and how to optimally deploy them, thereby helping keep complex ICT4D initiatives on a success trajectory.

Research question two asked 'Who do ICT4D champions relate to and draw resources from?'. Through SNA it was found that the champion has the willingness to build relationships with people that are different from herself in terms of gender, age and ICT skills. This provides her access to resources that would be inaccessible if a more homophilous approach was followed. It was also found that the underlying network resembles the more formal organisational structures, indicating the ability of the champion to function within the context of a project team or organisation. Finally, an analysis of the CSS of the champion revealed an over-estimation of tie existence among other stakeholders in the network, particularly about those who are strongly tied to the champion.

These findings, too, have practical and actionable implications, both to this specific initiative and also to ICT4D projects more generally. Mandisa herself can benefit by getting to know about the gap between real and perceived ties in her support network – she can learn to be more attentive and accurate about support relationships between other stakeholders, thereby increasing her effectiveness in advancing the initiative (in accordance with the findings of Krackhardt, 1987). More generally, training programmes can be conceived on the basis of these findings; equipping key project stakeholders with knowledge and skills to effectively develop and maintain support networks.

These findings were drawn from the case to illustrate the application of SNA and the potential lines of inquiry that it can open up. It will be subjected to further exploration from the qualitative data to confirm these initial indications, or reveal alternative explanations.

5. CONCLUSION

The paper started by pointing to the complex socio-technical nature of ICT4D and, by implication, the need – backed by repeated calls – for a diverse repertoire of research approaches to service the sub-discipline. Journeying through neighbouring academic territory within the social sciences, we came across social network analysis. SNA was, in the first instance, a conceptual and methodological approach that matched the requirements for a study of ICT4D champions, potentially in a better way than could be found from the commonly-used research approaches in our own sub-discipline. In the second instance, whilst using SNA, we began to

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

172

perceive its worth to a much wider range of ICT4D research interests. Most prominent of these were its conceptual, methodological, epistemological, and instrumental relevance to ICT4D practice and to present and future research.

This paper is our response and the contribution is threefold. First, the basic notion underlying the analysis of social networks was introduced. It was shown that a network view of society can readily be aligned with the socio-technical nature of ICT4D research thereby establishing that it is highly relevant to the field. Second, an explanation and overview of the core constructs, research design considerations, and analytic techniques of SNA were provided. This outline is offered as a resource to ICT4D researchers interested in exploring the relevance of SNA in their own research activities. Building on the distinct principles of SNA, we strengthened this contribution, by showing its relevance to ICT4D at various levels.

Building on the first two, the third contribution is a practical demonstration of the relevance of SNA in researching an, up-to-now, unexplored phenomenon in our field, namely ICT4D champions. The example case study aimed to illustrate the principles and practices of SNA in an actual research project but, as an over and above, forwarded a few interesting findings about these key individuals. Importantly, however, the usefulness of SNA should not be reduced to a focus on ICT4D champions; these practical examples should rather be perceived as a small sub-set of lines of enquiry within the much larger field of relevance in ICT4D. In fact, the use of SNA in the illustrative case actually affirmed our opinion about its wider relevance: its conceptual relevance to the nature of ICT4D practice; its methodological and epistemological relevance to the present and future state of ICT4D research; and its instrumental relevance to the future ICT4D research agenda.

It is acknowledged that many perspectives and details were omitted from all three of the main areas of contribution – it was not the aim of the paper, nor was it feasible to comprehensively cover all aspects of SNA, all aspects of its relevance to ICT4D, and the full ICT4D champion case study. These can be dealt with separately. However, it is our hope that by championing SNA as a research approach in ICT4D, we may contribute to the broadening and strengthening of research in our field.

6. REFERENCES

Alkalimat, A. & Williams, K. (2001). Social Capital and Cyberpower in the African American Community. *In:* Keeble, L. & Loader, B. (eds.) *Community Informatics.* London: Routledge.

Andersson, A. & Hatakka, M. (2013). What Are We Doing? – Theories Used in ICT4D Research. *Proceedings of the IFIP 9.4 12th International Conference on Social Implications of Computers in Developing Countries.* Ocho Rios, Jamaica.

Andrade, A. E. D. & Urquhart, C. (2008). The Value of Extended Networks: Social Capital in an ICT Intervention in Rural Peru. *Information Technology for Development,* 15(2)**,** 108-132.

Bailey, A. & Ngwenyama, O. (2010). Bridging the Generation Gap in ICT Use: Interrogating Identity, Technology and Interactions in Community Telecenters. *Information Technology for Development,* 16(1)**,** 62-82.

Balkundi, P. & Kilduff, M. (2006). The Ties that Lead: A Social Network Approach to Leadership. *The Leadership Quarterly,* 16(6)**,** 941-961.

Barney, M. (2010). *Leadership@Infosys.* New Delhi: Penguin Books.

Baron, L. F. & Gomez, R. (2012). Social Network Analysis of Public Access Computing: Relationships as a Critical Benefit of Libraries, Telecenters and Cybercafés in Developing Countries. *Proceedings of the iConference.* Toronto, ON, Canada.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

173

Best, M. L., Smyth, T. N., Etherton, J. & Wornyo, E. (2010). Uses of Mobile Phones in Post-Conflict Liberia. *Information Technologies & International Development,* 6(2)**,** 91-108.

Borgatti, S. P. & Everett, M. G. (2000). Models of Core/Periphery Structures. *Social Networks,* 21(4)**,** 375–395.

Borgatti, S. P., Everett, M. G. & Johnson, J. C. (2013). *Analysing Social Networks*. London et al: Sage Publications.

Borgatti, S. P., Mehra, A., Brass, D. J. & Giuseppe, L. (2009). Network Analysis in the Social Sciences. *Science,* 323(5916)**,** 892-895.

Burt, R. S. (2000). The Network Structure of Social Capital. *Research in Organizational Behavior,* 22**,** 345–423.

Cross, R., Borgatti, S. P. & Parker, G. (2002). Making Invisible Work Visible: Using Social Network Analysis to Support Strategic Collaboration. *California Management Review,* 44(2).

Davenport, T. H. (2000). Putting the I in IT. *In:* Marchand, D. A. & Davenport, T. H. (eds.) *Mastering Information Management.* London et al.

Durland, M. M. & Fredericks, K. A. (2005). Special Issue Editor's Notes: Social Network Analysis in Program Evaluation. *New Directions in Evaluation,* Fall(107)**,** 1-4.

Gomez, R. (2013). The Changing Field of ICTD. *The Electronic Journal of Information Systems in Developing Countries,* 58(1)**,** 1-21.

Gomez, R. & Day, S. A. (2013). Research Questions, Paradigms and Methods in ICT for Development: Content Analysis of Selected ICTD. *Proceedings of the IFIP 9.4 12th International Conference on Social Implications of Computers in Developing Countries.* Ocho Rios, Jamaica.

Goodman, J. (2005). Linking Mobile Phone Ownership and Use to Social Capital in Rural South Africa and Tanzania. *Vodafone Policy Paper Series,* 2**,** 53-65.

Granovetter (1983). The Strength of Weak Ties: A Network Theory Revisited. *Sociological Theory,* 1(1)**,** 201-233.

Gryc, W. (2009). The Social and Communication Networks of a Grassroots Organization in Kibera, Kenya. *Proceedings of the International Workshop on Intercultural Collaboration, IWIC'09.* Palo Alto, California, USA.

Haythornthwaite, C. (1996). Social Network Analysis: An Approach and Technique for the Study of Information Exchange. *Library & Information Science Research,* 18(4)**,** 323–342.

Heath, S., Fuller, A. & Johnston, B. (2009). Chasing Shadows: Defining Network Boundaries in Qualitative Social Network Analysis. *Qualitative Research,* 9(5)**,** 645-661.

Heeks, R. (2008). ICT4D 2.0: The Next Phase of Applying ICT for International Development. *Computer,* (June)**,** 26-33.

Heeks, R. (2014a). Future Priorities for Development Informatics Research from the Post-2015 Development Agenda. *University of Manchester Development Informatics Working Paper Series,* 57**,** 1-46.

Heeks, R. (2014b). ICT4D 2016. *University of Manchester Development Informatics Working Paper Series,* 59**,** 1-58.

Heeks, R., Krishna, S., Nicholson, B. & Sahay, S. (2001). Synching or Sinking: Global Software Outsourcing Relationships. *IEEE Software,* 18(2)**,** 54-60.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

174

Heeks, R. & Molla, A. (2009). Impact Assessment of ICT-for-Development Projects: A Compendium of Approaches. *University of Manchester Development Informatics Working Paper Series,* 39**,** 1-162.

Hoppe, B. & Reinelt, C. (2010). Social network analysis and the evaluation of leadership networks. *The Leadership Quarterly,* 21(4)**,** 600–619.

Johanson, G. (2010). Delineating the Meaning and Value of Development Informatics. *In:* Steyn, J. & Johanson, G. (eds.) *ICTs and Sustainable Solutions for the Digital Divide.* Hershey, PA: Information Science Reference.

Kilduff, M., Tsai, W. & Hanke, R. (2006). A Paradigm Too Far? A Dynamic Stability Reconsideration of the Social Network Research Program. *Academy of Management Review,* 31(4)**,** 1031-1048.

Krackhardt, D. (1987). Cognitive Social Structures. *Social Networks,* 9(2)**,** 109–134.

Krackhardt, D. & Kilduff, M. (1999). Whether Close or Far- Social Distance Effects on Perceived Balance in Friendship Networks. *Journal of Personality and Social Psychology,* 76(5)**,** 770-782.

Landzelius, K. (2006). *Native on the Net*. London: Routledge.

McCallister, L. & Fischer, C. S. (1978). A Procedure for Surveying Personal Networks. *Social Methods Research,* 7(2)**,** 131-148.

McPherson, M., Smith-Lovin, L. & Cook, J. M. (2001). Birds of a Feather: Homophily in Social Networks. *Annual Review of Sociology,* 27**,** 415-444.

Mingers, J., Mutch, A. & Willcocks, L. (2013). Critical Realism in Information Systems Research. *MIS Quarterly,* 37(3)**,** 795-802.

Morawczynski, O. 2009. What You Don't Know About M-Pesa. *CGAP Blog, 14 Jul.*

Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual review of sociology,* 24(1)**,** 1-24.

Renken, J. C. & Heeks, R. B. (2013). Conceptualising ICT4D Project Champions. *The Sixth International Conference on Information and Communications Technologies and Development.* Cape Town, South Africa.

Renken, J. C. & Heeks, R. B. (2014). Champions of Information System Innovations: Thematic Analysis and Future Research Agenda. *UK Academy for Information Systems (UKAIS) International Conference.* Oxford, UK.

Sambasivan, N. & Smyth, T. (2010). The Human Infrastructure of ICTD. *Paper presented at ICTD 2010.* London.

Siribaddana, P. A. (2014). Making Distance Learning an Effective Health Information Systems Strategy: A Combined Social Network Analysis and Content Analysis Perspective. *The Electronic Journal on Information Systems in Developing Countries,* 16(5)**,** 1-18.

Smith, M. L. (2005). Reconsidering ICT for Development Research. *In:* Bada, A. O. & Okunoye, A., eds. Proceedings of the Eighth International Working Conference of IFIP WG9.4, Laxenburg. IFIP, 30-40.

Taylor, L. (2012). *Global Travellers on the Digital Dirt Road: International Mobility, Networks and ICT Diffusion in Ghana.* DPhil, University of Sussex.

Thapa, D., Sein, M. K. & Sæbø, Ø. (2012). Building Collective Capabilities Through ICT in a Mountain Region of Nepal: Where Social Capital Leads to Collective Action. *Information Technology for Development,* 18(1)**,** 5.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

175

Uehara, E. S. (1994). The Influence of the Social Network's 'Second-Order Zone' on Social Support Mobilization: A Case Example. *Journal of Social and Personal Relationships,* 11(2)**,** 277-294.

Walsham, G. & Sahay, S. (2006). Research on Information Systems in Developing Countries: Current Landscape and Future Prospects. *Information Technology for Development,* 12(1)**,** 7-24.

Wasko, M. M. & Faraj, S. (2005). Why Should I Share? Examining Social Capital and Knowledge Contribution in Electronic Networks of Practice. *MIS Quarterly,* 29(1)**,** 35-57.

Weber, R. (2009). Research on ICT for Development: Some Reflections on Rhetoric, Rigor, Reality, and Relevance. *In:* Proceedings of the 3rd International IDIA Development Informatics Conference, Berg-en-Dal, South Africa. 2-27.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

176

ASSESSING E-GOVERNMENT TECHNOLOGY TRANSFER: EVIDENCE FROM THE IMPLEMENTATION OF A EUROPEAN PATENT MANAGEMENT SYSTEM IN BRAZIL

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Abstract: In order to bolster the emerging but still underdeveloped conceptualization of e-government technology transfer, we apply the E-Government Transfer Model (ETM) as an analytical lens to examine the implementation of a European Patent Management System in Brazil. The case study provided in this article offers opportunities to examine technical and organizational issues associated with e-government technology transfer. Our findings provide evidence that the transfer of e-government technology from a European to a Brazilian context requires multiple adaptations of the original design, intensive learning on the side of the recipient organization, and flexible implementation plans.

Keywords: e-government, technology transfer, information systems, patent management systems, developing countries

1. INTRODUCTION

Patent Offices are becoming essential public institutions in supporting enterprise value creation in the current knowledge-based economy. Increasingly, intangible resources are replacing tangible resources as the primary assets of innovative companies (Lall, 2003). Consequently, since the Patent Office enables the protection of new technologies through patents, this type of public institution is subject to increasing pressure from patent applicants to improve service provision.

Alongside the increasing importance of Patent Offices in the current knowledge-based economy, another trend of central importance to this study regards the growing dependence of our society on Information and Communication Technologies (ICTs). In fact, advances in ICTs are central to the process of socioeconomic changes and development (Dawes et al, 2012). In this way, ICTs have been largely used in the public sector for more than fifty years. However, the advent of the Internet has given this usage a new name - e-government - and it has also accelerated the diffusion of e-government applications worldwide (Heeks, 2004).

Nevertheless, significant variations can be observed with respect to the maturity levels of e-government practices in developed and developing countries. As a consequence of this operational gap, extant literature recognizes the increasing potential of collaboration as a means of reducing this gap (Heeks, 2002). Essentially, the maturity level of information and communication technology in developing countries is often low (Millard, 2008). Consequently, how to internalize an organization's external e-government technology has become a crucial issue to government bodies of developing countries.

To date, various developing countries throughout the world, such as Brazil, Malaysia, Pakistan, Colombia, Mexico, Vietnam, Uruguay, and Morocco are in the process of carrying out e-

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

177

government technology transfer programs to strengthen their Patent Office operations. However, despite the growing importance of Patent Offices in the context of the knowledge-based economy, the extant literature has been largely silent on e-government technology transfer involving this type of institution.

Fundamentally, we apply the E-government Transfer Model (ETM), proposed by Cavalheiro and Joia (2014) as our theoretical lens to examine a technical cooperation project involving the transfer of a Patent Management System (PMS) from the European Patent Office (EPO) to the Brazilian Patent Office, which is locally called Instituto Nacional da Propriedade Industrial (INPI). The purpose of this study is, thus, to provide a better understanding of the mainstream issues associated with e-government technology transfer by examining the transfer of a Patent Management System from Europe to Brazil.

The paper is structured as follows. Section 2 presents the E-government Transfer Model (ETM). Then, section 3 describes the research method used. Following this, section 4 examines the implementation of a European PMS in Brazil through the lens of the ETM frame. Subsequently, in section 5, our findings are then presented and related to prior literature. Finally, in section 6, the paper concludes setting forth the lessons learned from this study.

2. E-GOVERNMENT TRANSFER MODEL (ETM)

The conceptual framework that guides this study is the E-government Transfer Model (ETM), which was proposed by Cavalheiro and Joia (2014). This heuristic frame may be regarded as an improvement of the Information Technology Transfer Life-Cycle Model (ITTLCM) with greater emphasis in the process of technology transfer. Fundamentally, ETM can be deemed as an integrative meta-model that builds upon accumulated e-government and knowledge management experience (Dawes et al, 2012; Choi, 2009; Jagoda, 2007; Baark & Heeks, 1999; Cutrell, 1990; Bar-Zakay, 1971).

A key reason for the choice of this theoretical lens is that the ETM framework is aimed at motivating a more reasoned, reflective adoption of approaches from the diverse arena of information technology development and use in organizations, which is strongly aligned with the objective of this particular study. Additionally, as pointed out by Cavalheiro and Joia (2014), ETM still requires refinement through empirical studies. In essence, ETM incorporates conceptual constructs, which were derived from a review of the five existing TT models accrued from the field of knowledge management. As a consequence of this broader view, ETM proposes a circular process for transferring e-government technology as shown schematically in figure 1. Below, we provide a brief description of each element of the ETM.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

178
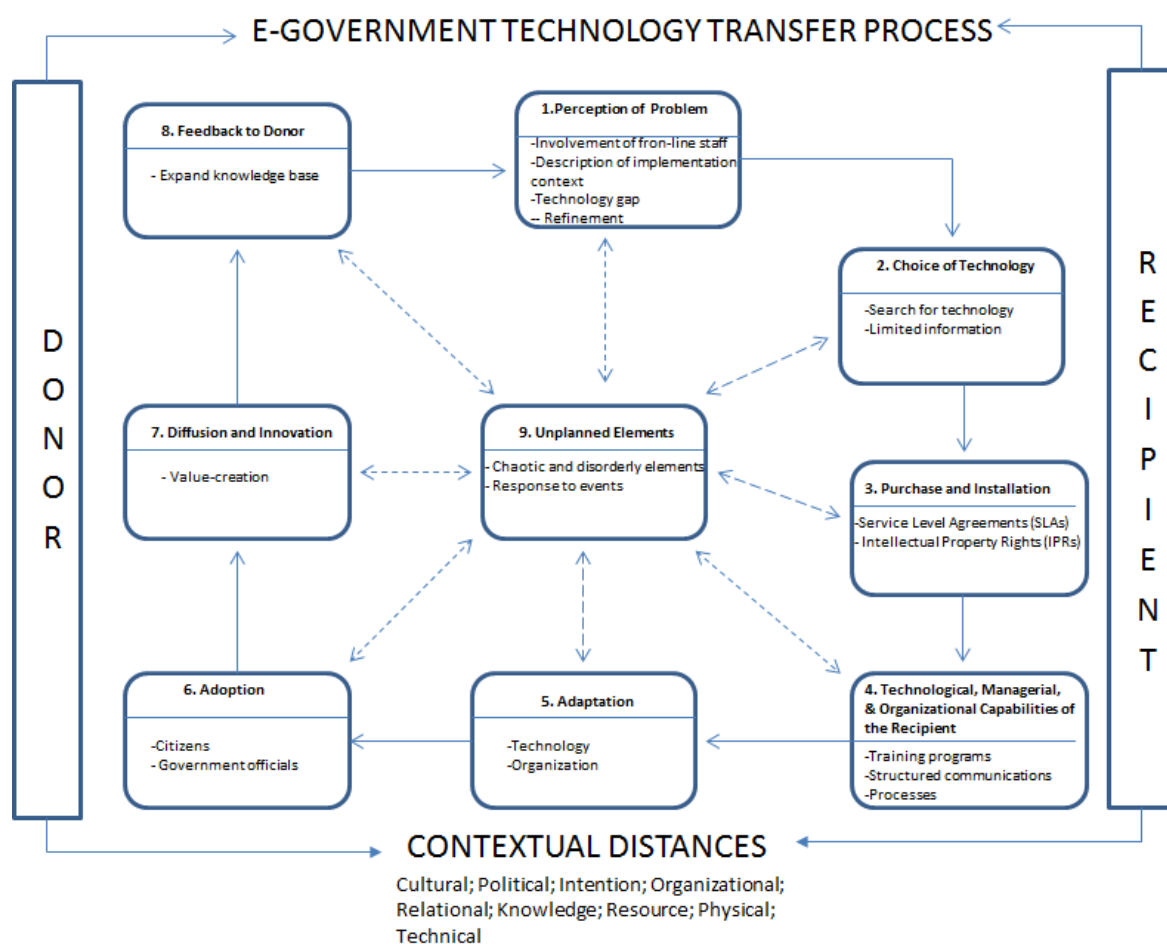
Figure 1: E-government Transfer Model (ETM). Source: Cavalheiro & Joia, 2014

Perception of Problem

It is necessary to stress the importance of a technology transfer project. In this respect, the involvement of front-line staff from developing country, at the initial project stage, can be seen as an effective way of eliminating the conception-reality gap, as the front-line staff is capable of providing a rich description of the context of the operations of the government agency in a developing country (Choi, 2009). As suggested by Cutrell (1990), the perception of the problem is subject to constant improvements (refinement), as experience is accumulated.

Choice of Technology

An important step in trying to address challenges in implementing e-government applications within a complex organizational setting is the available choice of technologies. Despite the long duration of a technology transfer project, the choice of technology takes place in the initial stage of the process (Bar-Zakay, 1971). .

Purchase and Installation

Since e-government applications are comprised by a combination of software and hardware, it is necessary to dedicate attention to the intellectual property rights associated with the software (Jagoda, 2007). Consequently, agreeing upon a basis for the valuation of technology right from the beginning to specify the agreements related to the intellectual property protection is extremely important to promote stability in the network formed by the participating actors.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

179

Technological, Managerial & Organizational Capability of the Recipient

The technological, managerial and organizational capabilities of the recipient are critical factors in dealing with the complexity of information systems associated with e-government applications. However, influencing the technological, managerial and organizational capabilities of the receiver involves monitoring user characteristics and behavior and, therefore, needs a profound knowledge base on factors, such as: user needs, ICT literacy levels, satisfaction of e-services, and impact of online public services (Choi, 2009).

Adaptation

The implementation of a foreign design of an e-government application requires complex customization between technology and implementation context in developing countries (Bar-Zakay, 1971). Due to different implementation contexts, it is necessary to identify and apply changes to an e-government application in order to enable it to fulfill user's requirements that are different than the original ones (Cutrell, 1990).

Adoption

Adoption plays an important role in the success of e-government initiatives. Low adoption, particularly by citizens, indicates inadequate utilization and rejection of the initiatives by the intended users. Adoption is an important factor for the success of technology transfer programs from developed to developing countries (Jagoda, 2007).

Diffusion and Innovation

According to Rogers (1983), diffusion is the process by which a communication is communicated through certain channels over time among members of a social system. Accordingly, the innovative solutions that were generated during the adaptation of the system can be considered innovations that need to be properly communicated to the users of the technology.

Feedback to Donor

Given the experience acquired with the implementation, project participants can provide feedback on both the execution of the TT project, as well as the adoption of the e-government application in the developing country context (Jagoda, 2007). Accordingly, the process of providing feedback can be deemed as an evaluation of the project, which contributes directly to "refine" the perception of the problem experienced by the government agency of a developing country.

Unplanned Elements

As argued by Gibson and Smilor (1991), technology transfer is often a chaotic, disorderly process involving groups and individuals who are likely to hold different views about the value and potential use of technology. Transferred technology is then more the result of an unplanned mixture of participants, solutions looking for problems, choice opportunities, and problems looking for solutions (Jagoda, 2007). In this way, the model is also of value in explaining local IS improvisations in developing countries.

3. RESEARCH METHOD

This article adopts a case study approach to explore e-government technology transfer. According to Stake (1988), case studies are of value in refining theory and suggesting complexities for further investigation, as well as helping to establish the limit for generalizability. Additionally, relies on qualitative data for understanding why or why not emergent relationships hold (Eisenhardt, 1989).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

180

This article is focused on a single case addressing the transfer of e-government technologies from the European Patent Office (EPO) to the Brazilian Patent Office. According to Yin (2003), a single case design is appropriate when it represents a unique, revelatory or critical case in testing a well-formulated theory, which in this study concerns the ETM framework.

3.1. Data Collection

We collected data through triangulation of several methods, which included participant observation, in-depth interviews, user training workshops, and extensive written documentation. We carried out several interviews with project participants, as well as patent examiners from other Patent Offices. The interviews were held between September 2011 and May 2013 in Brazil, the Netherlands and Norway. The interviewees were:

- Head of Technical Cooperation from EPO;

- Project Manager from EPO;

- Vice-President from INPI;

- Head of International Cooperation from INPI;

- Project Manager from INPI;

- Business Analyst from INPI;

- Patent Examiners from INPI;

- Patent Examiners from EPO;

- Patent Examiner from Pakistan Patent Office;

- Patent Examiners from Norwegian Patent Office..

3.2. Data Analysis

Yin (2003) suggests that every case investigation should have a general analytic strategy, so as to guide the decision regarding what will be analyzed and for what reason. The analytic strategy of this case study is comprised of three tactics for analyzing data, namely development of a code-scheme, triangulation of different sources of data, and pattern matching. First, in order to analyze large amounts of data derived from documentary sources and interviews, a coding scheme was developed and applied. Second, we triangulated data from different sources. Finally, we employed pattern-matching to compare our observations of the EPTOS case with ETM.

4. CASE STUDY: UNDERSTANDING THE EPTOS PROJECT VIA THE E-GOVERNMENT TRANSFER MODEL

After presenting the theoretical references and the research method to be used in this article, we move on to review the context associated with Patent Management Systems (PMS) and the implementation of EPTOS – a patent management system – at the Brazilian Patent Office (INPI).

4.1. Background of the EPTOS Project

In this particular study, we address a technical assistance program between an international organization and a National Patent Office. In fact, EPO is an international organization that is currently comprised of thirty eight member states and is supervised by an Administrative Council. EPO´s core activity is the examination of patent applications and the grant of European patents. According to Drahos (2010), EPO is perceived by developed-country Patent Offices as a leading institution in maintaining high standards of patent examination. INPI, in turn, is a National Patent Office, which consists of a government body belonging to the Brazilian Federal Government.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

181

Essentially, the EPTOS project regards the technical cooperation effort involving INPI and EPO that resulted in the Brazilian implementation of the European Patent and Trademark Office System (EPTOS), which refers to the Patent Management System developed by EPO to fulfill its operational needs. EPTOS is a system comprising five modules (PHOENIX, e-OLF, e-Vista, Espacenet and Soprano) that was originally commissioned and implemented by EPO. To date, EPTOS has also been adopted by 38 member states of EPO, as well as Brazil and Malaysia. .

4.2. Applying the E-Government Transfer Model

This section examines the EPTOS case from the perspective of the ETM frame. Here, we discuss operational, organizational and knowledge dimensions to e-government technology transfer. Figure 2 applies the ETM framework to the EPTOS case study. The focus is on the major issues associated with the execution of international e-government technology transfer project.
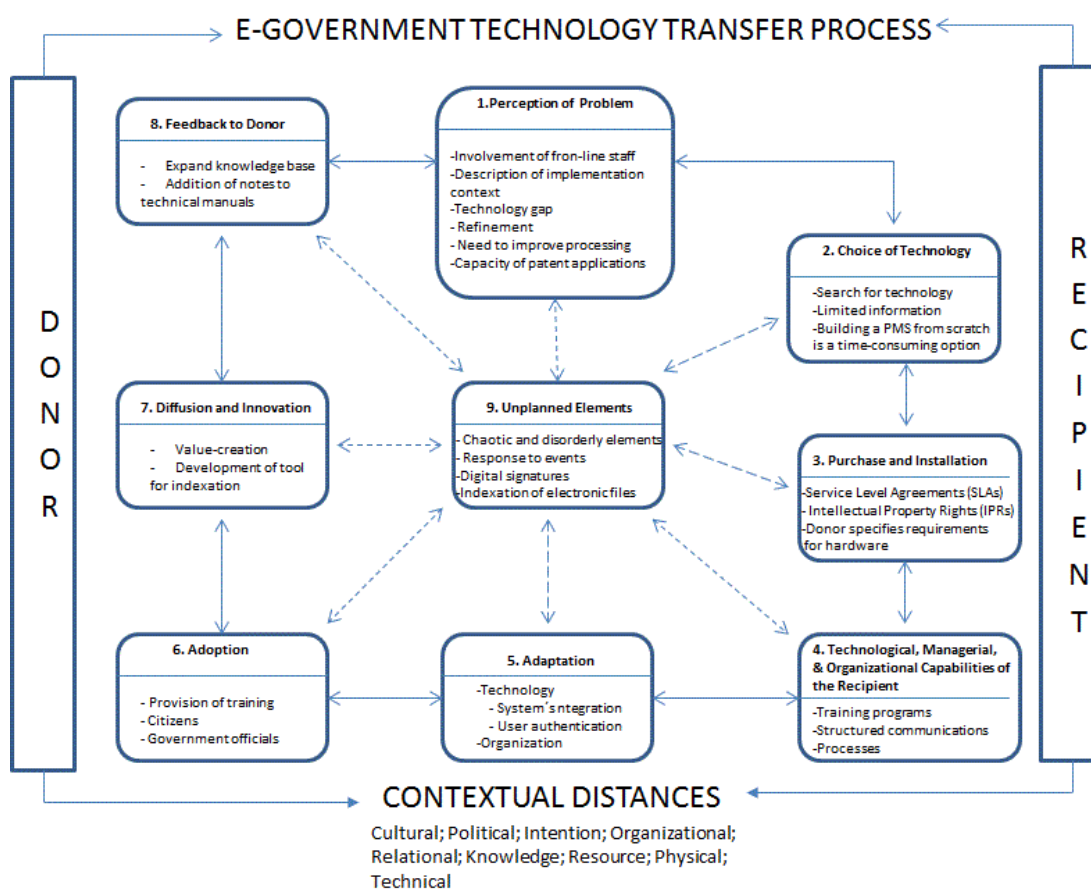
Figure 2: ETM framework applied to the EPTOS case study. Source: Adapted from Cavalheiro & Joia, 2014

Perception of Problem

The implementation of EPTOS at INPI was driven by INPI's President's perception that the services provided by the Brazilian Patent Office were inadequate and required significant improvements in terms of processing capacity of patent applications, as well as in providing better accessibility to services. The Vice-President of INPI confirmed this perception by stating that:

"For decades, Brazilian society had a perception that our office wasn´t really important and its operations were extremely bureaucratic and inefficient "

As a matter of fact, INPI's problems arose from lack of investment for decades, which generated the need for a more integrated information system to meet new demands of both public and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

182

private actors. The initiation of the project in 2003 can be traced back to the start of informal discussions performed by the President of the Brazilian Patent Office, regarding the need to implement an information system to improve the operations of INPI.

Choice of Technology

As reported by INPI´s Vice-President, the available choice of technologies were both purchasing a PMS from a Brazilian IT provider or transferring the EPTOS system from EPO. The option of buying a new system can be further divided into two options. The first was hiring a company to develop a new PMS from scratch. The second option consisted of buying a standard PMS.

Although purchasing an information system from a Brazilian company could be initially considered the most conventional choice, there were two main obstacles associated with this choice. First, building a PMS from scratch could be a challenge for an IT company without sufficient knowledge about the business processes of a Patent Office. Second, the administrative procedures associated with the purchase of an information system by a public institution belonging to the Brazilian Federal Government is highly complex and time consuming. The Vice-President of INPI described:

"INPI had a very tight budget when conversations with EPO started and we knew it was difficult to start a public tender to purchase a new patent management system"

Therefore, the awareness about the successful EPTOS implementation of EPTOS at several National Patent Offices and the long history of technical cooperation between EPO and INPI contributed to create a favorable perception of the EPO´s PMS as an interesting option for INPI.

Purchase and Installation

Although the EPTOS system was not purchased, EPO specified a set of requirements for the hardware supporting the noted PMS. In this way, as stated by an IT analyst of EPO, just like any another member state of EPO, INPI also needed to purchase adequate servers with sufficient computing capabilities to run EPTOS smoothly. However, since INPI purchases hardware on a regular base for maintaining the other information systems, purchasing new hardware could be considered a standard operation procedure (SOP) for the organization. As such, the required hardware was available in less than three months after starting the EPTOS project.

Technological, Managerial & Organizational Capability of the Recipient

Since the EPTOS system was implemented in most of EPO´s member states, the initiatives to enhance technological, managerial and organizational capabilities of INPI followed the same approach adopted to implement EPTOS at a member state. As the EPTOS team at INPI consisted of both Brazilian patent examiners and external IT consultants, the primary need for increasing capability of the recipient regarded knowledge about the EPTOS system. Therefore, seven Brazilian implementers of EPTOS went to EPO to attend training courses. Besides these trainings on EPO´s premises in The Hague, technical manuals of the EPTOS system were also provided to INPI. Additionally, as a means of facilitating the acquisition of capabilities, an incident page was set up by EPO through an open-source incident management tool.

Adaptation

The implementation of a new system at INPI cannot be considered as a green-field project, as far as IT is concerned. Rather, over the years, different departments have been implementing a number of applications to support their business processes. All these efforts come to represent the "installed base" of existing systems and applications that any new e-government initiative, such as the Brazilian EPTOS implementation, has to deal with.

Alongside the existing information systems at INPI, modules of the EPTOS system needed to be integrated with the existing systems. However, only four of the five modules of EPTOS were implemented at INPI. Since there was huge overlap between the functionality of Soprano and an

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

183

INPI´s existing administrative information system named SISCAP, a decision was made to maintain SISCAP and integrate the other four EPTOS´s modules. In addition, in spite of the specific functionality of each system, it is important to emphasize that the implementation of the different modules of EPTOS at INPI required a complex integration with other systems.

The need for another important adaptation became clear during the implementation of e-OLF, which is the EPTO´s module for online submission of patent applications. To ensure information security, the EPO contracted a company for the provision of smart-cards to patent applicants that authenticate individual access of authorized users. However, implementing the same smart-card was not feasible in Brazil for two reasons. First, the company contracted by the EPO does not have a Brazilian office. Consequently, in accordance with Brazilian legislation, it is not possible for INPI to contract services from a foreign company without an office in Brazil. Second, the Brazilian Federal Government adopts a national standard for digital signature supporting e-government applications named 'Infraestrutura de Chaves Públicas Brasileira´ (ICP-Brasil). The project manager of the EPTOS team explained:

"We needed to spend a lot of time learning about the technical characteristics of the "ICP-Brasil" standard in order to incorporate it into the implementation of e-OLF in Brazil ".

In this way, the EPTOS team at INPI had to carry out several additional tests to incorporate the 'ICP-Brasil' standard for digital signature into the e-OLF module of EPTOS in Brazil, which resulted in additional delays.

Adoption

Typically, adopting a new technology can be viewed as an economic risk, as the cost may be higher and the result less certain than existing technology (Baark & Heeks, 1999). However, since adoption is a critical performance-indicator for the success of e-government initiatives, there was a senior level order to promote adoption of the EPTOS system at INPI.

After that implementation, an existing system was perceived as a potential threat for the adoption of EPTOS. As a matter of fact, the SISCAP system carried out control over the production of patent examiners, but also provided access to digitalized patent documents in PDF format without indexation. Yet, as reported by the EPTOS project manager, the INPI´s Director of Patents requested the EPTOS team to remove this functionality of SISCAP. As a consequence, patent examiners had to login into PHOENIX in order to visualize the indexed patent documentation.

Another initiative undertaken during the EPTOS project to promote adoption concerned the provision of training sessions. In this way, training was provided to all Brazilian patent examiners. Additionally, several training sessions were organized throughout different parts of the Brazilian territory to train patent applicants in submitting patent applications online through the e-OLF module of EPTOS. At present, approximately one year after e-OLF´s launch, INPI management has announced through the corporate email that 59% of patent applications are submitted online in Brazil.

Diffusion and Innovation

The implementation of EPTOS in Brazil faced a number of obstacles that required solutions generated by the EPTOS team. As discussed above, a number of adaptations were made in the course of the implementation project and, therefore, small incremental innovations could be observed.

In this respect, a tool named e-Indexador was developed to feed EPTOS with indexed files associated with patent applications. As stated by the project manager of the EPTOS team, EPO used a device named Eposcan to digitize and provide indexation at the same time, while in Brazil an external firm started digitalizing patent documents prior to the EPTOS project, thus creating the need for indexing existing electronic files. In order to promote diffusion of this

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

184

particular innovation, two members of the EPTOS team trained several patent examiners and administrative staff to use e-Indexador.

Feedback to Donor

As stated by a project manager of EPO, the implementation of EPTOS in Brazil was more autonomous as compared to the implementation of EPTOS at National Patent Offices from member states of EPO. Yet, despite the relatively independence of the EPTOS team, feedback from INPI to EPO was provided in different ways in the course of the project. Accordingly, it was reported by an IT analyst of the EPTOS team that several notes were added to the technical manuals provided by EPO and these notes were submitted to EPO in the end of the project.

Unplanned Elements

Provided that the EPTOS project involved the implementation of a European design in the context of a Brazilian institution, there were several unplanned elements that could not be foreseen in the early phase of the project. Some of the adaptations described above can also be regarded as unplanned elements. First of all, the digital signature was not foreseen in the beginning of the project, as INPI had no previous experience with e-government technology transfer. In this way, incorporation of the Brazilian standard 'ICP-Brasil´ for digital signature into e-OLF was a challenging technical task.

Finally, another unplanned element that needs to be reported is the different method of indexation used in Brazil. Since INPI could not use the Eposcan tool to carry out digitalization and indexations in a large-scale as EPO did, IT developers of the EPTOS group were forced to design a solution for allowing manual indexing electronic files in PDF format.

4.3. Overview of Case Findings

The EPTOS case examined above allowed us to identify a number of relevant findings. Figure 3 below provides a summary of how the stages of the ETM framework map to our case study findings. This is accomplished by presenting our findings in terms of the process characteristics at various stages of the e-government TT process.

ETM stages	Case study findings
Perception of Problem	• Increased pressure to improve service provision; • Increasing number of patent applications; • Significant improvements required in terms of processing capacity of patent applications.
Choice of Technology	• Complex procedure for purchasing a PMS; • Building a PMS from scratch could be a challenging task for an IT solutions vendor without experience with the operations of a Patent Office.
Purchase and Installation	• EPO specified a set for requirements for the hardware that needed to support EPTOS adequately; • Purchasing new hardware can be considered a Standard Operating Procedure (SOP) for INPI.
Technological, Managerial, & Organizational Capabilities	• Need to improve knowledge about EPTOS by the recipient organization; • Technical manuals were provided by the donor;

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

185

of the Recipient	• Member of the EPTOS team from INPI attended courses at EPO´s premises in the Netherlands; • Incident page was implemented by EPO.
Adaptation	• Selection of most useful EPTOS modules to address operational needs of INPI (PHOENIX, e-OLF, Espacenet and e-Vista); • Localization of EPTOS´s interfaces; • Integration of EPTOS and INPI´s legacy systems; • Use the 'ICP-Brasil' standard for digital signature.
Adoption	• Access to indexed patent documents was centralized at EPTOS; • Patent examiners received training to use the EPTOS system; • Patent agents and other stakeholders were trained to submit patent applications online through e-OLF module of EPTOS.
Diffusion and Innovation	• A tool named e-Indexador was developed to feed EPTOS with indexed files associated with patent applications; • The Brazilian implementation of EPTOS used four out of five modules, as a decision was made to maintain a locally developed system named SICAP.
Feedback to Donor	• Implementation of EPTOS in Brazil was more autonomous as compared to the implementation in Patent Office of all member states of EPO; • Several notes were added to technical manuals, which were sent to EPO at the end of the implementation project;
Unplanned Elements	• Need to adopt the 'ICP-Brasil' standard for digital signature as an alternative for the smart-cards used by EPO; • Level of independence of the EPTOS team at INPI during implementation; • Different method for the indexation of electronic files needed to be developed by the EPTOS team.

Figure 3: Summary of case study findings

5. CASE DISCUSSION

The case study presented above has provided an important opportunity to further validate ETM through examination of a real-life e-government technology transfer project. Using a detailed description of the EPTOS implementation in Brazil, we have provided a rich illustration of the transfer of a European PMS to Brazil from the perspective of the ETM frame. The EPTOS case also contributed one step further to validate the E-government Transfer Model. More specifically, the EPTOS case revealed the interrelated, parallel and overlapping nature of e-government technology transfer.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

186

While the majority of the stages of the EPTOS project could be described in a sequential manner, there were some stages that appeared "out of sequence" in our selected case. For example, the stage "Technological, Managerial, & Organizational Capabilities of the Recipient" was observed to occur prior to the "Purchase and Installation" stage. As a matter of fact, attempts to raise technological, managerial and organizational capabilities on the side of the recipient were initiated right after the stage "Choice of Technology".

Additionally, the arrows indicating a one-way direction in the process of e-government technology transfer suggest that an activity should be finished before the next-one can be initiated, unless unplanned elements occur. As such, the unidirectional arrows should be replaced by bidirectional arrows as in the ETM model in order to better represent the simultaneous execution of several stages. The EPTOS case also revealed that a dedicated implementation team needed to be set up by INPI in order to interact with the IT department of EPO and implement EPTOS in Brazil. As such, we observe that this particular e-government technology transfer initiative faced challenges, since the required level of interorganizational collaboration was not sufficiently supported by existing institutional arrangements, organizational structures, and managerial processes at the recipient.

6. CONCLUSION

In this paper, we applied a heuristic frame to examine the e-government technology transfer process from a patent office in a developed country to a similar institution in a developing country. Although the basic idea of system transfer is simple, our case demonstrates the complexities of transferring e-government systems among different countries. We have found empirical evidence indicating that e-government solutions developed to fulfill specific requirements of the government agency of one country cannot simply be transplanted to other countries (Millard, 2008; Nahmpossa, 2005).

We have found that the invisible aspects of e-government technology, such as knowledge, skills and organization, were much more critical than the physical aspects, such as hardware, for accomplishing the transfer of EPTOS (Darr & Kurtzberg, 2000). Systems should be customized and altered according to host values, norms and practices before the systems will go into a production phase. Therefore, it is imperative for managers of technology to gain good insights into the donor environment, recipient environment, and the greater environment when planning and implementing an e-government TT project.

We recognize the limitations of the present study and suggest that these limitations can be viewed as opportunities for future research. First, the EPTOS case represents the analysis of a single project involving the Brazilian and the European Patent Offices to shed light on an under-researched area. Consequently, although significant insight can be gained from such analysis, further examination of the ETM in other e-government technology transfer contexts should be pursued.

7. REFERENCES AND CITATIONS

Baark, E. and Heeks, R. (1999) Donor-funded information technology transfer projects: evaluating the life-cycle approach in four Chinese science and technology projects, Information Technology for Development 8: 185-197.

Bar-Zakay, S.N. (1971) A technology transfer model, Technological Forecasting & Social Change, 2: 321-337.

Beynon-Davies, P. and Williams, M.D. (2003) Evaluating electronic local government in the UK, Journal of Information Technology, 18(2): 137-149.

Castells, M. (2000) The information age: economy, society and culture. Updated edition, Oxford: Blackwell.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

187

Cavalheiro, G.M.C. and Joia, L.A. (2014) Towards a heuristic frame for transferring e-government technology, Government Information Quarterly, 31(1): 195-207.

Choi, H.J. (2009) Technology transfer issues and a new technology transfer model, Journal of Technology Studies, 35(1): 49-57.

Cutrell, J.D. (1990) Technology transfer systems for the coming decade. Federal Highway Administration, Department of Transportation: Washington, DC.

Darr, E. D. & Kurtzberg, T. R. (2000) An investigation of partner similarity dimensions on technology transfer, Organisational Behavior and Human Decision Processes, 82: 28–44.

Dawes, S.S., Gharawi, M.A., and Burke, B. (2012) Transnational public sector knowledge networks: Knowledge and information sharing in a multi-dimensional context, Government Information Quarterly, 29:112-120.

Drahos, P. (2010) The global governance of knowledge: patent offices and their clients. New York: Cambridge University Press.

Eisenhardt, K.M. (1989) Building theories from case study research, Academy of Management Review, 14(4): 532-550.

Gibson, D.V. & Smilor, W. (1991) Key variables in technology transfer: A field-study based on empirical analysis. Journal of Engineering and Technology Management, 8: 287-312.

Heeks, R. (2002) eGovernment in Africa: Promise and practice. Paper No. 13. Institute for Development Policy and Management.

Heeks, R. (2004) eGovernment as a carrier of context. Paper No. 15. Institute for Development Policy and Management.

Jagoda, K.I. (2007) A stage-gate model for planning and implementing international technology transfer (Doctoral Dissertation). University of Western Sydney, Australia.

Lall, S. (2003) Indicators of the relative importance of IPRs in developing countries, Research Policy, 32: 1657-1680.

Millard, J. (2008) Egovernment measurement for policy makers, European Journal of ePractice, 4: 19-32.

Rogers, E.M. (1983) Diffusion of Innovations. Free Press: New York.

Stake, R. (1988) Case Studies. In Denzin, N.K. e Lincoln, I.S., Strategies of Qualitative Inquiry. Thousands Oaks/London: Sage Publications.

Yin, R. (2003). Application of case study research, Sage Publications: Beverly Hills.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

188

GRADUATE STUDENT TRACK

189

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Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

189

UN-INTENDED CONSEQUENCES OF TECHNOLOGY ADOPTION IN DEVELOPING COUNTRIES: THE M-PESA NARRATIVE

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Abstract: For sub-Saharan countries seeking socio-economic advancement, information systems and technologies that will aid in this effort, are key. Since many homes are increasingly becoming female-headed, interventions targeted at women will result in their empowerment and their ability to access economic and other opportunities that will lead to this development. One outcome of the adoption of information systems is the un-intended consequences of a system implementation. This study uses the lens of cultural contingency theory to look at how the *M-Pesa* service has taken into account the traditions and norms of the society and has gone on to become one of the most successful technologies in Kenya today. The study utilizes both quantitative and qualitative methodologies to draw conclusions.

1. INTRODUCTION

Many researchers in the information systems (IS) field have been concerned with how information systems are used within business organizations, with a lot of the work focusing on: perceptions towards adoption and use of technology (example, Davis, 1989); effective use (example, Davis, 1989); and outcomes attained from use of technology. The original work on adoption and use of technology has spawned numerous IS studies which have looked at the antecedents that affect adoption; factors that influence adoption; and organizational-related outcomes such as job satisfaction and performance. One outcome that a few IS researchers have studied, is the un-intended consequences of the adoption of technology or of an IS implementation, with the greatest focus being on healthcare IS (example, Ash, Berg and Coiera, 2004). Even though Heeks (2002) identified an unexpected outcome of "failure followed by success", no previous study has specifically looked at the influence of culture as a mediator resulting in the turning around a failure into success as an un-intended consequence of adoption.

According to Johns (2006), IS researchers cannot afford to ignore context, especially because the norms and values of the communities impact and are in turn impacted by the IS implementations. For developing countries, this cannot be truer given the importance of communal and social influences (Venkatesh and Sykes, 2013). Further, in these societies, community and belonging are important to the success or failure of an implementation (Gichoya, 2005). For example, while studying perceptions towards motivations, researchers found that for farmers in Punjabi (in India), "social approval" was more important than financial gain (Rogers, 1995).

Researchers have touted Information Communication Technologies (ICTs) to be a key driver for development in Sub-Saharan Africa (examples; Meso, Musa, Straub and Mbarika, 2009; Pigato, 2001). In addition, many believe that IS interventions will play a key role in improving the "quality of life", in terms of: improved access to health facilities, higher standards of education, improved agricultural practices and greater economic opportunities for people in developing

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

190

countries (Avgerou, 2010, Rao, 2009; Heeks, 2002). Further, one of the conclusions from the World Summit on Information Society (WSIS) conference held in Geneva 2003, was that ICTs can be a tool for women's empowerment (Sandys, 2005).

For many sub-Saharan countries, in the absence of the infrastructure that could be used for these sorts of interventions (Braa, Hanseth, Heywood, Mohammed and Shaw, 2007; Mbarika, Okoli, Byrd and Datta, 2005), mobile technology has grown in leaps and bounds (Meso, Musa and Mbarika, 2005) and Kenya is no exception. In Kenya, this growth has also seen an increase in number of mobile phone platforms and services. One of the most ubiquitous and most useful of these, is *M-Pesa*, a mobile money transfer service that has penetrated all sectors of the economy.

M-Pesa was launched in 2007 by *Safaricom*, a mobile network operator in Kenya, with a purpose of allowing users to deposit and withdraw, as well as transfer money to others and pay bills (Mas and Radcliffe, 2010). Statistics indicate that 83 % of Kenya's population has access to a mobile phone (Spurk, Schanne, Mak'Ochieng and Ugangu, 2013). Meanwhile, *Safaricom* estimate that they have over 17 million active *M-Pesa* users, with a deposit value of over Kenya Shillings 93 billion (over USD 1 billion) and with money transfers totaling Kenya Shillings 84 billion (almost USD 1 billion) by 2014[1]. The *M-Pesa* service has been so successful, that the majority of banks in Kenya have now linked their services to it, for instance, allowing users to transfer funds directly from their bank accounts to the *M-Pesa* accounts and vice versa (Kendall, Maurer, Machoka and Veniard, 2011).

The intention of *M-Pesa* was to not only to provide financial services to the poor and the un-banked (that is, those who did not have a bank account), but to all consumers of financial services where none existed before (Hughes and Lonie, 2007). However, the use of *M-Pesa* has had an un-intended consequences: due to *M-Pesa*, women and men who had never used a computer before are now familiar with terms like "login" or "enter 'secret' word" or "contact support" and training them on other aspects of IT and other technologies should be the next logical phase. The objective of this study is to understand the ways in which mobile services, specifically *M-Pesa* has increased and enhanced information technology (IT) literacy in Kenya. The rest of this paper is structured as follows: I start by looking at the theoretical background for the study followed by a description of research model. This is followed by an explanation of the data collection methodologies and results, and the analysis of the data. The paper concludes with a discussion of the conclusions and proposed contributions of the study.

2. THEORETICAL BACKGROUND

Most studies that have looked at failure as an impact of an IS implementation, have done so by viewing it as a "once-off" static occurrence or as a single incidence. Heeks (2002) however identifies a category of unexpected outcome where failure has been followed by success. A review of extant literature does not reveal any previous study has looked at how, because of culture as a mediating factor, the context has turned around and impacted the technology and subsequently the implementation or adoption has become a success. In attempting to understand this phenomenon, I focus on the factors that led to the success of *M-Pesa* to understand how they could be extended to other technologies being implemented in developing countries and I use the lens of cultural contingency theory.

2.1. Cultural Contingency Theory

Cultural contingency theory, an extension of contingency theory, expects that over time, the "norms and values" of the organization become compatible with those of the surrounding culture (Lincoln and Kalleberg, 1990). Cultural contingency theory is therefore an appropriate lens by which to study this phenomenon because it can explain why a technology in its original form may experience failure during implementation, but if modified to take into account the culture,

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[1] http://www.safaricom.co.ke/mpesa_timeline/timeline.html

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

191

traditions and norms of the community within which it is being implemented, it need not be a failure.

One technology that has had tremendous success in Kenya is *M-Pesa*, a mobile money service that has penetrated all sectors of the economy. For many years, the banking sector in Kenya was dominated by international banks who focused on the upper middle class (Wamae, 2009), resulting in a large population of unbanked people. *M-Pesa* was launched in 2007 by *Safaricom*, the leading mobile network operator in Kenya, with a purpose of allowing users to deposit and withdraw, as well as transfer money to others and pay bills (Mas and Radcliffe 2010). The *M-Pesa* service is able to reach the poor, unbanked people in rural Kenya, many of who had low or no financial or technical literacy (Wamuyu and Maharaj, 2011). This was contrary to expectations, where researchers anticipated that its uptake would be confined to the more affluent, urban populations (Wamuyu and Maharaj, 2011).

My study focuses on women following the body of research that explores the relationship between gender and technology (example, Wajcman, 1991), with the view that men and women have different psychological characteristics that affect their perceptions towards technology and subsequent adoption and use (example, Venkatesh and Morris, 2000). The reason for focusing on women is because statistics indicate that the number of female-headed households in Sub-Saharan Africa is on the increase (Buvinić and Gupta, 1997; UNFPA, 1999). At the same time, research shows that women are often ignored when ICT policies are being framed (Gill, Brooks, McDougall, Patel and Kes, 2010). Given this, there is therefore a need to urgently address this issue for more successful system implementations.

Technologies supporting women's economic advancement often do so by tackling one or more barriers that prevent use and adoption, one of which was identified as lack of basic education and training (Gill et al. 2010). An improvement in access to technology and an increase in IT literacy will inevitably lead to an increase women's empowerment as it unlocks their access to economic opportunities (Gill et al. 2010). One reason for the success of *M-Pesa* could be attributed to the technology and entire *modus operandi* being modelled after the norms and culture of the Kenyan psyche, for example, of sending money to relatives (mostly women) in rural areas (Morawczynski and Pickens, 2009). The use of *M-Pesa* has had an un-intended consequences. Due to *M-Pesa*, women who had never used a computer before are now familiar with terms like "login" or "enter 'secret' word" and training them on other aspects of IT and other technologies should be the next logical phase.

2.2. Hypotheses

According to statistics from the Kenya 2009 census, even though about 84 % of Kenya's population is literate, however, only 61.5 % have attained minimum literacy levels (Kenya National Bureau of Statistics, 2009). One of the un-intended consequences of *M-Pesa* has been that women who had never used a computer before are now familiar with terms like "login" or "enter 'secret' word" and training them on other aspects of IT and other technologies should be the next logical phase. I propose that as a result of using *M-Pesa*, the next step toward IT literacy for women in Kenya will be much simpler. For this first phase of this study I used quantitative data to obtain actual figures on the uses of M-Pesa and the technical abilities that the users feel they have as a result of this. This leads me to my hypotheses,

Hypothesis 1: *Women are more likely to adopt an ICT that responds to the traditions and norms of their culture, thus contributing to their empowerment.*

Hypothesis 2: *An ICT that responds to the traditions and norms of the surrounding culture, is more likely to enhance the literacy of women, thus contributing to their empowerment.*

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

192

2.3. Research Model

By this rationale, this study proposes that women understand a technology better if it takes them, their needs, norms and culture into consideration. In the 1990's, multinational banks in Kenya raised the minimum account balance that one was allowed to have, thereby forcing out small depositors (Wamae, 2009). *Safaricom*, a mobile network operator, filled this gap, created and adapted the M-Pesa technology to reach this group of unbanked people by taking into account the norm of (men) sending money to relatives (especially women) in the rural areas. The women, most of whom depended on this income for them and their children more readily received adopted and used the technology.

The research model in Figure 1, describes how the culture of the surrounding communities impacts and is impacted by technology, (in this case *M-Pesa*) in return. This improves the technology adoption rate as the community understand it better as it fits their need, leading to the empowerment of women. This concurs with Walsham, Robey and Sahay (2007) who emphasize that ICTs applied in developing perspectives must avoid "inappropriate impositions" and at the same time recognize that there is a "vast heterogeneity" from context to context.
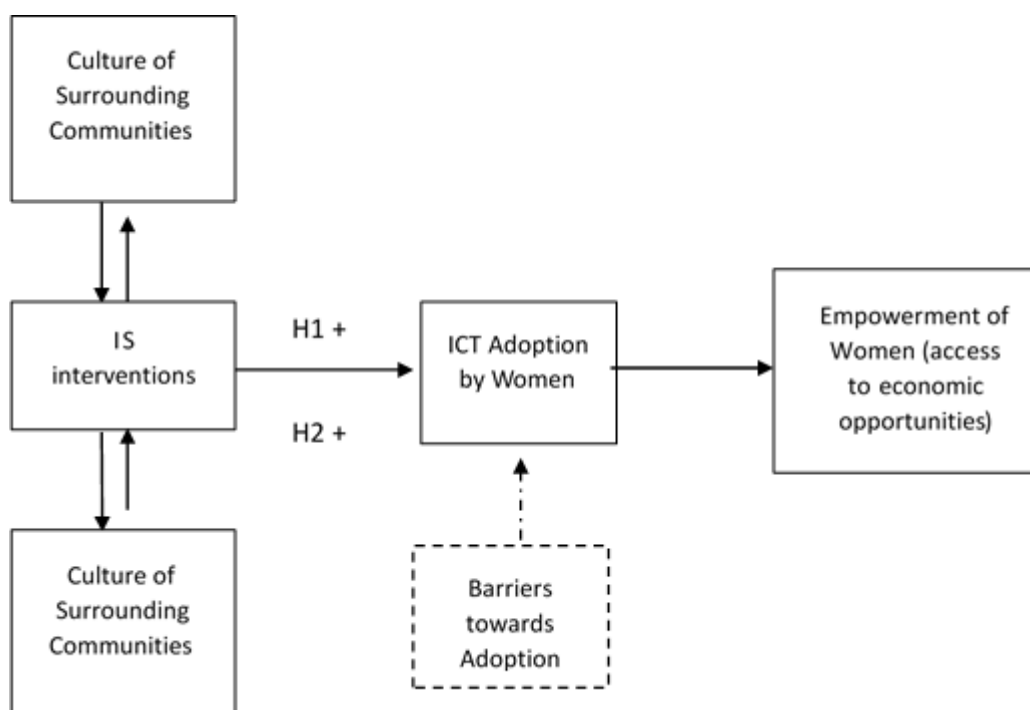
Figure 1. Research Model

3. DATA COLLECTION AND ANALYSIS

This study utilizes both quantitative and qualitative methods in a mixed-methods research design to collect data. Mixed-methods provides a "complete" picture of the research problem because qualitative data can provide depth while quantitative data can provide breadth. For phase one, I used partial quantitative data from a secondary source. The second phase of this study, which will be qualitative will be conducted at a later stage.

3.1. Phase one (Quantitative Study)

For this phase, I used secondary data from a study conducted by Microfinance Opportunities (MFO), a global non-profit organization that seeks to understand the financial realities of low-

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

193

income households [2](Stuart and Cohen 2011). The data was obtained from 100 respondents over 8 months. In the first phase of this study, I had proposed to collect data to identify 1) the perceptions towards technology and 2) the perceptions towards *M-Pesa*, aspects which their data captured. Some of the quantitative data they collected is therefore appropriate for the purposes of initiating the study.

3.1.1. Sample Context

The data is collected from two towns in rural Kenya: *Kitui* and *Murang'a*. The data sampling attempted to study a variety of people who were using the *M-Pesa* service and compare to those who were not. The geographic locations were selected to cover areas where *M-Pesa* agents were present. *Murang'a* is an agriculturally-rich county located in the heart of Central Kenya[3] while *Kitui* is hot and arid and is located in Eastern Kenya[4].

3.1.2. Sample Participants

The first half of the client sample was selected at random. Every third client visiting the shop was approached and asked if they would welcome a home visit and they signed a consent form. The second half of the client sample was selected purposively in collaboration with the agents. The agents identified "heavy" users of M-Pesa, that is, those who used the services most often. 92 households were sampled, of whom 58 % were women. Individuals who use the *M-Pesa* facilities and those who did not were included. An *M-Pesa* user was defined as one who conducted any transaction using *M-Pesa*. Non-users were identified through a peer-referral technique. 58 % of the participants were *M-Pesa* users. Mobile banking shops and *M-Pesa* agents were also sampled.

3.1.3. Measures:

For this study, I used measurement items adapted from existing literature.

ICT adoption: This is defined by how the participant uses *M-Pesa.* It includes use and frequency of use as shown in Table 1.

I use *M-Pesa* to receive money
I use *M-Pesa* to receive money once a day, once a week, etc. (frequency of use)
I use *M-Pesa* to send money
I use *M-Pesa* to send money once a day, once a week, etc. (frequency of use)

Table 1. Sample *M-Pesa* Adoption Items

Empowerment of women: Empowerment is a broad construct mostly used in development studies that includes a variety of dimensions such as social inclusion, cooperation, participation and well-being, or the capacity for exercising "strategic forms of agency" (Narayan-Parker 2006, Kabeer 1999; 2001). For this study, I adopt a definition of empowerment of women meaning access to economic opportunities and use such items as listed in Table 2. A business transaction is related to income-earning activities, such as receiving or paying a salary or wages; while a household transaction is any that is related to household functions like paying rent, paying for utilities or purchase of food and groceries.

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[2] Source: http://microfinanceopportunities.org/
[3] Source: http://muranga.go.ke/index.php?option=com_content&view=article&id=72&Itemid=468
[4] Source: http://www.kitui.go.ke/index.php/about-kitui-county

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

194

| I use *M-Pesa* for business transactions |
| I use *M-Pesa* for household transactions |
| I use *M-Pesa* as a savings account |

Table 2. Sample Items: Empowerment of Women

Barriers to adoption: These include lack of education and lack of IT training. Table 3 shows examples of some of the perceptions that could be a barrier towards using *M-Pesa.*

| *M-Pesa* is too complicated for me to use |
| I don't use *M-Pesa* because I don't have enough training to use it |
| Using cash is better or easier/ less complicated |
| I contact M-Pesa support when I run into problems |
| I understand all the menu items on the *M-Pesa* menu |

Table 3. Sample Items: Barriers toward *M-Pesa* use

3.1.4. Results

The results of the MFO study indicated that 58 % of the people sampled used *M-Pesa*, and mostly to receive money. The results further indicated that even though the transaction value for business purposes was higher, 76 % of *M-Pesa* transactions were for household uses. 90 % of the respondents also indicated that they thought their money was safe with *M-Pesa*. Women whose husbands sent them money considered their *M-Pesa* account as a place to save safely. The study found that when money was sent, not all of it was withdrawn for use.

4. REFERENCES AND CITATIONS

Ash, J. S., Berg, M., & Coiera, E. (2004). Some unintended consequences of information technology in health care: The nature of patient care information system-related errors. *Journal of the American Medical Informatics Association*, *11(*2), 104-112.

Avgerou, C. (2010). Discourses on ICT and development. *Information Technologies & International Development, 6*(3), 1-18.

Braa, J., Hanseth, O., Heywood, A., Mohammed, W., & Shaw, V. (2007). Developing health information systems in developing countries: The flexible standards strategy. *MIS Quarterly*, *31*(2), 381-402.

Buvinić, M., & Gupta, G. R. (1997). Female-headed households and female-maintained families: Are they worth targeting to reduce poverty in developing countries? *Economic Development and Cultural Change*, *45*(2), 259-280.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319-340.

Gichoya, D. (2005). Factors affecting the successful implementation of ICT projects in government. *The Electronic Journal of e-Government*, *3*(4), 175-184.

Gill K., Brooks, K., McDougall J., Patel, P., & Kes, A. (2010). *Bridging the gender divide: How technology can advance women economically*, Washington DC: The International Center for Research on Women.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

195

Heeks, R. (2002). Information systems and developing countries: Failure, success, and local improvisations. *The Information Society*, *18*(2), 101-112.

Hughes, N., & Lonie, S. (2007). M-PESA: Mobile money for the "unbanked" turning cellphones into 24-hour tellers in Kenya. *Innovations*, *2*(1-2), 63-81.

Johns, G. (2006). The Essential impact of context on organizational behavior. *Academy of Management Review*, *31*(2), 386-408.

Kabeer, N. (1999). Resources, agency, achievements: Reflections on the measurement of women's empowerment. Development and change, 30(3), 435-464.

Kabeer, N. (2001). Resources, Agency, Achievements. Discussing Women's Empowerment, 17.

Kendall, J., Maurer, B., Machoka, P., & Veniard, C. (2011). An emerging platform: From money transfer system to mobile money ecosystem. *Innovations*, *6*(4), 49-64.

Kenya National Bureau of Statistics. (2009). 2009 Kenya population and housing census 24th/ 25thAugust, 2009. Republic of Kenya. Nairobi, Kenya: KNBS.

Lincoln, J., & Kalleberg, A. (1990). *Culture, control and commitment: A study of work organization and work orientations in the United States and Japan*, Great Britain: Cambridge University Press.

Mas, I., & Radcliffe, D. (2010). Mobile payments go viral: M-PESA in Kenya. In P. Chuhan-Pole & M. Angwafo, *Yes Africa can: Success stories from a dynamic continent* (pp. 353 – 369). Washington, DC: World Bank Publications.

Mbarika, V. W., Okoli, C., Byrd, T. A., & Datta, P. (2005). The neglected continent of IS research: A research agenda for sub-Saharan Africa. *Journal of the Association for Information Systems*, *6*(5), 130-170.

Meso, P., Musa, P., & Mbarika, V. (2005). Towards a model of consumer use of mobile information and communication technology in LDCs: The case of sub-Saharan Africa. *Information Systems Journal*, *15*(2), 119-146.

Meso, P., Musa, P., Straub, D., & Mbarika, V. W. (2009). Information infrastructure, governance, and socio-economic development in developing countries. *European Journal of Information Systems*, *18*(1), 52-65.

Morawczynski, O., & Pickens, M. (2009). Poor people using mobile financial services: Observations on customer usage and impact from M-Pesa. Retrieved from https://openknowledge.worldbank.org/handle/10986/9492.

Narayan-Parker, D. (Ed.). (2006). Measuring Empowerment: Cross-Disciplinary Perspectives. Washington DC: World Bank Publications.

Pigato, M. (2001). *Information and Communication Technology, Poverty, and Development in Sub-Saharan Africa and South Asia*, Washington, DC: World Bank.

Rao, S. S. (2009). Role of ICTs in Indian rural communities. *The Journal of Community Informatics, 5*(1).

Rogers E. M. (1995). *Diffusion of Innovations* (4th ed.), New York, NY: The Free Press.

Sandys, E. (2005). Gender equality and empowerment of women through ICT, *Women 2000 and Beyond*, NY: UN Division for the Advancement of Women, Department of Economic and Social Affairs.

Spurk, C., Schanne, M., Mak'Ochieng, M. & Ugangu, W. (2013). Good information is in short supply. Kenyan farmers and their assessment of information on agricultural innovation. Nairobi: Multimedia University College of Kenya.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

196

Stuart, G. & Cohen, M. (2011). Cash in, cash out Kenya: The role of M-Pesa in the lives of low-income people. Retrieved from http://wwww.gsmworld.com/mobilefordevelopment/wp-content/uploads/2012/06/cash_in_cash_out_kenya.pdf.

U.N. Population Fund (UNFPA). (1999). Linking population, poverty and development: Reducing poverty and achieving sustainable development, UNFPA. Retrieved from http://www.unfpa.org/pds/poverty.html.

Venkatesh, V., & Morris, M. G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly*, 115-139.

Venkatesh V., & Sykes, T.A. (2013). Digital divide initiative success in developing countries: A longitudinal field study in a village in India. *Information Systems Research, 24*(2), 239-260.

Wajcman, J. (1991). Feminism confronts technology. University Park, PA: The Pennsylvania University Press.

Walsham, G., Robey, D., & Sahay, S. (2007). Foreword: Special issue on information systems in developing countries. *MIS Quarterly*, *31*(2), 6.

Wamae, W. (2009). Enhancing the role of knowledge and innovation for development. *International Journal of Technology Management and Sustainable Development*, *8*(3), 199–220.

Wamuyu, P. K., & Maharaj, M. (2011). Factors influencing successful use of mobile technologies to facilitate e-commerce in small enterprises: The case of Kenya. *The African Journal of Information Systems*, *3*(2), 2.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

197

INSOURCING A GOVERNMENT INFORMATION SYSTEM: A CASE STUDY

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Abstract: This paper explores insourcing and discusses the challenges and barriers that have impeded its implementation in selected government agencies in Malaysia. The paucity of similar projects and limited literature has resulted in this study that considers a post outsourcing context following the decision to insource a major Malaysian Government Information System in 2011. A qualitative research method was conducted in selected government agencies in order to obtain empirical evidence from 48 semi-structured interviews with government servants from top management to clerical staff including the users of the government information system. By using a combination of institutional and capability approaches to analyze the data, we found that insourcing could optimise the performance of the government's administration by using potential opportunities that are presented to them, despite challenges such as data centralization, technical training, resources for training, lack of awareness, lack of standardization and lack of infrastructure. We envisage that as insourcing evolves over time, participation and responses from public organisations, especially from large organizations, would represent the practice of insourcing as a whole. These findings will be of interest to government agencies and policy makers interested in insourcing information system support.

Keywords: insourcing; government information systems; qualitative research; semi-structured interview; large organization

1. INTRODUCTION

Government information systems are large and complex that use hardware, software and networks to enhance workflow and facilitate communications among government employees. They play an important role in improving internal management efficiency and an important measure for enhancing and expediting the government services delivery. Systems used by government include human resources, financial management, health, education among others. Insourcing, outsourcing, and co-sourcing are the three types of approach for developing a complete information system.

The outsourcing is the preferred approach because it can reduce the costs, and the risks related to business and technology where an organization can focus on core capabilities (Ahonen et al., 2009). However, whilst many studies have focused on outsourcing an information system in the organization (Lacity et al., 2009; Khan et al., 2011; Freytag et al., 2012), there are comparatively few studies that address insourcing. Oshri et al. (2009) defined outsourcing as an appointment of a third party service provider or a vendor to perform and complete the task for the management within a specified length of time (pp. 4). Therefore, insourcing can be defined as internal sourcing of business activities by allocate or re-allocate of resources internally within the organization (Schniederjans et al., 2005).

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

198

This research contributes to literature by investigating the factors and issues of insourcing a government information system and its adoption by public organizations. The research question this paper addresses is: **What are the factors and issues affecting the organization after termination of the outsourcing vendor arrangement?**. Futhermore, this research studies the organization's action to insource a large system with a large number of users, and explores the system's performance three years after the vendor's contract terminated. In order to acquire empirical evidence, a qualitative research method was conducted in the selected Malaysian government agencies by using semi-structured interviews based on the institutional theory and capability approach. The number of respondents was 48 government servants, from the top management to clerical staff, including 14 Human Resource Management Information System (HRMIS) users.

A brief literature review of the problem domain is discussed in the next section about related work in insourcing and then followed by an analytical framework by using the institutional theory and the capability approach. In section four, the use of a research methodology will be explained. While the findings are presented in section five and section six, the paper discusses insourcing an information system in the public organization. Finally, the conclusion and further work are explained in section seven.

2. RELATED WORK

Information and Communication Technologies (ICTs) are major enablers in private and government sectors in today's knowledge-driven economy (M. Samsudin et al., 2013). ICTs in government information systems are used to provide an online service and to improve the convenience, accessibility and quality of interactions (Ahmad & Othman, 2007). According to Heeks (2002), government needs to improve performance by making changes within public sector organizations. Therefore, the design of ICT in the government system should enable easy use and should give direct impact to individual and organizational performance (Gupta et al., 2008). However, government information systems are subject to legal and formal constraints which are often influenced by the political vagaries of changing administrations (Ward, 2006). Thus, the overall system development should be carried out thoroughly because the government information systems are very complex and complicated.

There are three types of ICT projects development and implementation, namely insourcing (internal personnel and expert); outsourcing (external services); and co-sourcing (external services with internal expert) (A. Nawi et al., 2012). As previously mentioned, few studies address insourcing of large-scale government information system. Insourcing an information system is the use of internal IT officers (in Malaysia, government staff members who are graded above clerical staff are titled officers) to continue the system development and maintenance. As mentioned by (Ahonen et al., 2009), organization preferred to outsource the information system espcially in Malaysia because Malaysia was ranked as the fifth most attractive country in Asia Pacific for outsourcing (Anon, 2014) due to its low costs of labor and taxes, good infrastructure, business environment and high levels of global integration (Noradiva et al., 2010).

A few studies of outsourcing has been conducted in Malaysia such as Khadaroo et al. (2013) that explained the model of e-government partnerships and David et al. (2007) highlighted that most organizations do not gain the advantages of the outsourcing engagement as expected. In addition, Aris et al. (2008) suggested a conceptual framework to examine the risk management in IT outsourcing projects in the organization. Whilst several studies were focused on the implementation and impact of outsourcing such as the relationship between client-developer (Haried & Ramamurthy, 2009; Heiskanen et al., 2008; Lacity et al., 2011; Moe et al., 2012), competencies of the worker (Hätönen & Eriksson, 2009; Moe et al., 2013) and risk management (Harland et al., 2006; Adeleye et al., 2004), there are fewer studies on insourcing. Moe et al. (2013) discussed the post-termination action after not receiving the expected benefits from the offshore outsourcing relationship. However, this study is focused on the factors and issues of

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

199

insourcing a government information system after the termination of the outsourcing contract in 2011.

Insourcing can provide constant service in a timely manner if the software architecture is well-defined and clearly documented that managed by internal officers who are responsible, trustworthy and familiar with an organizational policy and system (Park & Kim, 2005). Therefore, the competencies of the government IT officers are an important factor to ensure the officer has an up-to-date knowledge and skills that help the government to reduce dependence on vendors. Othman & Rahmat (2005) stated that the IT officer must have a very high competency level and committed to the projects before the initiation of the projects. Qu et al. (2010) claimed that the firm should develop the IT-related resources to the officers as part of their core competencies to achieve the strategic plan through IT investments. Moreover, the software engineering project can be cancelled due to the unavailability of experienced people when the project team was selected (Ahonen & Savolainen, 2010). Hirschheim & Lacity (2000) also added that the successful implementation of insourcing can help the companies to achieve cost savings of 20 per cent.

3. INSTITUTIONS AND CAPABILITIES

North (1990) defined the institution as the rule of the game in a society that the way society evolves through time that shaped by institutional change. The concept of institutions by Scott (2008), *"comprised of regulative, normative and cultural cognitive elements that, together with associated activities and resources, provide stability and meaning to social life"* (pp. 48). According to Oliveira & Martins (2011), organizational decisions are not only driven by goals of efficiency but also influenced by social and cultural factors and concerns for legitimacy. Thus, the organization would combine certain social norms, cultures, structures, and routines in order to achieve its mission and goals. There are various researchers have used the institutional analyses in their study such as Avgerou (2002); Kimaro & Sahay (2007); and Orlikowski & Barley (2001).

Sen (1999) has conceptualized the capability approach as a basic concern about human development of what their capability, responsibility, and the opportunity can do and be. Whereas, Robeyns (2005) defined the capability approach as the design of policies and proposal about social change in society that has a broad normative framework for the evaluation and assessment of individual well-being and social arrangements. Alkire (2008) stated that the capability approach is a working set of policies, activities, and recommendations to generate considerable capability expansion. It also to seek for empowering a person to become active agents in the social and political structures, and also within the home. However, the capabilities approach is difficult to identify which course of action is better, it could be better for some area or group but worse for others. It also detrimental to the freedoms of others either physical or psychological harms (Deneulin & McGregor, 2010). Nevertheless, the capability approach in the IT and information system domain has been applied in few studies (Madon, 2000; De', 2006; Zheng & Walsham, 2008).

The approach of this study is to combine institutional theory and the capability approach into a framework which is developed to create a model of insourcing in a government information system. The analytical framework can model factors which inhibit or enable individuals from taking full advantage of ICT resources. The framework is used to study the relationships between technology and institutions and how institutions recommend government information system according to their cultural, social and institutional features (Bass et al., 2013). The capabilities approach is focused on individual capabilities and their welfare, whereas institutional theory focuses on social and organizational factors.

A "bottom-up" perspective by the capability approach is the starting point that gives consideration to individuals' opportunities to achieve their wants and needs, whereas a "top-

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

200

down" perspective of institutional theory provides the rules and norms used to regulate interactions and transactions in society (Bass & Thapa, 2014). By combining these perspectives into a framework, we gain unique insights into our field of study.
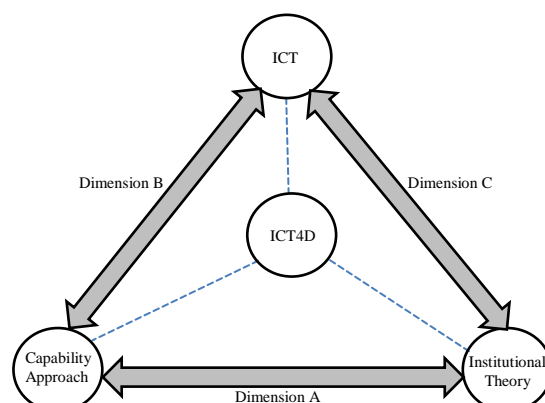
Figure 1. Institutional theory, the capability approach and ICT

The goal of a government information system can be affected by technology, the capabilities and institutions as shown in **Figure 1**. The influences or effects can either be positive or negative between institutions and capabilities; institutions and technology; technology and capabilities. The positive influence can be referred as an exciter and negative influence as an inhibitor.
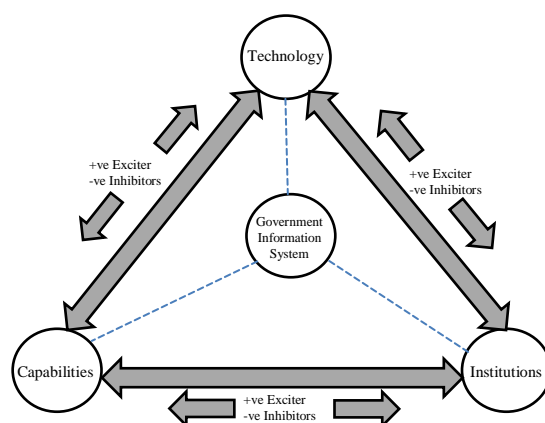
Figure 2. Exciters and Inhibitors

We have proposed an analytical framework by using the institutional theory and the capability approach that links institutions, capabilities and technology (**Figure 2**). Institutions, capabilities and technology play an important role in ensuring that a government information system is properly managed. The enforcement of key performance indicators (KPI) by the Secretary General of the Ministry can be seen as an exciter, whereas rigidity and reluctance to make changes by some government agencies can be seen as an inhibitor within the Institutions. For capabilities, knowledge sharing and Training of Trainers (ToT) are a catalyst for improving the knowledge and skills of IT officers. Conversely, the mind-set of a government servant can be an obstacle in the implementation of any government system or project. By providing communications between individuals and institutions, technology makes lives more convenient and has the potential to change every aspect of life. However, technological development should be in accordance with the current situation so that it can increase access to opportunities and help people to communicate with each other distant in both time and space via the internet.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

201

4. METHODOLOGY

We use a case study to perceive the applicability of the framework and the investigation of this research is outlined in the form of 'institutions', 'capabilities' and 'technology'. Thus, a qualitative research method was conducted by using a semi-structured interview technique to gather the data sources. This method is useful to get more rich data from the user's experience and open in posing questions to the interviewees. Ritchie et al. (2013) mentioned that this method can encourage the interviewee to talk freely when answering the question. It can allow the researcher to be responsive to relevant issues raised spontaneously by the interviewee.

4.1. Research Sites

Data was obtained and analyzed from two central government agencies and users of government information system in Malaysia. The interviews were conducted in Klang Valley, Malaysia (November 2013, December 2013 and January 2014) in total 48 interviews were conducted as shown in **Table 1**.

Organization	Date	Interviewee Job Titles	No.
Organization A, Cyberjaya, Malaysia	18 – 29 Nov., 2013	• Top management	1
		• Senior officers	9
		• Junior officers	5
		• Programmers	5
Organization B, Cyberjaya, Malaysia	2 – 13 Dec., 2013	• Top management	2
		• Senior officers	7
		• Junior officers	5
Various organizations, Klang Valley, Malaysia	17 Dec, 2013 – 8 Jan. 2014	• Clerical staff to Director	14
TOTAL			48

Table 1. Participating Organizations and Interviewee Job Titles.

Organization A was selected because it manages a large government information system on the aspects of human resource management. Users of the government information system were chosen from various government agencies that use the system provided by Organization A. Organization B was chosen because it is a central agency for administrative modernization and transformation of public service delivery systems, especially for the implementation of ICT development.

4.2. Data Collection

This study is a part of an on-going study; the interview questions were designed based on institutional theory and the capability approach, in order to obtain a broader and deeper approach to the research. This study uses empirical data from 48 semi-structured face-to-face interviews conducted between November 2013 and January 2014. The breakdown of interviews from the Malaysian government agencies for Organization A was 20, for Organization B was 14 and users of government information system were 14 participants (**Table 1)**. Participants were assured that any data used for publication will be anonymized.

The interviews were conducted in Malay in their office premises and transcribed in the Malay language. However, the data have been coded and categorized in English. The average interview lasted between 25 – 35 minutes and all the interview sessions were audio-recorded by using a tape-recorder. The interviews were then carefully transcribed, and the audio records were listened to many times and the transcripts inspected for errors to ensure the accuracy.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

202

4.3. Data Analysis

Data analysis involves examining, categorizing, tabulating, testing, or otherwise recombining the collected data for the purpose to produce empirically based findings (Yin, 2014). Patton (2002) describes that the recorded interview should be transcribed, reviewed, analyzed and coded. The interview transcripts were subjected to an iterative multi-step process of data analysis. As explained in the previous section, the research process started with the framework that describes the institutional changes, individual capabilities and technology events associated with the government information system. Subsequently, the data were processed by breaking them down into pieces to examine closely, compare for relations, similarities and dissimilarities found in the transcriptions.

The analysis, coding, grouping of codes and concept, and re-analysis of data were an interactive process in order to study all the issues arising to be grouped into categories representing common themes. The analytical framework was introduced and as a result of the analysis process and coding, twelve major categories emerged from the data, of which only six categories will be described in the findings section. These categories were selected to describe the two categories from each dimension that had highest frequency of responses.

5. FINDINGS

In this section, we consider the data through the lens of the analytical framework by using the institutional theory and the capability approach in dealing with insourcing a government information system. We focus on the main exciter and inhibitor in each dimension in this study. The finding is summarized in **Figure 3** that will form the basis of the contributions of this paper.
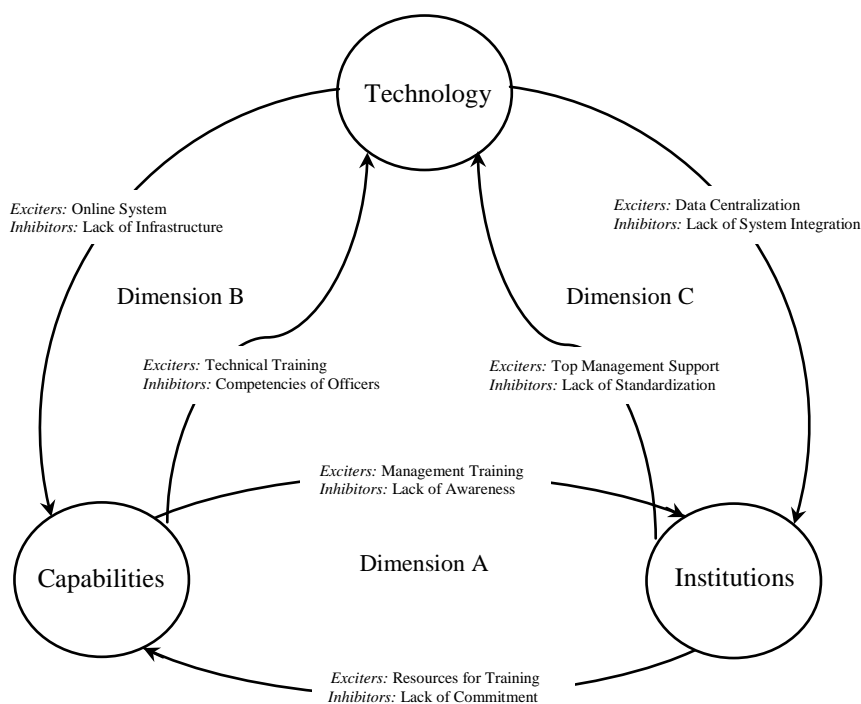
Figure 3. Summary of Findings

5.1. Institutions and Capabilities (Dimension A)

Resources for training are an exciter from Institutions to Capabilities. Resources for training can help to increase the officer's capacity and competencies in system development. The government gives full support to make sure there is a budget allocation to manage the training as stated by Management1: "*there is no problem for HRMIS (Human Resource Management Information System) in obtaining some budget from the government*". All expenses involved in the development, implementation, testing, training and maintenance for the HRMIS allocated

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

203

under the Development Budget as mentioned by Technical1: *"we (organization A) can always get a budget because HRMIS is under development budget"* and supported by Management5: *"we (Organization A) have the budget for next year… under development budget."* The budget allocation is an investment for the organization in managing the training. It is to ensure the officers have the knowledge, skills and abilities to execute the organization's strategic plan.

Programmers and technical officers obtain training from the National Institute of Public Administration (INTAN) to enhance their skills and knowledge as described by Developer2: *"I went for training organized from this Division (Organization A) or INTAN"* and Technical6: *"there is an opportunity to get training from INTAN"*. In addition, the government has provided a portal of training and facilities that consists of 346 public training institutes known as 1MTC (1Malaysia Training Centers) to encourage government servants to attend training as stated by Management13: *"all 346 agencies will update the information about courses and facilities in the portal and it's open to all"*. The organization needs to provide the best training resources so that the organization can create more experts, good quality officers and increasing the overall success of the organization.

Lack of awareness is an inhibitor from Institutions to Capabilities. A lack of awareness of the government information system causes the systems to be not widely used by the government servants, and the system cannot survive for longer periods of time. Currently, the government has 28 active government information systems as mentioned by Management11: *"the e-Government flagship, there were about 28 government projects."* However, the findings indicated that most users in this research were not aware of government information system projects in general and of online services in particular. This resulted users only using Human Resource Management Information System (HRMIS) as mentioned by User4: *"so far, I never used another system than HRMIS"* and User6: *"so far, only HRMIS"*. The government servants knew about the existence of the project or system if they were involved with the project as confirmed by Management13: *"there was lots of government system that we (government servant) did not know"* and User13:*"if Malaysian Administrative Modernisation and Management Planning Unit (MAMPU) did something, only the parties involved with the project will know what MAMPU was doing"*. Management13 also added most of the systems developed were based on the specific needs of certain groups: *"focusing on the targeted user group or a group of Malaysians"*. Thus, the promotion by the government must be improved to encourage the government servants to use the government information system more actively, thereby improving government administration and service delivery.

5.2. Capabilities and Technology (Dimension B)

Technical training is an exciter from Capabilities to Technology. Technical training can provide the officers a new skills and knowledge that focuses on the programming language, database, system architecture and methodologies. It is to increase the contribution to the development of organization through the utilization of acquired skills and knowledge as Technical2 said: *"I was given training on Java, framework and database related to Open Source, Postgres and Oracle"* and from Technical3: *"I have attended certified course... for system testing... Certified Tester Foundation Level (CTFL)"*. The statement also added by Technical6: *"we (Technical group) were exposed to the training database and system"*. Specific technical training is also provided by training providers to enhance the existing skills and knowledge as described by Developer3: *"training was more towards to Microsoft products such as SQL, ASP and ASP.Net"* and Developer4: *"we (developer) learnt about HTML5, Cascading Style Sheets (CSS) and JavaScript for a week"*. Continuous technical training is needed to help the officers to be upskilled to do new and different tasks, which keeps them motivated.

Lack of infrastructure is an inhibitor from Technology to Capabilities. Lack of infrastructure to access the system gives difficulties to use the system more effectively and efficiently. In this study, lack of infrastructure is more focused on network connectivity and ICT infrastructure in

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

204

the government agencies. With technology advancing rapidly, government agencies in the rural and remote areas still have problems with infrastructure as mentioned by Management13: *"sometimes they (government office in Sabah and Sarawak) had to reboot the servers a few times because of the black-out"* and Technical1: *"the infrastructure, especially in the ministry (headquarter) is good but how about the infrastructure in the rural or remote area?"*. The network and ICT infrastructure in federal agencies, especially in the Klang Valley is much better compared to other agencies situated outside Klang Valley as said by User9: *"users at the state agencies were hardly to access the system compared to the others at the federal agencies"*. Nevertheless, sometimes the network interruption happened even though the ICT infrastructure is good in the Klang Valley, as specified by Management1: *"sometimes there was an interruption of network either from the EGNet line or the network provided by Malaysian Administrative Modernisation and Management Planning Unit (MAMPU)"*. The infrastructure is important to make sure the system can be accessed at anytime and anywhere because with the sophistication of today's technology; infrastructure facilities can be provided anywhere, even in rural and remote areas.

5.3.   Institutions and Technology (Dimension C)

Data centralization is an exciter from Technology to Institutions. Data centralization can help the government to change, re-organize and analyze because all the information can be accessed from the same location at the same time. Previously, the data needed to be collected from the agencies to be consolidated as specified by Management1: *"In the past, we had to collect data from each agency, and it takes time"*. Currently, the information can be obtained more easily and quickly from one system as mentioned by the same interviewee: *"this system makes it easy to get information"*. Management3 also supported: *"government servant can find any information about service from the system (HRMIS)"* and User2: *"records are easily kept and easy to check back"*. Furthermore, centralized data can be a one-stop central system for government servants. It contains the service history from the date of appointment until the date of retirement as specified by User9: *"one stop center for information services of public servants, starting from the date of appointment until the date of retirement"*. Hence, the decision making process can be improved because the government can conduct proper human resource planning from the report for the career development of the government servants as stated by Management7: *"the system can generate a lot of things (reports) to the government for human resource planning and career"* and Management12: *"with the system, the government can know how many officers in the public sector. It is easy to monitor and make a plan"*. Data centralization is not only helping the government to conduct proper planning of human resources in the public sector more effectively and efficiently, but it can also improve the capacity of the ICT infrastructure.

Lack of standardization is an inhibitor from Institutions to Technology. Lack of standardization in policies and regulations will impede the implementation of an information system, and ICT projects cannot be extended to all government agencies. Any circular issued by the federal government may be adopted in whole or in part by the state, statutory bodies and local authorities becaue each administration has its own policies and regulations, especially in the implementation of the system as mentioned by Management5: *"for the state, Statutory Bodies and others are different process because they have their own acts"* and Technical5: *"the Public Service Department of Malaysia (PSD) can handle for the Federal agencies but others, they have their own acts"*. Moreover, the government agencies, even within the ministry or department, tend to work in silos that make it difficult to standardize the policies and regulations as pointed out by Management12: *"it (the department) is not united, seems like a work in silos"*. This statement is supported by Management13: *"every agency has its own core business. They (government agencies) tend to concentrate on their core business"*. Therefore, standardization in the policies and regulation is important to ensure the insourcing of an information system across government agencies can be implemented more systematic and effective.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

205

6. DISCUSSION

In this section, we will discuss the lack of awareness in Dimension A, technical training in Dimension B and a lack of standardization in Dimension C from our findings due to word count limit.

Lack of awareness occurred among government servants due to lack of promotion carried out by government authorities. Awareness among the government servants is important for insourcing because it can encourage government to develop an integrated system that meets the needs of users. The promotion of using a government information system (GIS) related to external users, but at the same time, it also can target government servants (Heeks, 2005). Currently, government users are not aware of the existence of GIS and they only use the Human Resource Management Information System (HRMIS). Many studies give less attention on the lack of awareness in the use of GIS. What we found in our findings is the need for promotion to create awareness to government servants because they are not aware of the GIS. There is a gap between the people who are aware and those who are not aware of GIS. The findings that contribute to this research are that government servants even within the organizations are not aware of the use of GIS, all of which will be an obstacle to implementing the insourcing of a GIS.

Technical training helps to enhance the competency of IT officers in programming language, methodologies, software architecture and database. According to Miller et al. (2006), by providing training and technical assistance to the officers, they can learn the principles of evaluation purpose, design, analysis, and reporting but it only produced short-lived results. This study is contrary to our findings that training that focuses only on the evaluation, design, analysis and reporting will inhibit the insourcing of an information system because the training should be focusing on technical skills and knowledge of the IT officer. Therefore, contributions for this research show that government must provide a systematic and continuous technical training programme, especially in programming language, methodologies, software architecture and database in order to enhance the capability and quality of IT officers.

The lack of standardization in Dimension C. Standardization of system and application is necessary for all parties so that the system can interoperate with different systems and applications. As stated by Sahay et al. (2003), the use of standard product design, development methodologies and benchmarked management processes can help the organizations develop a template with which they can interact, share information and communicate with others in a network spread across the globe. Conversely, Hirschheim & Lacity (1998) stated that different users have different preferences in using the software, especially for the packages of word processing, electronic mail, fourth-generation languages, and spreadsheets. Both studies have different views on standardization, but we agreed with the Sahay et al. (2003) study that standardization of policies and regulation is good for the implementation of the system across government agencies to make the system easily accessible and cost effective. However, based on our results, most Malaysian government agencies tend to work in silos, and they have their own policies and regulations. Thus, as a contribution, standardization is different among the organizations depending on the policies and regulations because the different agency has different service provided and demands of the customers or within the organization.

7. CONCLUSION AND FUTURE WORK

This study is focused on the post-termination actions following the termination of an outsourcing contract in 2011 that developed the Human Resource Management Information System (HRMIS). HRMIS with approximately 650,000 users is one of the government information systems to be insourced. Since most articles focus on outsourcing in the private sector, this research has investigated the factors and issues associated with insourcing in the public organization that can contribute to filling the literature gap. The vendor's contract was terminated because the fundamental problems were not solved, such as a slow system response

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

206

time, cost and lack of user-friendliness. Hence, insourcing an information system helps the organization to improve the quality of public services by continuing to develop and maintain the system.

The data was gathered from selected government agencies in Malaysia with 48 interviews of government servants. The semi-structured interview technique was used to obtain more rich data from the user's experience. This paper analyzes all information gathered to map with an analytical framework by using a combination of institutional and capability approaches. The analytical framework is difficult to use because it is hard to understand both the institutional theory and capabilities approach. Each has its own substantial body of literature which must be accessed and understood.

Project costs do not neatly map to the analytical framework because they can be mapped into all dimensions in the framework. The implementation of insourcing can reduce the cost of maintenance, the vendor's contract agreement and the cost of problem solving by the vendor (Institutions). Simultaneously, the cost also can increase for staff training (Capabilities) and the purchase of the software license and ICT equipment (Technology). However, this analytical framework helped to identify the factors and issues of insourcing a government information system (GIS) and its adoption by public organizations. The factors are resources for training, technical training and data centralization and a lack of awareness; infrastructure and standardization are the issues of insourcing a GIS. It also help the practitioners, policymakers and managers to understand and direct the institutional arrangements for living well together which involve the capability of people to participate in policy decisions which affect their lives.

From the discussion section, technical training is a factor to improve skills and knowledge in programming language, methodologies, software architecture and databases that contribute to enhancing the capability and quality of IT officers. A lack of awareness is an issue for insourcing an information system where government servants' awareness of GIS plays an important role to increase the use of GIS in order to sustain the system for longer periods of time. Therefore, government needs to boost the promotion of GIS activities to create awareness of GIS among government servants. Standardization is another issue in our research because it can allow the systems or application to communicate or integrate very well. However, every organisation has its own planning and strategies in achieving its goals for the type of services provided and demand of the customers.

As further work, a second data collection has been planned in order to see the progress of the system and we also propose to obtain more participation, responses and data from large public organisations to explore how the organizational and technological factors will influence the implementation and represent the practice of insourcing as a whole. This study will assist as a guide to organizations that want to implement insourcing an information system, and will give some credit and recognition to internal IT officers for their skills and knowledge.

8. ACKNOWLEDGEMENT

9. REFERENCES

A. Nawi, H. S., A. Rahman, A., & Ibrahim, O. (2012). Government ICT project failure factors: Project stakeholders' views. *Journal of Research and Innovation in Information Systems, 2*(a), 69-77.

Ahmad, M., & Othman, R. (2007). Implementation of electronic government in malaysia: The status and potential for better service to the public. *Public Sector ICT Management Review, 1*(1), 2-10.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

207

Ahonen, J. J., Valtanen, A., Savolainen, P., Schalkowski, T., & Kontio, M. (2009). Outsourcing through combining software departments of several companies. . *In Software Engineering Approaches for Offshore and Outsourced Development, Springer Berlin Heidelberg, ,* 1-14.

Ahonen, J. J., & Savolainen, P. (2010). Software engineering projects may fail before they are started: Post-mortem analysis of five cancelled projects. *Journal of Systems and Software, 83*(11), 2175-2187. doi:http://dx.doi.org/10.1016/j.jss.2010.06.023

Alkire, S. (2008). Using the capability approach: Prospective and evaluative analyses'. *The Capability Approach: Concepts, Measures and Applications, Cambridge University Press, Cambridge,* 26-50.

Anon. (2014). *2014 tholons top 100 outsourcing destinations: Regional overview* . (). New York, USA: Tholons Advisory, Investments and Research Services.

Aris, S. R., Arshad, N. H., & Mohamed, A. (2008). Conceptual framework on risk management in IT outsourcing projects. *Management, 36*(37), 38.

Avgerou, C. (2002). *Information systems and global diversity* . Oxford, United Kingdom: Oxford University Press.

Bass, J. M., Nicholson, B., & Subrahmanian, E. (2013). A framework using institutional analysis and the capability approach in ICT4D. *Information Technologies & International Development, 9*(1)

Bass, J. M., & Thapa, D. (2014). Multi-casting in mountainous regions of developing countries: Analysis through ICT, institutions, and capabilities perspectives. *In System Sciences (HICSS), 2014 47th Hawaii International Conference,* 3327-3336.

David, F. B., Yuserrie, Z., Au Tin, C., Syed Azizi, W., Sonali, M., & Syed, N. (2007). Successful IT outsourcing engagement: Lessons from malaysia. *The Electronic Journal on Information Systems in Developing Countries, 30*(5), 1-12.

De', R. (2006). Evaluation of e-government systems: Project assessment vs development assessment. *Electronic Government: 5th International Conference, EGOV 2006, Kraków, Poland, September 4-8, 2006. Proceedings,* 317-328.

Deneulin, S., & McGregor, J. A. (2010). The capability approach and the politics of a social conception of wellbeing. *European Journal of Social Theory, 13*(4), 501-519.

Freytag, P. V., Clarke, A. H., & Evald, M. R. (2012). Reconsidering outsourcing solutions. *European Management Journal, 30*(2), 99-110. doi:http://dx.doi.org/10.1016/j.emj.2011.11.002

Gupta, B., Dasgupta, S., & Gupta, A. (2008). Adoption of ICT in a government organization in a developing country: An empirical study. *The Journal of Strategic Information Systems, 17*(2), 140-154. doi:http://dx.doi.org/10.1016/j.jsis.2007.12.004

Haried, P., & Ramamurthy, K. (2009). Evaluating the success in international sourcing of information technology projects: The need for a relational client-vendor approach. *Project Management Journal, 40*(3), 56-71. doi:10.1002/pmj.20113

Hätönen, J., & Eriksson, T. (2009). 30+ years of research and practice of outsourcing – exploring the past and anticipating the future. *Journal of International Management, 15*(2), 142-155. doi:http://dx.doi.org/10.1016/j.intman.2008.07.002

Heeks, R. (2002). Reinventing government in the information age. *Reinventing Government in the Information Age: International Practice in IT-Enabled Public Sector Reform, ,* 9-21.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

208

Heeks, R. (2005). *Implementing and managing eGovernment: An international text* Sage Publications.

Heiskanen, A., Newman, M., & Eklin, M. (2008). Control, trust, power, and the dynamics of information system outsourcing relationships: A process study of contractual software development. *The Journal of Strategic Information Systems, 17*(4), 268-286. doi:http://dx.doi.org/10.1016/j.jsis.2008.10.001

Hirschheim, R., & Lacity, M. (2000). The myths and realities of information technology insourcing. *Communications of the ACM, 43*(2), 99-107.

Hirschheim, R., & Lacity, M. C. (1998). Reducing information systems costs through insourcing: Experiences from the field. *System Sciences, 1998., Proceedings of the Thirty-First Hawaii International Conference On, , 6* 644-653 vol.6. doi:10.1109/HICSS.1998.654826

Khadaroo, I., Wong, M. S., & Abdullah, A. (2013). Barriers in local e–government partnership: Evidence from malaysia. *Electronic Government, an International Journal, 10*(1), 19-33.

Khan, S. U., Niazi, M., & Ahmad, R. (2011). Factors influencing clients in the selection of offshore software outsourcing vendors: An exploratory study using a systematic literature review. *Journal of Systems and Software, 84*(4), 686-699. doi:http://dx.doi.org/10.1016/j.jss.2010.12.010

Kimaro, H. C., & Sahay, S. (2007). An institutional perspective on the process of decentralization of health information systems: A case study from tanzania. *Information Technology for Development, 13*(4), 363-390. doi:10.1002/itdj.20066

Lacity, M. C., Solomon, S., Yan, A., & Willcocks, L. P. (2011). Business process outsourcing studies: A critical review and research directions
. *Journal of Information Technology, 26*(4), 221-258.

Lacity, M. C., Khan, S. A., & Willcocks, L. P. (2009). A review of the IT outsourcing literature: Insights for practice. *The Journal of Strategic Information Systems, 18*(3), 130-146. doi:http://dx.doi.org/10.1016/j.jsis.2009.06.002

M. Samsudin, N., Hashim, R., & S.M Fuzi, S. F. (2013). Electronic government outsourcing issues in malaysia. *Journal of Outsourcing & Organizational Information Management, 2013*

Madon, S. (2000). The internet and socio-economic development: Exploring the interaction. *Information Technology & People, 13*, 85-101.

Miller, T. I., Kobayashi, M. M., & Noble, P. M. (2006). Insourcing, not capacity building, a better model for sustained program evaluation. *American Journal of Evaluation, 27*(1), 83-94.

Moe, N. B., Smite, D., & Hanssen, G. K. (2012). From offshore outsourcing to offshore insourcing: Three stories. *In Global Software Engineering (ICGSE), 2012 IEEE Seventh International Conference ,* 1-10.

Moe, N. B., Šmite, D., Hanssen, G. K., & Barney, H. (2013,). From offshore outsourcing to insourcing and partnerships: Four failed outsourcing attempts. *Empirical Software Engineering*, pp. 1-34. doi:- 10.1007/s10664-013-9272-x

Noradiva, H., Aini, A., Ruhanita, M., Sofiah, M. A., & Rozita, A. (2010). Outsourcing decision processes: A case study of a malaysian firm. *African Journal of Business Management, 4*(15), 3307-3314.

North, D. C. (1990). *Institutions, institutional change and economic performance*. UK: Cambridge University Press.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

209

Oliveira, T., & Martins, M. F. (2011). Literature review of information technology adoption models at firm level. *The Electronic Journal Information Systems Evaluation, 14*(1), 110-121.

Orlikowski, W. J., & Barley, S. R. (2001). Technology and institutions: What can research in information technology and research on organizations learn from each other? *MIS Quarterly, 25*, 145-165.

Oshri, I., Kotlarsky, J., & Willcocks, L. (2009). *The handbook of global outsourcing and offshoring*. New York, USA: Palgrave Macmillan.

Othman, R., & Rahmat, A. R. (2005). The analysis of electronic government blueprint for implementation towards the actual e-government implementation. *In Knowledge Management International Conference and Exhibition,* 487-494.

Park, J., & Kim, J. S. (2005). The impact of IS sourcing type on service quality and maintenance efforts. *Information & Management, 42*(2), 261-274. doi:http://dx.doi.org/10.1016/j.im.2003.08.005

Patton, M. Q. (2002). *Qualitative research and evaluation methods
* (3rd Edition ed.). California, USA: SAGE Publications, Inc.

Qu, W. G., Oh, W., & Pinsonneault, A. (2010). The strategic value of IT insourcing: An IT-enabled business process perspective. *The Journal of Strategic Information Systems, 19*(2), 96-108. doi:http://dx.doi.org/10.1016/j.jsis.2010.05.002

Ritchie, J., Lewis, J., Nicholls, C. M., & Ormston, R. (2013). *Qualitative research practice: A guide for social science students and researchers* SAGE Publications, Inc.

Robeyns, I. (2005). The capability approach: A theoretical survey. *Journal of Human Development, 6*(1), 93-117. doi:10.1080/146498805200034266

Sahay, S., Nicholson, B., & Krishna, S. (2003). *Global IT outsourcing: Software development across borders* Cambridge University Press.

Schniederjans, M. J., Schniederjans, A. M., & Schniederjans, D. G. (2005). *Outsourcing and insourcing in an international context* ME Sharpe.

Scott, W. R. (2008). *Institutions and organizations: Ideas and interest*. California, USA: SAGE Publications, Inc.

Sen, A. (1999). *Development as freedom
*. Oxford, United Kingdom: Oxford University Press.

Ward, M. A. (2006). Information systems technologies: A public-private sector comparison. *Journal of Computer Information Systems, 46*(3), 50-56.

Yin, R. K. (2014). *Case study research: Design and methods* (5th Edition ed.). California, USA: SAGE Publications, Inc.

Zheng, Y., & Walsham, G. (2008). Inequality of what? social exclusion in the e-society as capability deprivation. *Information Technology & People, 21*, 222-243.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

210

BUILDING A COMPETITIVE IMPACT SOURCING SECTOR: A CASE OF MALAYSIA

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Abstract: This study attempts to evaluate whether Malaysia has the necessary resources to develop a competitive Impact Sourcing (ImS) sector. ImS is claimed to have created employment opportunities to marginalized communities by bringing simple, low-value outsourcing tasks to these communities. This study uses Porter's Diamond Model to evaluate whether Malaysia has the resources and conditions to start, grow and sustain ImS. The findings of this study show that availability of good ICT infrastructure, vibrant BPO presence and strong government commitment could bring ImS forward. However issues of low motivation among workers, lack of demand and absence of micro payment systems pose as threats to ImS growth. Unless these issues and challenges are sufficiently dealt with, the full benefits and potential of ImS could not be realized. The findings of this study will help relevant agencies to formulate strategies and policies to spur ImS growth in Malaysia.

Keywords: Impact sourcing, socially responsible sourcing, rural sourcing, Porter's Diamond Model, Malaysia.

1. INTRODUCTION

Impact Sourcing (ImS) is an outsourcing practice that employs marginalized individuals to provide outsourcing services such as data entry and transcription, which are mainly IT-enabled tasks. These marginalized and disadvantaged individuals including the poor and the disabled usually do not have many opportunities for formal employment due to their conditions. Unlike conventional outsourcing, which is mainly focused on cost saving, ImS emphasizes on the socio-economic impacts it brings to these individuals and the community in which it operates. To the international development community ImS could be seen as a response for a more active role of business enterprises in poverty alleviation programs (Prahalad & Hart, 2002; Smith & Pezeshkan, 2013). At the national or community level, it is claimed that ImS has produced benefits including increased employment opportunities for disadvantaged individuals including the youth and happier and healthier people (Accenture, 2012).

A study by Kennedy et. al (2013) identifies 20 countries that have desirable characteristics for ImS in terms of business environment, Base of Pyramid (BoP) characteristics, education, labour force and Business Process outsourcing (BPO) industry characteristics. Eight of these countries (i.e. India, Kenya, South Africa, Ghana, Uganda, Nigeria, Cambodia, Vietnam) have already had established IS presence. Malaysia, with the other 11 countries (i.e. Brazil, Sri Lanka, Senegal, Morocco, China, Egypt, Philippines, Mexico, Costa Rica, Jordan and Argentina) in which ImS is still largely at the formative stage are seen as having the best potential for expansion of ImS in the future.

To date, to the researcher's knowledge, all of the studies that have been done on ImS are focused on countries where ImS is already established. Research in countries where ImS is still at formative stage such as Malaysia is needed so that deeper understanding could be gained on the issues and challenges unique to that particular group of countries. In this regard, (Heeks & Arun,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

211

2010) caution any attempt to "photocopy" an existing blueprint of ImS and emphasize on the importance of context. As ImS is a worldwide phenomenon, different country contexts might offer opportunities to enrich the theoretical findings (Malik et al., 2013).

Previous studies have identified a number of criteria desirable for ImS development. However, they either compare countries according to their attractiveness to ImS (e.g. Kennedy et al., 2013), describe the success of particular ImS initiative or propose actions to develop ImS in a prescriptive manner. None of the studies investigate the issue of competitiveness in ImS. It is argued that to ensure sustainability of an ImS project, ImS is best run as a (social) enterprise where commercial and social goals are simultaneously emphasized on pursued (Castresana, 2013). Thus, the study of competitiveness is still relevant and too important to ignore in the realm of ImS. At the national level, in-depth studies are needed to analyze whether a nation has of what it takes to build a competitive ImS sector. The understanding gained in this analysis would help government agencies in formulating favorable policies to stimulate and grow the sector.

Thus, the purpose of this study is to uncover the underlying processes or mechanisms that influence the ability of Malaysia to develop a competitive ImS sector. To achieve this objective, this study asks this question: What enables and constraints Malaysia to build a competitive ImS sector?

2. LITERATURE REVIEW

2.1. Impact Sourcing: motivation, drivers and enablers

The term "Impact Sourcing" was coined by the Monitor Group (2011) in their report. Prior to the work of Rockefeller foundation, similar initiatives (although some might have different emphasis) were given different names including corporate social responsibility (CSR) in outsourcing (Babin, 2008), sustainable global outsourcing (Babin & Nicholson, 2009), social outsourcing (Heeks & Arun, 2010) and rural outsourcing (Lacity et al., 2011). In this report, ImS is defined as "employing people at the base of pyramid, with limited opportunity for sustainable employment, as principal workers in business process outsourcing (BPO) centers to provide high-quality, information-based services to domestic and international clients" (Monitor Group, 2011).

As ImS is still at its nascent stage, understanding of the motivation of its stakeholders' (buyers, providers and workers) engagement and the enablers and barriers of their engagement is crucial in order to advance the sector further. So far, there are no academic research conducted specifically to investigate these issues with an exception of Malik et al. (2013) that study the enablers and barriers to ImS engagement among disadvantaged individuals. The motivations, enablers and barriers identified in the literature are mostly from consulting reports. Although the findings from the professional studies are useful, they are generally descriptive, lacking theoretical framework and often aimed at addressing immediate issues.

At the national level, economic and political benefits could be the motivation for governments to embrace ImS (Accenture, 2012; Heeks & Arun, 2010). E-government projects are considered an important factor that boost demand for ImS at the national level (Monitor Group, 2011; Avasant, 2012). They also agree that a strong presence of donors play an important enabling role especially in countries where public fund is limited. Kennedy et al. (2013) and Monitor Group (2011) find out that decreasing ICT cost is what makes ImS possible as communication costs such as broadband is much more affordable. In addition, Monitor Group (2011) identifies another five enabling conditions; increased demand for digitalization, global demand for low end ICT tasks, ImS promotion, a strong BPO presence and existing telecentres. Tax incentives, financial grants (Accenture, 2012; Avasant, 2012) and hiring incentives (Avasant, 2012) are found to play an important role in attracting firms to engage in ImS. Avasant (2012) also finds

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

212

out entrepreneurship spirit among BoP community is important in building a vibrant ImS ecosystem.

Monitor Group (2011) find out the lack of regulatory and monitoring frameworks and low education among disadvantaged individuals are among the factors that could constraint ImS growth. This is concurred by Avasant (2012) that cited the lack of skilled workforce as an issue that need immediate attention. Further, absence of good ICT and other physical infrastructure are found to be a major stumbling block of ImS (Accenture, 2012; Avasant, 2012).

2.2. Impact Sourcing in Malaysia

In Malaysia, the initiative similar to ImS started in 2012 when Digital Malaysia was launched aiming at advancing Malaysia as a developed digital economy by 2020. There are eight projects of in the Digital Malaysia of which "Micro Sourcing to generate Income for the B40" is one of them. Although it is named as micro sourcing (later change to crowd sourcing), the aim is similar to ImS which is to provide employment opportunities to the B40 group of people; defined as the lower 40% of Malaysian population that earn less than RM3050 (US$850) per month. There are currently four local ImS service providers. B40 Division of Multimedia Development Corporation (MDeC), a government agency acts as the facilitator in the micro sourcing project. This project is run in collaboration with Ministry of Women, Family and community, which act as the sponsor (Salleh et al., 2013).

As ImS is a new phenomenon, particularly in Malaysia, the number of individuals engaged in ImS is still small. In 2013 there were 1,147 B40 individuals trained for microwork of which 300 members are actively participating in digital employment with the value of income to B40 workers amounting to RM100,000 (US$27,000). By 2020 ImS is targeted to contribute RM2.23 billion (US$750 million) to the Gross national Income (GNI) and create 340,000 microworkers (Digital Malaysia, 2013).

Although ImS has already made its presence in Malaysia, its ability to grow, sustain and become a competitive sector is still questionable. Thus this study attempts to investigate the conditions that could enable ImS to grow and the conditions that could impede ImS development in the context of Malaysia.

3. CONCEPTUAL FRAMEWORK

As previously argued, for the sake of its sustainability, ImS is best presented a practice that strives for a mix of commercial and social goals. Being partly a commercial endeavor, the study of competitiveness in this sector is as important as in other business-focused sectors. This is the main reason for the selection of Porter's Diamond Model (PDM) to explain a nation's ability to build a competitive sector. Besides PDM is the most popular theory used to analyze competitiveness (Heeks, 2006).

PDM emphasizes home base as the launch pad for global competitiveness of firms. This models has been used to analyze sector such as software sector (Heeks, 2006), an industry (Jin & Moon, 2006; Mann & Byun, 2011) and a country (e.g. Barbe, Magdalena, & Triay, 2011; Chobanyan & Leigh, 2006; Hodgetts, 1993).
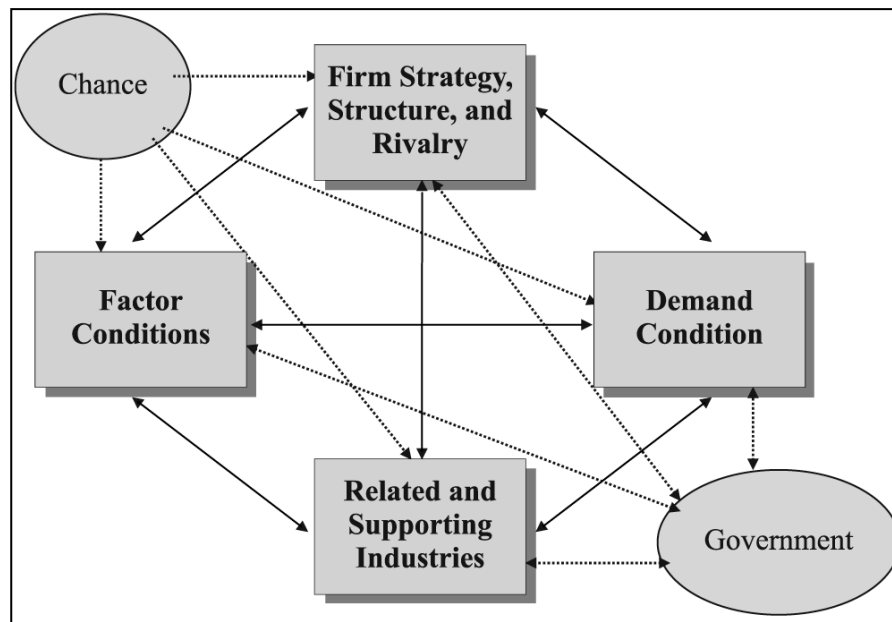
Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

213

Figure 1. Porter's Diamond model, Porter (1998)

This model identifies four components that determine a competitiveness of an industry or sector; factor conditions, demand condition, related and supporting industries and firm strategy, structure and rivalry.

Factor conditions refer to factors necessary for production of goods and services. Porter classifies the factors into human, physical, knowledge, capital and infrastructural resources. Porter argues that advanced factors such as modern digital communication infrastructure, highly educated personnel and university research institutes are more important than basic factors such as natural resources, climate, location, unskilled and semi-skilled labour, and debt capital in creating a nation's competitive advantage. Similarly, he suggests that specialized factors such as narrowly skilled personnel and infrastructure with specific properties and limited applicability weigh more than generalized factors such as highway system and a generalized supply of debt capital in determining a nation's competitive advantage.

Demand conditions are concerned with home base demand for the products or services in the industry. Porter suggests that the composition of demand especially home demand is more important than the market size. Domestic demand is important because when there is a conflict between the needs of local and foreign markets, the former usually emerges as the winner (Porter, 1998).

Related and supporting industries are concerned with the existence of domestic suppliers to the focal industry who are competitive themselves. These suppliers may provide cost-effective inputs, encourage informal joint efforts of ideas generation and problem solving and stimulate other firms to innovate. In this regard, local suppliers are preferable to foreign ones due lower transaction costs, proximity, and "cultural similarity" (Porter, 1998, p. 106).

Firm strategy, structure and rivalry refer to the importance of the way in which firms are created, organised and managed in determining their competitiveness. The probability of a nation to succeed in a particular industry increases when the sources of national environment correspond with the industries' sources of competitive advantage. The presence of intense rivalry in the home base creates pressure to innovate in order to upgrade competitiveness.

Outside of the diamond there are two elements; government and chance.

Government can influence positively or negatively each of the above four determinants of competitiveness which can occur at local, regional, national or supranational level. However government cannot of itself create competitive advantage (Porter, 1998).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

214

Chance refers to occurrences that are outside of control of a firm such as wars and technological changes that can positively or negatively influence the other four determinants (Porter, 1998).

4. METHODOLOGY

4.1.   Research Approach

This study is based on a critical realist case study methodology case study to explore and discover observable and unobservable mechanisms that cause a phenomenon (i.e. ImS) to happen. The primary objective of critical realist-based research is to understand why and how a phenomenon happened through empirically supported statements of causation (Wynn & Williams, 2012). This fits very well with the objective of this study; to understand why the state of ImS in Malaysia is what it is, which can be achieved by answering the question of how this happened or what caused this to happen.   The understanding of this phenomenon may come from the accounts of the actors (i.e. government officials, marginalized workers) and from other sources, which are observable (e.g. documents, rules, practice) or unobservable (e.g. culture, politics, other social institutions).

4.1. Data Collection

The fieldwork took place in Malaysia, with interview as the main method of data collection. Purposive sampling which is the most frequent form on non-probability sampling technique used in qualitative was used in this study (Miles & Huberman, 1994). 14 people participated in this study which is enough for saturation to be achieved (Saunders, 2012) for heterogeneous population like in this study. Interviews were conducted between 16 November and 20 December 2014 involving 14 people which resulted in 15 hours of recording.

Organisation	Total	Designation	Code
MDeC	2	General Manager of B40 Division	R1
		Manager of B40 Division	R2
Academics	1	Associate Professor & Director of Crowd sourcing Business Innovation Centre	R3
NGO	1	Director	R4
Consultant	2	CEO of global outsourcing consultancy	R7
		Director of local ICT consultancy	R8
ImS Providers	4	Managing Director	R9
		Managing Director	R10
		Managing Director	R11
		Senior manager	R12
B40 individuals	4	Worker	R13
		Worker	R14
		Worker	R15
		Worker	R16

Table 1. Research Respondents

5. DATA ANALYSIS AND FINDINGS

In this study, data were analyzed using template analysis technique (King, 2012). The analysis and findings are presented according to this order; factor conditions, demand conditions, related and supporting industries, firm strategy, structure and rivalry and government.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

215

5.1. Factors Conditions

5.1.1. Human Resource

In Malaysia, the target group of ImS initiative is B40 members. The choice of B40 is mandated by the Ministry of Women, Family and Community. This is also in line with the Tenth Malaysia Plan (2010-2015) that specifically target to improve the standard of living of the B40 group. This choice presents, simultaneously, some advantages and challenges.

Criteria	Description
Income	Household income of less than US$1000 (RM3050)
Size	11.7 million people 73% are Bumiputera 7.6% classified as poor and 1.8% as hard-core poor
Education level	52.3% have no school qualification 25.4% have SPM (high school certificate) 17.9% have PMR (junior school certificate)

Table 2. B40 characteristics

As shown in Table 2, there are 11.7 million people that fall under this category (Digital Malaysia, 2013) which provide a large pool of talent for the industry to choose from. However B40 suffers a low level of English proficiency. In ImS English proficiency is important because most of the jobs advertised are in English. The General Manager of B40 comments:

> *They have low proficiency in English. They need to understand English as the instruction is usually in English. (R1)*

This could be explained by the fact that more than half of the B40 members do not have any school qualification. English is taught throughout the 11 years of schooling, thus a person without a school qualification might have not learned English at all or have learned English at only the elementary level.

A low attrition rate has been cited as one of the advantages of ImS over traditional outsourcing (Avasant, 2011). However this is not the case in Malaysia where ImS suffers high attrition rates. For instance, in 2013, platform providers recruited and trained 3,217 B40 individuals, however only 1,229 (38.2%) of them earned some additional incomes through this programme, making the attrition rate of 61.8%. This high attrition rate could be explained by the comment made by the director of NGO and the General Manager of B40:

> *The Malay groups made up the biggest number of dropouts partly because they received other assistance such as zakat (alms). They lacked the motivation to persevere. (R4)*

> *They are not desperate enough for the job as they got other forms of help zakat (alms), help from their MPs, BR1M (1 Malaysia People's Aid). (R1)*

The low level of desperation for jobs can be explained by the many formal and informal mechanisms that are in existence that help the poor, especially Bumiputera which make up the biggest group (73%) of the B40 members. Malaysian government, in all its long term economic policies from New Economy Policy (1970-1990), New Development Policy (1991-2000), National vision Policy (200-2010) to the latest New Economy Model (2010-2020) has always made poverty eradication in the agenda. This is mostly evident during NEP and NDP which witnessed the establishment of numerous government agencies such as Yayasan Basmi Kemiskinan (Poverty Eradication Foundation), Majlis Amanah Rakyat (Mara) and Pusat Zakat (alm centres). These agencies primarily focus on capacity building of their targeted groups, however assistance could also be in the form of cash and subsidies. For example cash is handed out to qualified recipients by Pusat Zakat and in PPRT- Projek Perumahan Rakyat Termiskin (Housing Project for the Hardcore Poor) the poor are given hefty discounts in house purchase. Further these economic policies have been described as pro-Bumiputera or 'ethnicity-oriented'

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

216

(Roslan, 2001). More recently the government has given BR1M- Bantuan Rakyat 1Malaysia (1Malaysia People's Aid), a cash hand-out to the B40 individuals in three consecutive years (2012-2014) purportedly to help people cope with rising living costs. In addition to these formal institutions and mechanisms that the poor can turn to when they need help (without having to "work"), there is an informal practice of assemblymen giving cash assistance to the members of their constituency. This has become a norm or even cultural, something expected of from an assemblyman.

5.1.2. ICT Infrastructure

Generally Malaysia has a good ICT infrastructure which augurs well for the development of ImS. This was stressed by one of the consultants interviewed who opines:

> *Enabling infrastructure is not an issue, we have good ICT infrastructure. (R6)*

In this paper, due to space limit the focus is on the existence of telecentres although there are other infrastructures worth investigating (i.e. broadband network and cloud computing).

Currently there are 2,477 telecentres all around Malaysia that to cater for the ICT needs in different locations and different target groups of people. These telecentres were built mostly as a response to reduce the digital divide between urban and rural population. Thus most of these telecentres are located in rural areas (Meng et al., 2013). These telecentres are equipped with internet access, basic computing hardware and software that make them suitable for ImS. Most Telecentres are still underutilised and thus can be used as location for training as well as delivery centres for ImS. However, since these telecentres are under the control of different ministries, MDeC and platform providers faced issues in gaining permission to use them. These telecenteres were originally built for specific objectives and not for commercial activities like ImS. In the interview, the Manager of B40 comments:

> *The opening hours of these centres are between 8.00am and 4.00pm. If they were to at night this would increase the operating cost and they don't want that. (R2)*

Despite their best hope and effort, bureaucracy and poor coordination between ministries that own these facilities hampered their effort to make use of these existing facilities. As a response to this challenge, recently MDeC launched eRezeki in which establishments such as the existing Urban Tranformation Centres (UTC), Rural Transformation Centres (RTC), community colleges and mosques with existing computing facilities are identified as digital working centres as training and delivery venues for ImS (The Star, 2015).

5.2. Demand Conditions

In its basic definition, demand conditions could be translated into the quantity and quality of demand. In this model Porter stresses more on the quality of the demand as he argues that the sophistication of home base demand will encourage domestic players to innovate better products and services. However considering the newness of ImS, the concern is more on the size of the demand. The issue of demand sophistication has not arisen yet, at least for now.

5.2.1. Low Level of Awareness

Demand for ImS is still minimal. This could be due to the low level of awareness among companies who are potential clients of ImS. This is echoed by the Manager of B40:

> *The key issue here is demand from clients… their awareness of ImS is low. (R2)*

They lack knowledge about the industry which calls for setting up of awareness programs to propagate the concept of ImS to the industry. Only when companies are aware of the existence of ImS and have had experience with its services, can they demand for more sophisticated services.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

217

Based on data collected between January and June 2012, 77% of the demand for ImS come from SMEs, 18% come from MNC and government only contributes 1% of total demand (Digital Malaysia, 2013).

5.3. Related and Supporting Industries

Porter contends that the existence of strong related and supporting industries in home base country is important in building the competitiveness of the focal industry. In this regard, the existence of vibrant BPO sector plays an important role in enhancing the competitiveness of ImS.

5.3.1. Vibrant BPO Industry

Most of the studies on ImS sponsored by Rockefeller Foundation consider ImS as an offshoot of BPO. Kennedy et al. (2013), another study sponsored by Rockefeller identified the existence of BPO as one of the elements in determining the attractiveness of a location for ImS. In this study, the existence of vibrant BPO in Malaysia is considered as the plus point for Malaysia as an ImS location. There are more than 250 foreign and MNCs who have set up regional and global shared services and outsourcing (SSO) centres, in which BPO is one of the activities. In 2014, Malaysia is ranked third in the A.T. Kearney Global Services Location Index. One of the consultants interviewed explains how ImS could benefit from BPO:

> *Malaysia has a vibrant BPO industry, it's the easiest way to create new jobs for Impact Sourcing. (R5)*

This is concurred by the General Manager of B40 when he says:

> *BPO is expected to climb higher in the value chain and channel the low value jobs to CS program. (R1)*

The existence of vibrant BPO industry in Malaysia is attributable to a few number of factors. First, there is a strong government support through the establishment of SSO cluster in MDeC that facilitates the growth of SSO industry in terms of its capability, capacity and credibility. In addition, SSO is recognised as one of the focuses in the country's Economic Transformation Plan to bring Malaysia to a "high income", knowledge-based economy by 2020 (Digital Malaysia, 2013). Numerous incentives including tax incentives are given to attract foreign and local firms to set up their SSO centres in Malaysia. Secondly, Malaysia offers skilled talent pool to work in SSO centres. Thirdly, the existence of first world infrastructure such as expansive broadband and highway improves connectivity and ease of travel.

5.3.2. Electronic Payment System

As mentioned earlier the model of ImS currently practiced in Malaysia is similar to micro sourcing or crowd sourcing where workers are remotely engaged. In this type of setting, the ability for workers to conveniently receive payment from distance employers is an important element of the whole model (Hirth et al., 2011). However there is an absence of local electronic system that enables workers to receive micro payment immediately after jobs are done. MyClear and MEPS are two major payment gateways currently available in Malaysia but they only allow payment to companies not individuals. Despite regarded as important, the issue has not been sufficiently dealt and this is acknowledged by the B40 manager when he says:

> *We still have issues on how to pay the workers....B40 workers want payment immediately, we can't use Paypal because the transaction fees are high and there is a threshold before a withdrawal can be made. (R2)*

Currently most workers receive payment via electronic bank transfer which may cause inconveniences to both parties, the senders and recipients. Further, workers want assurance that they get paid for every job performed and employers want to ensure only jobs done according to

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

218

the specification get paid. Thus, trust is an important component for the whole model to work (Sun et al., 2015). This can be achieved through an escrow service provider, a third part that holds money between the employer and workers and only releases it when both parties have fulfilled the agreed terms. In Malaysia, escrow service can only be offered by licensed financial institutions. This further complicates the issue of payment system.

5.4. Firm Strategy, Structure and Rivalry

A check of all of the four local ImS service providers' websites showed that they act more like a job placement rather than a crowd sourcing site. In most cases, the website are used to advertise jobs and for workers to apply for the jobs. Other processes such as the job delivery and payment are done off site. This unsophisticated system limits the potential of the service providers to reach international market. These challenges are articulated by the B40 General Manager:

> *They (service providers) have to be at par with their international counterparts, they have to scale up..we have engaged consultants to evaluate the platforms (service providers) and make suggestions to the providers to improve their systems. (R1)*

Competition among the service providers is almost non-existent. They do not compete because they serve different types of clients. Currently two of the service providers serve internal clients and only two serve external clients. This non-competitiveness is further enforced through informal agreement between them as related by the Manager of B40:

> *We will promote other platforms (service providers) as well during training, we agree to promote each other as we feel this serve us better than to compete. (R12)*

5.5. Government

Government plays an important role in ImS. In fact the Micro sourcing project was initiated by MDeC, a government agency. Through its B40 Division, MDeC facilitates the formation of ImS ecosystem and communication between its actors (i.e. buyers, providers and workers). Nationwide roadshows have been conducted to promote ImS to B40 and business communities which was proven to be useful as commented by one of the managers of an ImS provider:

> *The roadshow by MDeC is good, it introduces ImS to people and it's a good for exposure for our company too. (R8)*

Training incentives were given to ImS providers to train selected B40 individuals to be hired in the programme. US$90 was allocated to each B40 trained which was enough for two day basic ICT training and to introduce ImS to these individuals. There are also numerous government agencies that indirectly contribute in the ImS value chain especially the training of B40 members. Agencies such as YBK- Yayasan Basmi Kemiskinan (Poverty Eradication Foundation), PIT- Persatuan Ibu Tunggal (Single Mothers Association), PERHEBAT- Persatuan Tentera Bersara (Retired Army Association) which reside in different ministries provide training to their members as well as gatekeeper of database of members (who are mostly B40).

Despite these efforts, there is still much can be done by government. Government has been criticized for failing to provide an exemplary role in providing jobs to the ImS sector. The absence of an anchor demand from government is frustrating as commented by two managers of the ImS providers interviewed:

> *We expect the big bulk of job come from the government, but it is not happening..they have issues with the mechanism to pay this type of job. (R9)*

> *This is a private-public project, but there is no job from the public sector, they should anchor the demand. (R10)*

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

219

5.6. Chance

The recent drop of oil price may have some effects on the running of ImS initiative in Malaysia. Being an oil producing nation, oil (i.e. petroleum) contributes 30% of total government revenues in 2014 (The Star, 2014). To counter the impact of the oil drop government could lower its spending through the cutting of its development expenditure. This would have a direct impact on the running of its programmes including ImS although no data has yet been available to back up this claim.

6. DISCUSSION

The findings reveal as a nation Malaysia has some strengths that they have to take advantage and improve on and some weaknesses that need to rectify and improve on in order to build a competitive ImS sector. The biggest strength is the commitment of Malaysian government that puts ImS as national agenda for it to receive necessary input to flourish. The setting up of B40 Division in MDeC to manage the programme leads to, among others, nationwide ImS promotion and availability of financial incentives that give the needed boost for ImS to grow (Accenture, 2012; Avasant, 2012). It is also due to government commitment to make ICT the enabler of national economy that lays a convenient foundation of good ICT infrastructure and a supporting industry for ImS to take advantage on. This is translated into having telecentres, expansive broadband coverage and a vibrant BPO that really helps ImS to move forward (Monitor Group, 2011). Nevertheless, building a competitive industry requires commitment from all stakeholders especially the business communities (i.e. buyers and providers of ImS). In fact government only plays a supporting role as proposed in the Porter's model. ImS providers have to raise their skills and technology and evolve from being a mere job matching site to a "real" crowd sourcing site. They need to realize that doing business in an open industry and competing against other international firms demand for unfaltering fighting spirit. Likewise, local firms should be open to the idea of ImS as an alternative source of labour that offers opportunities for cost saving, increased speed of delivery and doing social good. Although mandated as the target group, given the large number of B40 of 11.7 million, MDeC and the service providers have some "leeway" to select the members that could present the least risk and at the same time increase the chance to make this ImS work in Malaysia. The choice of B40 members to involve in this program is crucial to address the high attrition rates. Members of B40 chosen in this program should be IT literate, motivated and in need for jobs as suggested by the Director of NGO interviewed:

> *They define B40 by household income only. They should help the hardcore poor or marginalised groups instead who really want the jobs and have the needed skills. (R4)*

Perhaps, the most important ingredient in bringing ImS to a level it is intended to achieve is the understanding by the actors (i.e. buyers, providers, workers, government) of the dynamics of their respective domain in today's globalized world. This is succinctly captured in the comment made by one of the consultants:

> *Despite your best intention and effort you won't achieve much if you fail to understand and appreciate the dynamics of your world. (R8)*

7. LIMITATION AND FUTURE WORK

There a few limitation of this paper that needs to be acknowledged. First, although there are 12 possible inter-relations between determinants this study only focuses on six. Further study could explore the other relations. Secondly, the use of Porter' diamond model may not sufficiently explain competitiveness in a setting where the involvement of non-profit and non-government organisations is noticeable. Future research may focus on how Porter's diamond model could be modified to address this issue. Last but not least, no real or potential buyers of ImS were interviewed due to time constraint. Future work could focus on ImS buyers as they might

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

220

provide alternative views on the issue of buyers' awareness and shed lights on what makes them want to buy from ImS and what makes them shy away from it.

REFERENCES AND CITATIONS

Accenture. (2012). Exploring the Value Proposition from Impact Sourcing: The Buyer's Perspective. Retrieved from http://www.accenture.com/us-en/Pages/insight-exploring-value-proposition-impact-sourcing.aspx

Avasant. (2012). Incentives and Opportunities for Scaling The Impact Sourcing Sector. Retrieved from http://www.rockefellerfoundation.org/news/publications/ incentives-opportunities-scaling.

Babin, R. (2008). Assesing the Role of CSR in Outsourcing Decision. *Journal of Information Systems Applied Research*, *1*(2), 1–14.

Babin, R., & Nicholson, B. (2009). Corporate Social and Environmental Responsibility and Global IT Outsourcing. *MIS Quarterly Executive*, *8*(4).

Barbe, F. G. T., Magdalena, & Triay, M. G. (2011). Is Porter's Diamond Applicable To Developing Countries? A Case Study Of The Broiler Industry In Uruguay. *International Journal of Business and Social Science*, *2*(6), n/a.

Castresana, J. C. P. de M. (2013). Social enterprise in the development agenda. Opening a new road map or just a new vehicle to travel the same route? *Social Enterprise Journal*, *9*(3), 247–268.

Chobanyan, A., & Leigh, L. (2006). The competitive advantages of nations: Applying the "Diamond" model to Armenia. *International Journal of Emerging Markets*, *1*(2), 147–164.

Digital Malaysia. (2013). Digital Malaysia - Digital Malaysia Fact Sheet. Retrieved from http://www.digitalmalaysia.my/about-digital-transformation-programme/digital-malaysia-fact-sheet/

Heeks, R. (2006). Using competitive advantage theory to analyze IT sectors in developing countries: a software industry case analysis. *Information Technologies & International Development*, *3*(3), pp–5.

Heeks, R., & Arun, S. (2010). Social outsourcing as a development tool: The impact of outsourcing IT services to women's social enterprises in Kerala. *Journal of International Development*, *22*(4), 441–454.

Hirth, M., Ho\s sfeld, T., & Tran-Gia, P. (2011). Anatomy of a crowdsourcing platform-using the example of microworkers. com. In *Innovative Mobile and Internet Services in Ubiquitous Computing (IMIS), 2011 Fifth International Conference On* (pp. 322–329). IEEE. Retrieved from http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=5976179

Hodgetts, R. M. (1993). Porter's diamond framework in a Mexican context. *Management International Review*, *33*(2), 41.

Jin, B., & Moon, H.-C. (2006). The diamond approach to the competitiveness of Korea's apparel industry: Michael Porter and beyond. *Journal of Fashion Marketing and Management*, *10*(2), 195–208.

Kennedy, R., Sheth, S., London, T., Jhaveri, E., & Kilibarda, L. (2013). Impact Sourcing: Assessing the Opportunity for Building a Thriving Industry. Retrieved from http://www.rockefellerfoundation.org/uploads/files/0f234180-55d4-4054-b4c1-6b26a8ed544b-impact.pdf

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

221

King, N. (2012). Doing Template Analysis. In G. Symon & C. Cassell (Eds.), *Qualitative Organizational Research: Core Methods and Current Challenges*. London: SAGE Publications.

Lacity, M., Carmel, E., & Rottman, J. (2011). Rural Outsourcing: Delivering ITO and BPO Services from Remote Domestic Locations. *Computer*, *44*(12), 55–62.

Malik, F., Nicholson, B., & Morgan, S. (2013). Assessing the Social Development Potential of Impact Sourcing. Retrieved from http://www.globdev.org/files/proceedings2013/paper_20.pdf

Mann, M., & Byun, S.-E. (2011). Accessing opportunities in apparel retail sectors in India: Porter's diamond approach. *Journal of Fashion Marketing and Management*, *15*(2), 194–210.

Meng, C. C., Samah, B. A., & Omar, S. Z. (2013). A Review Paper: Critical Factors Affecting the Development of ICT Projects in Malaysia. *Asian Social Science*, *9*(4), p42.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: an expanded sourcebook*. Thousand Oaks: Sage Publications.

Monitor Group. (2011). Job Creation Through Building the Field of Impact Sourcing. Retrieved from http:www.rockefellerfoundation.org/blog/job-creation-through- building-field

Porter, M. E. (1998). *Competitive Advantage of Nations*. New York: Free Press.

Prahalad, & Hart. (2002). The fortune at the bottom of the pyramid. *Strategy+Business*, *26*, 54–67.

Roslan, A. H. (2001). Income inequality, poverty and development policy in Malaysia. Presented at the Poverty and Sustainable Development, Université Montesquieu-Bordeaux IV, France. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.196.3596&rep=rep1&type=pdf

Salleh, S. S., Arshad, N. H., Mastuki, N., Aris, S. R. S., & Janom, N. (2013). Formulating cohesive digital ecosystem of micro sourcing business process in Malaysia. In *Science and Information Conference (SAI), 2013* (pp. 321–327). IEEE. Retrieved from http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6661757

Saunders, M. (2012). Choosing Research Participants. In G. Symon & C. Cassell (Eds.), *Qualitative Organizational Research: Core Methods and Current Challenges*. London: SAGE Publications, Ltd.

Smith, A., & Pezeshkan, A. (2013). Which businesses actually help the global poor? *South Asian Journal of Global Business Research*, *2*(1), 43–58.

Sun, Y., Wang, N., Yin, C., & Zhang, J. X. (2015). Understanding the relationships between motivators and effort in crowdsourcing marketplaces: A nonlinear analysis. *International Journal of Information Management*, *35*(3), 267–276.

The Star. (2014). Falling commodity prices present downside risk to Malaysia's economy - Business News | The Star Online. *10/24/2014*. Retrieved from http://www.thestar.com.my/Business/Business-News/2014/10/25/Pressure-on-growth-Falling-commodity-prices-present-downside-risk-to-Malaysias-economy/

The Star, Z. A. (2015, February 9). Government to declassify some records - Nation | The Star Online. *The Star*. Retrieved from http://www.thestar.com.my/News/Nation/2014/10/24/Govt-to-declassify-some-records-Najib-Move-will-accelerate-delivery-of-public-projects-for-peoples-b/

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

222

Wynn, J., Donald, & Williams, C. K. (2012). Principles for Conducting Critical Realist Case Study Research in Information Systems. *MIS Quarterly*, *36*(3), 787–810.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

223

CLOUD COMPUTING: ADOPTION ISSUES FOR ETHIOPIAN PUBLIC AND PRIVATE ENTERPRISES

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Abstract: This paper explores the emergence and adoption of cloud computing by enterprises in sub-Saharan Africa. Several studies have shown the benefits of cloud technologies for enterprises. Using qualitative techniques we obtained and analyzed data from nine enterprises on adoption of cloud computing as an IT strategy. These enterprises span the finance, information and communication technology (ICT) training, research, construction and manufacturing sectors in Ethiopia. We found that, contrary to the literature on cloud computing adoption in the global north, these enterprises are yet to adopt cloud computing as an IT provisioning method and they lack awareness of the advantages and disadvantages of adopting the cloud. The enterprises are concerned with challenges like security, privacy and trust issues as well as Government telecommunications infrastructure policies and cloud technology skills acquisition. This research is part of a wider study taking place in Nigeria and Ghana, where we have observed higher levels of adoption. We envisage that, despite the challenges, more enterprises in sub-Saharan Africa will adopt cloud computing as an IT Strategy. This could positively contribute to the economic growth of developing countries. This research raises awareness of the challenges and potential benefits of this worldwide technology trend.

Keywords: ICTs, Cloud Computing, Enterprise Adoption, Ethiopia, Sub-Saharan Africa

1. INTRODUCTION

The ability to access computing resources or develop robust IT infrastructure in developing countries has been difficult. Cloud computing as a new computing paradigm can now provide remote access to these resources that were otherwise inaccessible. The emergence of cloud computing will change the stakes for entrepreneurs, small and large businesses, and researchers and governments (Greengard, 2010). The focus of this paper is on the implications of this new paradigm on public and private enterprises (PPEs) in Ethiopia. Early investigations into the cloud readiness of countries in sub-Saharan Africa by Laverty (2011) showed that there is the potential for growth of at least one form of the cloud technology in the future. Consequently, examining PPEs in Ethiopia will indicate future adoption trajectory in the region.

The definitions of enterprises vary significantly with place and the economy concerned. The Central Statistical Agency (CSA) of the Federal Democratic Republic of Ethiopia (2010) classifies enterprises into small, medium and large scale and also on a number of variables such as level of employment, turnover, capital investment, production capacity, level of technology and subsector. It defines them as having employees not exceeding 10 for small scale enterprises, 50 for medium scale enterprises and above 50 for large scale enterprises. CSA also defines them as business enterprises with a paid-up capital of Birr 20,000 ($2,500) but not more than Birr

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

224

500,000 ($62,500) for small and medium enterprises and paid-up capital of more than Birr 500,000 ($62,500) for large scale enterprises.

Like most information and communication technology for development (ICT4D) or information systems (IS) researchers, we view development as structural societal change where diverse socio economic change is a key component (Tribe & Sumner, 2008). According to Heeks (2010) however, whatever our particular understanding of development – ICTs are making a contribution. Though the implications of cloud computing to PPEs in sub-Saharan Africa are still unclear, ICT has the potential to enable access to technology in a way that could not have been possible few years back. PPEs are beginning to utilize this opportunity as cloud-based commercial services become increasingly prevalent. Gartner (2012) says that "…cloud computing will soon become the main strategy for many enterprises". Overall, this could contribute to the economic growth desired by these countries.

This research is part of a wider study taking place in sub-Saharan Africa, where Abubakar, Bass & Allison (2013) have examined cloud adoption issues and have also observed higher levels of adoption. The contribution of this paper to the literature is to identify three set of key issues associated with cloud adoption by PPEs in Ethiopia. We envisage that as cloud computing evolves, more PPEs in the country will adopt it as an IT Strategy.

Being a relatively new area, a grounded theory approach is used as research methodology. The main objective of applying this methodology in this research was to develop new ideas while simultaneously collecting and analyzing data. Hence the issues discovered were allowed to emerge from the data without forcing any preconceived ideas on the data.

This paper is organized into five further sections. Preliminary literature review is discussed in the next section as related work. In section three, the research methodology is discussed. Findings from this research are presented in section four and discussed in section five. Finally, the conclusion and further work are presented in section six.

2. RELATED WORK

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction (Mell & Grance, 2011). Cloud computing is where service providers make available software and technology as services (computing and storage) over the internet. The end-user does not require the knowledge of the physical location and configuration of the system that delivers the services. Thus, the end-user does not require the capital investment required to establish IT infrastructures, but rather can use revenue to invest in flexible Internet hosted compute services.

Examining the issues associated with cloud computing adoption will play a vital role in the successful adoption and implementation process. Kim et al., (2009) have examined issues that could impede the rapid adoption of cloud computing from the perspective of potential users with more emphasis on medium to large users. However, the study requires strong justifications on how those issues were arrived at and the very many predictions that were made concerning cloud computing adoption. Neves et.al, (2011) have also used Political, Economic, Social, and Technological (PEST) analysis to identify issues associated with cloud computing adoption by enterprises specifically with Small and Medium Enterprises (SMEs) and how to cope with these issues. The analysis, conducted by scoping published literature however, only provided external issues associated with cloud adoption disregarding the impact on organizations' behavior. In a related work, Le Roux & Evans (2011) have shown how cloud computing could bridge the digital divide in secondary education in South Africa. It cited lack of political will and determination amongst other issues as key factors responsible for widening the digital divide. It however does not address actual adoption issues faced by these education institutions as it was

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

225

more of a readiness, availability and uptake studies rather than impact as Heeks (2010) categorized. Kshetri (2011), on a general note propounds that the findings on the potentials and impact of cloud computing to companies in the developing world are inconsistent. According to the same study, the greatest barrier to adoption and effective utilization of cloud computing centre's on level of penetration of the PC and on the availability of good internet connection. The study did not examine or identify organizations' cloud adoption decisions but pointed it out for future research. Few studies however, have shown the direct impact of ICTs to development (Heeks 2010). Bass (2011) have studied the impact of ICTs for development in Ethiopia by citing the impact of developing an initial ICT infrastructure in education institutions and presenting ICT maturity model. To the best of our knowledge no study has been carried out that shows the direct impact of cloud computing adoption to enterprises or its impact on economic growth especially in developing countries. Thus, this paper contributes in filling the literature gap identified in this emerging area.

3. METHODOLOGY

Grounded theory (GT) is followed in this study as a research methodology. It is a research method that seeks to develop theory that is grounded in data which has been systematically collected and analyzed (Association for Information systems, 2011). A proponent of this method, Glaser and Strauss (1967) has first defined this theory as – "the discovery of theory from data" (p. 1). It is a qualitative approach that has been variously described as positivist, interpretive or critical (Urquhart, Lehmann & Myers, 2010). Our research adopts the "Glaserian" or classical grounded theory approach with an interpretive viewpoint mainly because of its usefulness when studying relatively new areas (Stern, 1994) like this study in Ethiopia. More so, its coding procedure is simpler to use and closer to the original version (Urquhart, Lehmann & Myers, 2010). To determine an area of research in the broad topic of cloud computing, a literature review was conducted just enough to allow for the development of an interview guide for data collection and for interaction with participants in the study on the subject of cloud computing. This is in accordance with the recommendations of GT by Glaser (2004), which insist that "undertaking an extensive literature review before the emergence of the core category can violate the basic premise of GT".

A literature survey was first conducted to find out what is being published by high ranking journals on cloud computing adoption by enterprises in Sub-Saharan Africa. Such review of studies shows that a large portion of the published research was conducted in developed and industrialized countries (Sahandi et. al., 2013) (Veigas et. al., 2012) (Rath et. al., 2012). In contrast, little has been written in developing countries particularly when its many benefits have been trumpeted continuously. This gap is particularly apparent in sub-Saharan Africa and most third world countries. On another hand, most existing studies have only focused on just the diffusion or acceptance, services and deployment models of cloud computing and issues of benefits and concerns. However, this study aside recognizing the factors that inhibit its adoption which are constraining forces necessitating adoption.

3.1. Research Sites

Growth rates in East African Internet adoption are encouraging, despite starting from a very low base. Uganda, Ethiopia and Rwanda have more than tripled their number of Internet users. Ethiopia had a comparatively high fixed-line penetration with 4% of households having a fixed-line phone. The increase in Internet use intensity can also be considered a positive sector development. Daily use rose over the past four years compared to once-a-week and once -a-month use, in particular in Rwanda and Ethiopia (Stork et al., 2014).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

226

Since there is no previous research conducted on cloud adoption by PPEs in Ethiopia, we believe that getting insight into the readiness and adoption of cloud computing model by public and private enterprises in the country is vital. Ethiopia is a high growth economy in sub-Saharan Africa and, following South Africa, Nigeria and Ghana in terms of economic development, is representative of a middle tier of regional economies. Because of this, the research sites chosen for this study are made up of public and private enterprises in Ethiopia. These PPEs in Ethiopia were chosen because of the availability and accessibility of a favorable government national ICT4D policy as a framework that has given a special initiative to facilitate the active participation of enterprises in the local ICT industry and services sector (The Federal Republic of Ethiopia Ministry of Capacity Building, 2006). To inform the selection/sampling of the research sites pieces of information gathered from initial research sites are used. This led to the selection of companies across different industries in Ethiopia including finance, information and communication technology (ICT) training, research, construction and manufacturing. A summary of the profiles of the PPEs are presented in Table 1.

PPEs	Domain	Type	No of Employees	IT Staff including CTO
PPE-A	Project Office	Public	More Than 100	Not Specified
PPE-B	Construction	Private	More Than 170	10
PPE-C	Urban Development and Construction	Public	Not Specified	More than 35
PPE-D	IT/Training	Private	112	112
PPE-E	Research Institution		More Than 200	10
PPE-F	Finance	Private	1000 (Across all 20 Branches) 100 Employees in the Main Area Branch	80
PPE-G	Manufacturing	Public	Not Specified	10
PPE-H	Telemedicine	Public	150 – 200	12
PPE-I	Finance	Private	Not Specified	Not Specified

Table 1. A Summary of the Profiles of the PPEs

3.2. Data Collection and Analysis

Embracing an exploratory research method, the qualitative data collected through open-ended face-to-face semi-structured interviews and supported by observations were analyzed using 'Glasserian' grounded theory approach. Dey (1999), in giving the definition of grounded theory asserts that data analysis is systematic and begins as soon as data is available and involves identifying categories and connecting them (cited in Urquhart 2001). A total number of nine PPEs and nine participants comprising of two participants at Managerial level, two Project Managers, one Senior System Analyst staff, one Data Management Statistician staff, two Information Technology (IT) technical staffs, and one Mechanical Engineering staff were interviewed. All the interview sessions were audio-recorded. Using the key-point style of coding

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

227

as described by Allan (2003), significant points emanating from the investigation were identified from the transcripts of the interviews as described by the following table.

ID	Key-Points	Codes
K1R	*'It is beyond our control once we give our information. So there is no security, there is no anything to say that... we don't have anything to safeguard.'*	Security concerns Usage despite security concerns
K2	*'Well, the weakness starts from the maintenance and security issues.'*	Usage despite weakness
K3	*'In the data loss issue, we don't have huge infrastructures because we don't have redundant back up issue. Because of that, through the internet the capacities are very tight and important to really loss data'*	Data Access/Loss issues

Table 2. Key-Points to Codes

Identifiers (K1, K2…) are used for each significant point identified within the text of a specific interview transcript, where 'K' indicates a key-point. Key-points that are repeated in the same interview are assigned a suffix, for example 'K1R'.

The process described above is also known as open-coding in grounded theory. Similar codes are then grouped together by method of constant comparison (Glaser and Strauss, 1967). This is achieved by comparing the codes that arose from one interview against codes from the same interview and those from other interviews. This resulted into a higher level of regrouped codes called concepts as shown in Table 3.

Concepts	Frequency of occurrence/comparison with other codes
Government Policy Issue	4
Security Issues	18
Concerns about privacy and trust	6
Awareness Issue	6
Other Challenges	4

Table 3. Codes to Concepts

By applying repeated constant comparison method to the concepts, some core categories emerged from the groups. At the end of the categorization, three major categories emerged from the data as will be described in the findings section.

4. FINDINGS

We present a grounded theory of cloud adoption issues by PPEs in Ethiopia. The findings are outcomes of the analysis carried out as shown in the data analysis section above and they form the basis for the contributions of this paper.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

228

4.1. Security, Privacy and Trust Issues

Security has been cited in various surveys on cloud computing adoption as one of the key challenges that is keeping end-users away from adopting any form of the cloud. We identified the same trend amongst the PPEs in Ethiopia that participated in this research. Most of the staff in these enterprises has seen security as a major threat or an obstacle in adopting the cloud. Consider this statement by one of the interviewees when asked about his thoughts on security in the cloud: "*Security is one issue that discourages to use the cloud and how much I am amenable to use the cloud services in the organization by itself*" **[Interviewee 2].** Another interviewee is of the belief that: "*It may not be secured to give some sensitive document on the net, communicating on sensitive documents is a little difficult if the software is found in the cloud*" **[Interviewee 4**] he has used. Furthermore even those that are actually using cloud computing applications have expressed their fears about security like this interviewee who said concerning cloud security: "*One thing, especially security is more an issue in the internet because there are unwanted users trying many things. I am worried about security as well as privacy and trust issues on the internet*" **[Interviewee 7].** In another statement this interviewee added that: "*One is security and privacy issue; you know you put patient profile on the cloud. This should have a strong security. This problem is our threat*" **[Interviewee 7].** One interviewee who works in the banking sector added that "*data security in the internet is not secured because it may get third party or others can edit or delete the information*" [**Interviewee 6**]. Another participant explained his fear on cloud security as a threat as: "*The big threats as I observed, the first thing is security. Once we give information to the vendors we don't have control for that, totally we are controlled by the cloud vendors. That's a big threat in the cloud*" **[Interviewee 8].**

As this study revealed most of the interviewees agreed that security is their first threat that hinders the adoption of cloud computing for their organizations. This is evident from the following statements:

> "*…security issue is the challenge; that is the threat*" **[Interviewee 3].**

> "*…It is a little difficult in countries like Ethiopia because the security is great issue; it is threat*" **[Interviewee 4].**

Privacy and trust is another important component of this category. They are more of the breach of trust by the cloud service provider of your official or personal information. 6 out of 9 interviewees expressed their fears on this issue as evident from some of their statements: "*I'm not that much trustful when I put data or information on the internet*" **[Interviewee 3].** In another interviewee's opinion, "*100% I do not trust it; may be someone will see it, someone may discover it*" **[Interviewee 2].** One of the participants expressed his concern about privacy and trust as: "*it is a great threat to be sure that the information is secure or private*" **[Interviewee 4],** and another participant added that "*Yes there is privacy and trust fears*" **[Interviewee 7].**

4.2. Awareness Issue

In order to elicit the participants' awareness and understanding of cloud computing, their respective experiences and use of cloud computing services, several questions were asked to determine the level of awareness and understanding of cloud computing by these enterprises. This study revealed that there is a low and basic understanding of cloud computing among the PPEs in Ethiopia. This is evident from some of their statements: "*Oh, I don't have a clue or the idea about it. I can't say about it. So, I can't answer this question*" **[Interviewee 1].** One interviewee expressed his limited knowledge of cloud computing as: "*I don't know because I*

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

229

didn't hear this thing before; I don't have any idea about this" **[Interviewee 3]**. When asked about cloud computing adoption by his company, this interviewee interestingly added in his statement that "*Currently, I have no idea. I don't want to force my company to use this cloud application*" **[Interviewee 3]**.

The interview data indicate that most of the enterprises do not have sufficient knowledge about what cloud computing can do and how it works. As a consequence, a lot of unexpected issues are likely to come up during the adoption phase. One interviewee manifested the limited awareness about cloud computing in the country by his statement: "*…there is no awareness about cloud computing*" **[Interviewee 4]**. This in turn limits Enterprises to better understand the benefits of cloud computing for their businesses. However, 2 out of 9 interviewees mentioned that they know about cloud computing and have been using it: "*Our institution uses this cloud application for data entry and data management purpose, to put our data in safe place in server*" **[Interviewee 4]**. The other interviewee added: "*Cloud hosted applications are basically used for enhancement of our work in order to basically know the different raw materials type. We are using different specifications based on the company specifications*" **[Interviewee 7]**.

4.3. Government Policy Issue

As is seen from the participant's perspective, some of these organizations view the government policy as a threat for the successful implementation of cloud computing to their corporate IT culture. One interviewee expressed his concern on this issue accordingly: "*It is not supported by policy and also the deployment or the development of Internet service in our country is very much discouraging so this and some related issues like financial access, the involvement of private sectors and the inventors on this particular issues is less. So, it may discourage the deployment and dissemination of the Internet in my country*" **[Interviewee 1]**. The following interviewee expresses the issue as: "*The government policy somehow discourages the system… the cloud system not to expand, not to do as the technology offers*" **[Interviewee 6]**. This interviewee in his statement added that "*The security issue is the main thing that discourages using this cloud system. The other thing is related to policies, rules of the government*" **[Interviewee 6]**. Another interviewee added his fear on the government policy regarding on cloud usage in his statement: "*The other thing that I think is the policy issues especially as it will relate to our country and how it is going to deal with the cloud. So that's also another threat not to use cloud*" **[Interviewee 8]**.

5. DISCUSSION

There is little experience in terms of cloud adoption in Ethiopia since this study is taking place at a very early stage of deployment. The authors have found no previous research on cloud adoption in Ethiopia; hence this study is the first to provide empirical evidence in the field.

A comparison of the findings of current study with the previous work on cloud computing adoption elsewhere shows that some issues found in the current study match with the findings of previous work. Table 4 shows the adoption issues of cloud computing which reoccur in the current study.

Adoption Issues	Related Research
Security, privacy and trust Issues	Abubakar, Bass & Allison (2013)

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

230

privacy and trust issues including lack of user control and unauthorized secondary usage	Pearson & Benameur (2010)
Security	Shaikh & Haider (2011) and Gens et.al. (2009)
Awareness and top management support issues	Abubakar, Bass & Allison (2013)

Table 4. Cloud computing adoption factors matching with the prior studies' findings

The comparison of the adoption issues found in the related research with the ones identified in the current study shows that security, privacy and trust issues are significant adoption issues where a common agreement is reached. Similar to this study, the vulnerabilities and threats from infrastructure and network, up to the service platform was a significant concern in those studies too. Another matching issue-"Awareness and top management support issues" is also a factor found in Abubakar, Bass & Allison (2013) work. Although their main concern is on top management only and the given names are different, this factor has the same content with "awareness issue" identified in the current study. On the other hand, the issues which are not covered by related research while present in the current study are government policy issue. This is because of the reason that as compared with other African countries the support of the government policy in Ethiopia is not quite substantial as much as the deployment or the development of Internet service in the country is very much discouraging. Although the country has ICT policy at the federal level, this policy doesn't inculcate the way on how to deal with cloud technology. Thus, failure to support the technology through policy making could be a barrier to successful adoption.

6. CONCLUSIONS

We have established that there are no any reputable resources to consult concerning adoption of cloud computing by PPEs in Ethiopia. This lack of prior work indicated a gap in the literature. But findings from this research have identified some important issues relating to the adoption of cloud computing by these enterprises. Security, privacy and trust of data were found to be leading in determining the decision to adopt cloud computing in Ethiopia as data collected from PPEs revealed. Importantly, when the users demand for the required security implementations and assurance, cloud service providers have to provide those through their service offer with technological solutions. The level of awareness were also proved to be a constant recurrent issue that plays a vital role in determining cloud computing adoption by these enterprises in the country.

There is therefore the need to focus and raise awareness on its benefits and importance in the current digitized knowledge-based economy amongst public and private particularly technology-driven enterprises. Government policy was also a critical factor for the successful adoption of the technology throughout the country. The government shall do well to determine which areas of improvement they must embark on to encourage the spread ICTs and cloud based solutions. It is recommended that the Ethiopian government should expeditiously adopt a new regulatory approach that will nurture, sustain and promote the emerging technology of cloud computing and its impact on personal data protection, data confidentiality and security.

Whilst we did not find the direct impact of cloud computing to development, any generalized conclusion will be early at this stage. However, the potential opportunities cloud computing offers to public or private enterprises are seemingly real. Thus, the further evolution of cloud

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

231

computing as a new IT strategy will see to the engagement of more enterprises in the country with the cloud paradigm. This will show consequently that the direct impact of adopting cloud computing technology on economic growth can be clearly measured and understood.

REFERENCES

A. D. Abubakar, Ian Allison, and Julian M. Bass, 'Cloud Computing: Adoption Issues for Sub-Saharan Africa SMEs', in *IFIP Working Group 9.4 12th International Conference on the Social Implications of Computers in Developing Countries*, Ocho Rios, Jamaica, 2013, pp. 179–192

A. Rath, S. Kumar, S. Mohapatra and R. Thakurta (2012), "*Decision points for adoption cloud computing in small, medium enterprises (SMEs)*," in International Conference for Internet Technology and Secured Transactions, 10-12 December, London.

Allan, G. (2003). A critique of using grounded theory as a research method. Electronic Journal of Business Research Methods, Vol. 2(1), 1-10.

Association for Information systems, (2011), *"Qualitative research in information systems", viewed may 10 2011, http://www.qual.auckland.ac.nz/*

Bass,   J.   (2011).   *An   Early-Stage   ICT   Maturity   Model   Derived   from Ethiopian   Education   Institutions*.   International   Journal   of   Education   and Development Using ICT, 7(1).

Carr, N. (2009). The Big Switch: Rewiring the World, from Edison to Google, W.W. Norton & Co.

Central Statistical Agency of Federal Democratic Republic of Ethiopia. (2010). *Report on Small Scale Manufacturing Industries Survey*. Retrieved February 1, 2014, from http://www.csa.gov.et/surveys/Small_Scale_Manufacturing_Industries/es---eth---ssis---

2007---08/survey0/data/Docs/Small%20Scale%20Report---2010_F.pdf

Christoph Stork, Enrico Calandro, Ranmalee Gamage, (2014) "*The future of broadband in Africa*", info, Vol. 16 Iss: 1, pp.76 – 93.

Corbin, J., & Strauss, A. (1990). Basics of qualitative research: Grounded theory procedures and techniques. *Basics of Qualitative Research: Grounded Theory Procedures and Techniques.*

European Network and Information Security Agency. (2009). *An SME perspective on cloud computing*. Retrieved February 26 2012, from http://www.enisa.europa.eu/activities/risk-management/files/deliverables/cloud-computing-sme-survey

Gartner. (2012). *Gartner special report on cloud computing*. Retrieved February 10 2012, from http://www.gartner.com/technology/research/cloud-computing/index.jsp

Gens, F., Mahowald, R., Villars, R.L., Bradshaw, D., & Morris, C. (2009). *Cloud computing 2010:   An   IDC   Update*.   Retrieved   31   October   2012   from http://www.slideshare.net/JorFigOr/cloud-computing-2010-an-idc-update

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research* Aldine de Gruyter

Glaser, B. With the assistance of Judith Holton (2004). Remodeling grounded theory. In *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research, 5*(2)

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

232

Greengard, S. (2010). Cloud computing and developing nations. *Commun.ACM, 53*(5), 18-20. doi: 10.1145/1735223.1735232

Heeks, R. (2010). Do information and communication technologies (ICTs) contribute to development? *Journal of International Development, 22*(5), 625-640.

ITU (2012c). The state of broadband 2012: achieving digital inclusion for all. *A report by the broadband commission*, September 2012. Avaialble at http://www.broadbandcommission.org/Documents/bbannualreport2012.pdf (accessed on February 2014).

J. P. Veigas, V. Naik and K. Chandrasekaran (2012), "*Cloud Computing Adoption and Impact in Emerging Markets*," IRNet Transactions on Computer Science and Engineering, vol. 1, no. 1, pp. 89-95.

Kim, W., Kim, S. D., Lee, E., & Lee, S. (2009). Adoption issues for cloud computing. *Proceedings of the 11th International Conference on Information Integration and Web-Based Applications \& Services,* Kuala Lumpur, Malaysia. 3-6. doi: 10.1145/1806338.1806341

Kshetri, N. (2011). Cloud computing in the global south: Drivers, effects and policy measures. *Third World Quarterly, 32*(6), 997-1014. doi: 10.1080/01436597.2011.586225

Laverty, A. (2011). The Cloud and Africa – Indicators for Growth of Cloud Computing African File. Retrieved on February 7 2011, from http://theafricanfile.com/academics/usc/the-cloud-and-africa-indicators-for-growth-of-cloud-computing/

Le Roux, C., & Evans, N. (2011). Can cloud computing bridge the digital divide in south african secondary education? *Information Development, 27*(2), 109-116.

Mell, P., & Grance, T. (2011). The NIST definition of cloud computing (draft). *NIST Special Publication, 800*, 145.

Neves, F. T., Marta, F. C., Correia, A. M. R., & Neto, M. C. (2011). The adoption of cloud computing by SMEs: Identifying and coping with external factors.

Pearson, S., & Benameur, A. (2010). Privacy, security and trust issues arising from cloud computing. *Cloud Computing Technology and Science (CloudCom), 2010 IEEE Second International Conference on,* 693-702.

R. Sahandi, A. Alkhalil and J. Opara-Martins (2013), "*Cloud Computing from SMEs Perspective: A Survey-Based Investigation*," Journal of Information Technology Management, vol. XXIV, no. 1, p. 1–12.

Shaikh, F. B., & Haider, S. (2011). Security threats in cloud computing. *Internet Technology and Secured Transactions (ICITST), 2011 International Conference for,* 214-219.

Smallbone, D., & Welter, F. (2001). The role of government in SME development in transition economies. *International Small Business Journal, 19*(4), 63-77. doi: 10.1177/0266242601194004

Stern, P. N. (1994). Eroding grounded theory. *Critical Issues in Qualitative Research Methods,* 212-223.

The Federal Republic of Ethiopia Ministry of Capacity Building. (2006). '*The National ICT for Development (ICT4D) Five Years Action Plan for Ethiopia [2006 – 2010]*', A United

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

233

Nations Development Programme (UNDP) Initiative. Retrieved February 06 2012, from http://unpan1.un.org/intradoc/groups/public/documents/un-dpadm/unpan040825.pdf

Tribe, M. A., & Sumner, A. (2008). *International development studies: Theories and methods in research and practice* Sage Publications Limited.

Urquhart, C. (2001). An encounter with grounded theory: Tackling the practical and philosophical issues. *Qualitative Research in IS: Issues and Trends,* , 104-140.

Urquhart, C., Lehmann, H., & Myers, M. D. (2010). Putting the 'theory' back into grounded theory: Guidelines for grounded theory studies in information systems. *Information Systems Journal, 20*(4), 357-381. doi: 10.1111/j.1365-2575.2009.00328.x

Yeboah-Boateng, EO & Essandoh, KA (2014). '*Factors Influencing the Adoption of Cloud Computing by Small and Medium Enterprises (SMEs) in Developing Economies*' International Journal of Emerging Science and Engineering (IJESE), vol 2, nr. 4, 4, s. 13-20.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

234

OPEN INNOVATION: GOVERNANCE MODELS, IMPLEMENTATION TOOLS, STRATEGIES AND OUTCOMES

Track Chairs:

Mira Slavova

Mobile Empowerment Africa, Pretoria, South Africa

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Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

235

INSTITUTIONAL APPROACHES AND STRATEGIES OF CONTROL AND COLLABORATION IN E-GOVERNMENT PROJECTS

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Abstract: Open governance is often idealized as a bottom-up approach of empowered citizens to get more involved. However, in practical terms, major changes and reforms end up being the result of coordinated efforts from multiple organizations of the organized. The degree of control exercised over such organisational networks and the potential of openness and collaboration is the object of this study. In the public sector context of transition economies the sustainability of reforms emerges as an important value by which the two approaches will be measured. Rational action institutionalism and discursive institutionalism in conjunction with project management methodologies are proposed as theoretical lenses for analyzing strategic innovation and change in e-government project practices.

Keywords: control, collaboration, institutional theory, open innovation, multi-actor projects, change, public sector, e-government

1. INTRODUCTION

In a world that is becoming increasingly more open in terms of information available, but also more centralized in terms of who controls information, systems public sector projects present unique opportunities to research complex inter-organizational arrangements of multi-stakeholder engagement (Arellano-Gault, Demortain, Rouillard, & Thoenig, 2013). This study contributes by focusing specifically on two common concepts of management and organization studies: control and collaboration.

Multi-actor e-government reforms provide a good research environment for studying open project networks of government agencies, private companies, non-profit organizations, and even international donors (Heeks & Stanforth, 2007). Since the four stage model of developing a fully functional e-government system proposed by Layne and Lee (2001) many things have evolved. Recent research on public sector reforms identifies the control and collaboration tensions between actors in large scale sponsored projects, highlighting the need for more holistic accountability (Cordery, Baskerville, & Porter, 2010). Yet, this problem emerges not only as a result of tensions between actors, but also from the different project management methodologies institutionalized by each actor during the reforms.

Openness comes with the challenge of consolidating multiple individualities, data, perspectives, and ways of doing things into common goals and steps to achieve them. Individual or organization actors have their own institutionalized values, norms and practices. Coordinating open innovation among a multitude of actors is a challenge that needs to consider the communalities of institutional logics they bring in, and the institutionalized discursive capabilities to solve problems and work together. In this context institutionalism can be combined with system dynamics to understand multi-actor initiatives in complex arrangements such as e-government projects (Luna-Reyes & Gil-Garcia, 2011). Consequently, the question that should be asked is 'How different project management strategies can be institutionalized

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

236

among different actors in a common environment?' To answer this question this study on multi-actor transition projects has the following objectives:

1. Discuss how rational and discursive institutionalism can help our understanding of project management in e-government reforms.

2. Analyze two strategic approaches of multi-actor e-government projects by contrasting theoretical perspectives and practical evidence.

The empirical evidence is selected from two large scale public sector projects in Albania, a transition post-communist economy similar to many in Eastern Europe and Central Asia (Myant & Drahokoupil, 2011). In such environments, because of the transitional changes, forces of control and collaboration are even more dynamic among the increasing number of local and international actors (Keating, 2013). Open e-government innovation is considered to have great potential in anti-corruption initiatives (Kim, Kim, & Lee, 2009) and creating a culture of transparency (Bertot, Jaeger, & Grimes, 2010). However, both these works highlight the need for strong leadership and coordination to guarantee success. Politics can be perceived as a means of organizational integration under multiple institutional pressures in this context; yet, we know relatively little about how this happens (Yu, 2013). This study contributed in this direction by showing how an open approach to managing multi-actor organisational networks in e-government reforms could deliver these results by balancing responsive control and open collaboration among them and the organized.

2. BETWEEN THEORIES AND PROJECT MANAGEMENT METHODOLOGIES

The organizational debate on how to achieve strategic competitive advantage remains a relevant one also in the multi-actor project environment. Gupta et al. (1994) present two alternative approaches for this: Conformity to institutionalized expectations suggested by institutional theory, or adaptation to change suggested by contingency theory. This duality represents also the challenge of open innovation in developing countries, struggling between archaic stability and chaotic change.

Rational action institutionalism (DiMaggio, 1998) suggests that individual actions are rational and based on predetermined rules, laws, organizational forms and norms, while actors are stable and exogenous. Explaining the theory, DiMaggio (1998) focuses on economic rules or formal political institutions, based on rational choice in political institutions or sociology. A very similar approach is rational choice institutionalism (Moe, 1984) which traditionally has been focused on property rights, transaction costs and rent-seeking of institutions in their operations. In an attempt to maximize efficiency in the public sectors using business rationality, economists and political scientists started to embrace a rational choice thinking (Ostrom, 1991). New public management (Barzelay, 2001; Dunleavy & Hood, 1994; Dunleavy, Margetts, Bastow, & Tinkler, 2006; Hood, 1991; Lane, 2000) followed as a practical approach stressing the importance of cost-efficiency and business type management in e-government systems. Resistance to changes in such large scale transformation (Thomas & Davies, 2005) captured some research interest in this regard.

The critique towards rational action institutionalism (Joas & Knoebl, 2009; Weik, 2011; Weik, 2013) argues that the theory downplays situations and the humans' ability to adapt, disregarding actors and social relationships (Forgues, Greenwood, & Martí, 2013). Yet, control-based project management methodologies such as waterfall discussed later have a lot in common with this theory, and continue to find successful practical applications as the findings of this study will show.

In an attempt to explain multiple realities in the more open current environment of actors and complexity, Schmidt (2008) suggests discursive institutionalism, challenging the limitations and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

237

rigidity of rational action institutionalism or other new institutionalist perspectives (V. A. Schmidt, 2006; V. A. Schmidt, 2010; V. A. Schmidt, 2012). Discursive institutionalism (V. A. Schmidt, 2008; V. A. Schmidt, 2011) highlights the importance of ideas, actors' interactions, and discourse to explain how institutions happen and evolve. Constructivist institutionalism (Hay, 2006) also gives a very similar perspective by attempting to explain the extent to which established ideas become codified, understood and implemented between institutions, individuals and groups. This approach has more in common with collaborative and adaptive project management methodologies such as agile discussed latter.

The debate between institutional rationality and discourse continues even in the context of project organizations and information systems. Longitudinal studies try to identify how the institutionalization of project management practices for the implementation of information systems happens (Mignerat & Rivard, 2012). This is similar to the context of multi-actor e-government case projects providing the empirical evidence for this study. More research in this direction suggests that efficiency, technical, and innovative rationalities can gain or lose salience over time (K. J. Park & Berente, 2012). A reaction to the fragmentation and structural devolution caused by new public management, but also as a reaction to a more insecure world (Christensen & Lægreid, 2007) has caused holistic governance approaches to emerge. The limited research in this direction justifies the focus of this study on multi-actor projects in complex transition environments.

Summarizing the key ideas presented so far, the following figure provides a strategic bridge between institutional theories of control and collaboration, and project management methodologies across key project management concepts:

Application of rational action institutionalism in project management	Key elements of project management	Application of discursive institutionalism in project management
Defined in advance by leadership and unchangeable	*Scope*	Defined along the project from adaptations and consensus
Inflexible, but subject to efficiency and structural tradeoffs	*Time*	Mostly inflexible, but subject to relational and operational tradeoffs
Predefined in total and its parts from stable actors and resources.	*Cost*	Agreed in general, but flexible to adaptations when broken down.
Based on the predetermined deliverables of a stable client	*Quality*	Based on required solutions of a client flexible about deliverables
Formal, following a bureaucratic chain of command	*Communication*	Informal and adaptive, focusing on consensus to find solutions
Calculated, controlled through planning and reserve resources	*Risk*	Calculated, controlled through the team's cohesion and adaptability

Table 1: Applying institutional theoretical perspectives to project management

While the first theory might require efficiency tradeoffs for more time flexibility, consensus in communication on the other hand can be a timely process. Control and collaboration are often taken for granted as organic elements of project management and organizational dynamics, to the extent that they are rarely defined. Yet, in recent organization studies literature there is a tendency to justify and explain a paradigm change and transition towards the latter, from bureaucratic control to post-bureaucratic organizations (Hodgson, 2004), from 'iron cages' to 'liquid modernity' (Clegg & Baumeler, 2010). Interorganisational networks on the other hand are the place where control or collaboration practices are born, institutionalized and applied to

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

238

prevent transaction risks, improve the success rate, and provide stability (S. H. Park, 1996). Inter-organizational interactions can also transcend diffused practices, rules and technologies into new institutions (Lawrence, Hardy, & Phillips, 2002). This study will contribute in this direction by exploring how multi-actor transition projects could create new control and collaboration norms and embed them into the post-project environment.

Pluralism in project management is a known reality (Söderlund, 2011), but bridges between theoretical frameworks and project methodologies need to be materialized better in strategic practices. There is an increasing trend in the project management literature to fill this gap through a structured documentation of best practices. Rather than focusing on management tools and methodologies, some recent books present and summarize specific project cases where traditional and open approaches are applied (Kerzner, 2010; Kerzner, 2012; Kerzner, 2013; Meredith & Mantel Jr, 2011; Wysocki, 2011). This trend is reflected even in a global context of public administration. Four volumes of the Compendium of Innovative E-Government Practices (UNDESA, 2005; UNDESA, 2006; UNDESA, 2009; UNDESA, 2012) list different e-government projects worldwide. Its purpose is to share best practices through examples rather than through standardized project management methodologies. To contribute in this direction, two case studies analyzed in this paper provide some comparative insights on rational action strategic approaches of planned control and more discourse-oriented collaborative approaches in complex multi-actor projects. The study builds on what we already know about the challenges of policy-level continuity vs. operational-level continuity (Sandeep & Ravishankar, 2014) by looking at the multi-actor institutional logics and change in e-government projects. This could feed back to rational action and discursive institutionalisms, making a contribution to these theories and project management practice in the broader context of management and organization studies.

3. METHODOLOGY AND RESEARCH SETTINGS

Case study analysis is one of the most common qualitative approaches in information systems (Orlikowski & Baroudi, 1991). Its value in comparative studies has been frequently discussed in various articles (Benbasat, Goldstein, & Mead, 1987; Cavaye, 1996; Lee, 1989). With the advancement of more dynamic approaches to information systems such as the agile methodology, more action research for systems' development (Baskerville, 1999; Fox-Wolfgramm, 1997) or dynamic-comparative case study methods (Fox-Wolfgramm, 1997) were recommended.

More recent approaches suggest that case study research should be refined according to the subject of analysis, and not necessarily follow conventional designs (VanWynsberghe & Khan, 2008). This argument is supported by a critical realist approach that suggests a more accurate review of the case study methods in the context of the unit of analysis (Easton, 2010). Following these arguments, a cross-case comparison is expected to provide a more reliable answer to the research question and objectives of this study. A multiple case approach, due to its comparative nature, provides more compelling (Yin, 2009) and robust (Herriott & Firestone, 1983) evidence. The selected two project cases are of large scale, high complexity, and significant impact for a developing and transition country like Albania. Therefore they have sufficient richness to build some theoretical constructs on control and collaboration strategies related to rational action and discursive institutionalisms.

The fieldwork for this research was conducted in Albania, a transition country where it was difficult to plan and execute a rigid research protocol because of the changing, and to a certain extent, informal environment. To assure the consistency of the study, the replicability of the two case studies, and the comparability of the findings, a semi-structured research plan was prepared focusing on: 1) The background of each project; 2) The organisational actors; 3) The implementation processes; 4) The management of contingencies and institutional acceptance; 5)

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

239

The post-project changes resulting from the reforms. The two case studies were dealt with in the field during the same time between 2010 and 2013, and not one after the other. This was possible because the two projects were planned and implemented in almost the same time period: between 2007 and 2011, followed by ongoing monitoring until present. Due to the transition project environment, the collection of the research evidence had to be adjusted for each case to mirror the other on the go. This does not make the research design plan unimportant. Instead, it suggests a higher level of flexibility in the field, based on the immediate replicability of fieldwork activities for this longitudinal study of project implementation and follow-up.

This study is primarily based on interviews, triangulated by documentary review and observations. For the first case study on the electronic system of business registration 17 interviews were conducted with representatives from the different organizational actors such as international donors, government agencies, information system companies, civil society organizations, businesses and individuals. Parallel to this, 73 legal documents, reports, manuals and news articles were reviewed. For the second case study on the electronic system of civil status 14 interviews were conducted with similar representatives and during the same period of time as for the first case study. The number of reviewed legal documents, reports, manuals and news articles on the other hand was 51. Observations for the post-project stage were also conducted every six months in 2-3 front-desk offices of business registration and civil status in the capital city Tirana until 2013.

Taking a multi-methods approach was important to have rich evidence and triangulations, but certainly this had its limitations that became more evident during the fieldwork. Limited access, contradicting pieces of evidence from different sources and difficulties in practically applying them, and to replicate them for each of the two cases were only some of them. However, the use of various methods as applied in this study provides a rich triangulated evidence for the two e-government projects and their analysis (Miles & Huberman, 1994). Furthermore, the comparative case study design of parallel activities in a changing environment could also lead to new findings and theoretical interpretations.

4. TWO STRATEGIES OF CONTROL AND COLLABORATION IN MULTI-ACTOR PROJECTS

4.1. The one-stop-shop National Registration Center for businesses

The first case study is a project about the electronic system of business registration in Albania. Before, business had to go to different agencies to register for tax, legal, employment, licensing and other business purposes. The new electronic system provided the one-stop-shop solution for registering a business from one place. The agency responsible for this is the newly created National Registration Center (NRC) that communicates with the Taxation Directorate, the E-Procurement Agency, the National Licensing Center, the employment and pension offices, or other agencies that regulate business activities in Albania.

United States Agency for International Development and Millennium Challenge Corporation, the two donor organizations commissioned by the U.S. government, took the lead in the electronic business registration project in Albania in order to have full control over their grant to the government of Albania. Its purpose was the modernization of public services for businesses such as the electronic register of businesses discussed here. The following diagram summarizes the control project management strategy in this case. This is discussed in the following paragraphs of this section using evidence from the key organizational actors:
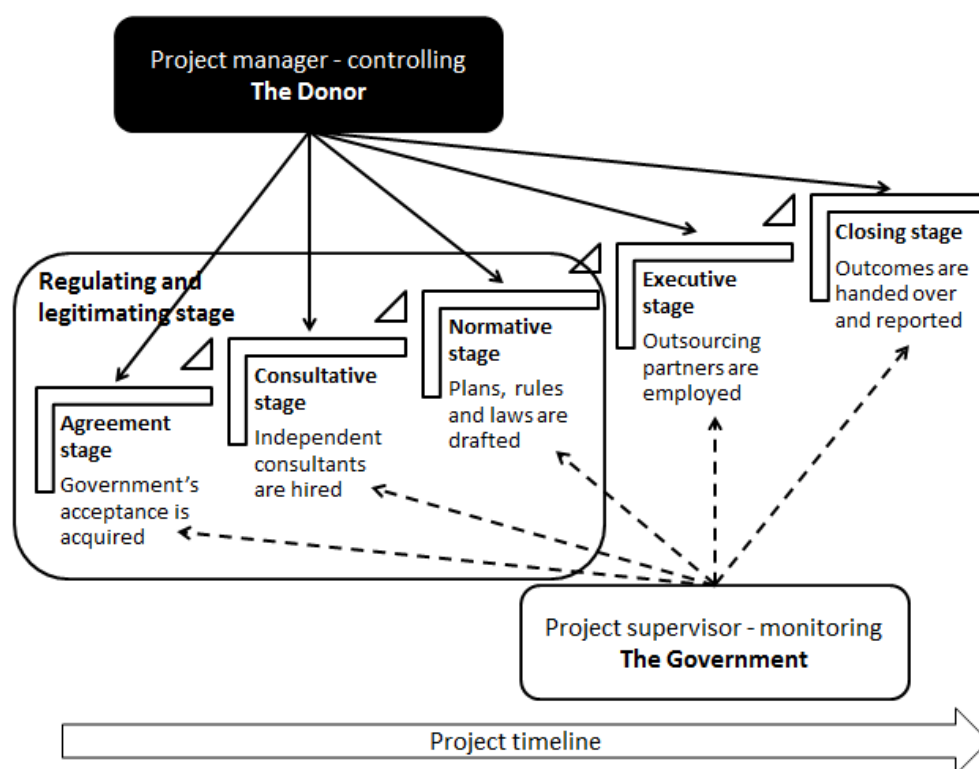
Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

240

Figure 1: A control project management strategy

Initially, to have a clear perspective on the local environment before starting to implement the project, the donor organizations appointed the Institute for Contemporary Studies, an independent think-tank in Albania, to research the current situation in the country, as one of the persons who worked with this organization describes in an interview:

> *"So the first study was the preparation of a policy paper for the different options of the reform. This policy paper was presented to USAID and then to the government."*

The fact that this document was first presented to the donor and then to the government identifies the leading and controlling role of the former. The consultative and normative stages of legal coordination between the government, the donor, and policy-making stakeholders, were also organized through the financial support of the donor. This is described by a government official as follows:

> *"So the work group prepared the suggestion. As I mentioned, in the work group there were representatives from the ministries and some lawyers from a project. I am not sure what its name was. I believe these were lawyers financed by USAID."*

Moving to the executive stage, Chemonics, a U.S. information technology company, was appointed to design the electronic system. Later it subcontracted Alfa-XP another U.S. company. Some Albanian IT experts who worked with the latter in Albania set up IKubInfo: the local software company which actually did the system and maintains it currently. The strategic bridge between the technical expertise, the law on the new systems and the local environment was again created and managed by the international donors. One of the project managers working for Millennium Challenge Corporation describes the intense involvement of the donor in coordinating different groups and organizations in the project as follows:

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

241

> *Two teams were created, one to design the law on business registration, the other to amend other laws. Fierce discussion between the two groups needed international coordination.* (Paraphrased from notes as recording during the interview was not allowed)

The use of foreign expertise was justified by the lack of local skills in managing large projects, especially on e-government reforms. The network of actors required a strong-handed leadership, preferably the party providing the funding, to smooth all possible disagreements, and avoid any conflict or delay. Indeed, following this strategy, there were only minor problems and the project progressed smoothly, it was delivered on time, and performed from the first day according to the specifications. However, a control strategy was more based on rational institutionalization through extensive testing and incremental stages, rather than on pure waterfall planning. This is shown in the following paragraph on lessons learned, taken from the final donor's report:

> *Test systems extensively and repeatedly with small groups of trained users before rolling them out, and monitor them to determine when and where retraining is required. Wherever it was feasible, the team attempted to minimize risk by implementing in stages.*

In a transition multi-actor environment though, where the major problem this project was trying to address was corruption, this was not sufficient. Informal relations also had to be embedded into the strategic control mechanism. The importance of politics and informal organizational relationships in controlling and managing large scale multi-actor projects in the public sector is undoubted as the following passage from the final donor's report shows:

> *Use deadlines imposed by public events to focus attention on work plan tasks. Dedication ceremonies present an excellent opportunity to dramatize the availability of a new service.*

Now NRC is fully managed locally, without any direct intervention from the U.S. donors that controlled the project implementation. Yet, although the Centre serves as a one-stop-shop for the tax, employment, or local business authorities, it is not replacing them. Beyond the registration process, businesses will have to follow up with them separately as NRC explains in one of its informative leaflets:

> *"NRC will inform the tax administration, social and health insurances, as well as the Work Inspectorate about the registration of your business. It will inform also the city hall where the head office of your business is. All registered businesses will continue to communicate directly with these authorities for issues concerning obligations towards each of them."*

Even in this case NRC resembles the donor that maintained control on a strategic level by outsourcing work to local actors, but passing over ownership of processes even before the closing stage as soon as feasibility was demonstrated. This strategy worked well for the donor with exclusive financial and technical capabilities during the project. However, in the post-project stage, this new agency will have to struggle to fully institutionalize its intermediary position between end-users and the back-end existing agencies. As this case shows, e-government reforms are not only about administrative changes, but also about political and social transformations that can be approached through more discourse, as the second case illustrates.

4.2. The electronic National Register of Civil Status for citizens

The second case study is a project about the electronic register of civil status. Before the civil status records were kept in hard copy books. With the new system they were entered into an electronic database that provided the backbone for many other services for citizens such as

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

242

identification documents, pensions, or social benefits. The agency responsible for this is the General Directorate of the Civil Status, an existing agency within the Ministry of Interior in Albania. The donors that supported this project were the European Union and the Organization for Security and Cooperation in Europe.

What characterizes best the creation of the electronic register of civil status in Albania is its network of collaborative national and international actors. This project, unlike the other case study, was managed by an executive project board with representatives of all the organizations involved. Although there was a general plan for the modernization of the National Register of Civil Status, many decisions about the implementation of the project were taken on an operational basis by this board. The following diagram represents the collaborative project management strategy in this case.
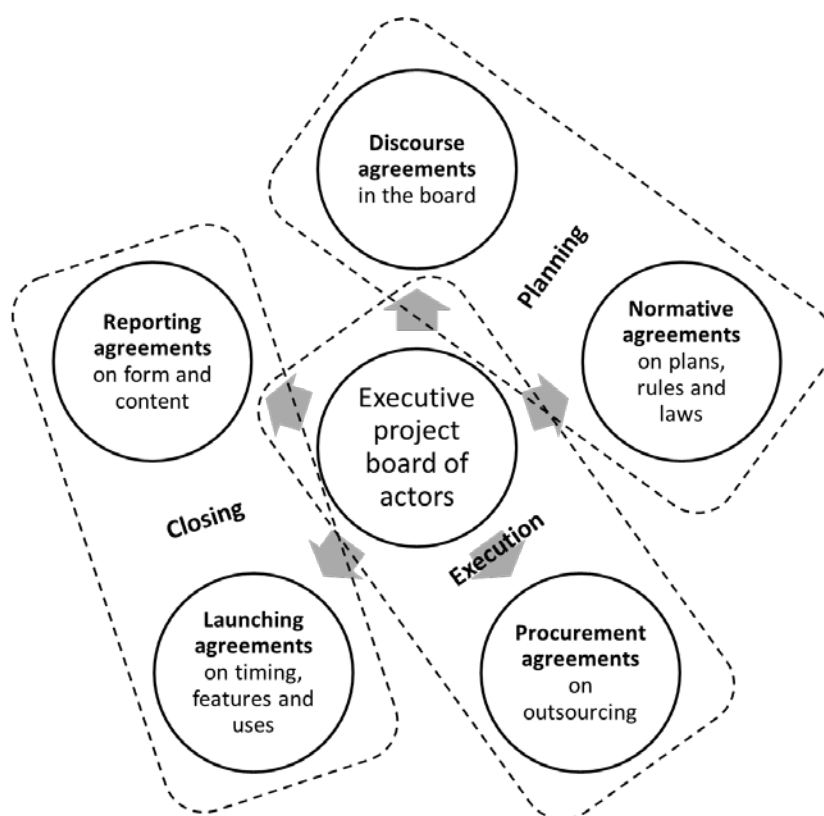

Figure 2: A collaboration project management strategy

The executive project board for this project was easy to set up because it consisted of national and international organizations that had a long term relationship with each other in Albania. The most important ones in terms of financial and technical contributions for this project are summarized in the following news release of 17 February 2011 from the Council of Ministers' website:

> *"The project was supported by a 2.5 million euro fund allocated by the European Union, the OSCE and the USA and it had the technical assistance of Austria, Norway and the Council of Europe."*

The first moment of discourse agreements was reaching consensus among actors to form the board and decide on specific matters. The director of the General Directorate of Civil Status who was directly involved in higher level decision-making from the beginning. He explains the mechanism behind the created network of actors from the government, donor agency, international partners, and system providers as follows:

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

243

> *"The project was organized by creating a steering committee, with representatives from Ministry of Interior, with representatives from the European Union, OSCE etc. which periodically gathered, set the objectives, analyzed the previous period and set the objectives for the following meeting."*

Discourse agreements on the boards were important to start the reform before moving to normative agreements on rules and laws. For example, the board agreed on a manual for the transition of records from the old registers to the new electronic system. The meetings for such discussions were periodic as a representative of OSCE, the assisting organization, explains:

> *We have quarterly reviews of the project activities, project results and planning for the next stage. […]The structure of the project is that there is a project implementation unit, technical staff, who works and presents project results.*

While the first case of controlled management operated on a practical trial-and-error basis for deciding on progress, in this one decisions had to be agreed by all actors in the board before they were implemented. This assured consensus, but sometimes also caused delays. A good example for this is the new law on Civil Status in Albania that was approved only after the project was implemented, unlike in the first case where the law assisted by the donor guided the development of the system.

On the procurement agreement side, the electronic system was bought by the government, but some assistance was provided for it from the Austrian government that was also a board member. The head of the Development Division for the National Register in the General Directorate of Civil Status explains this collaboration between organizational policy-makers and information technology providers as follows:

> *"The System of Electronic Register is bought by our state from the government of Austria and Xion. It was made by IBM […] We have assistance from the Norwegian assistance project in Albania and from OSCE."*

The Austrian government, Xion providing for maintenance now, or even Aleat: a local consortium producing the identification documents, were more like partners than outsourcing companies in this case.

In the closing stage, the project was launched jointly by the representatives of the board, rather than using special events instrumentally as in the first case. The first civil status certificates not completed by hand as before were printed using the system in 2008 in Tirana and two small municipalities. A press release of that time documents the joint participation of the most important representatives in this pilot launching as follows:

> *Prime Minister, Sali Berisha, Interior Minister, Bujar Nishani, the Head of the OSCE Presence, Ambassador Robert Bosch, and the Acting Head of the European Commission Delegation to Albania, Hubert Petit, took part in today's event.*

Regardless of this joint appearance for the general public, there was a division between agreed reporting and accountability as an OSCE representative explains:

> *We as OSCE have received funding from the EU and in principle we are for the implementation, for the use of the funds, we are accountable. This is however not to change the success of the project. In terms of overall success of the project the decision*

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

244

> *maker is basically the steering committee […], so they approve the progress reports, they approve project results.*

OSCE as the assisting international organization on behalf of the EU that provided the funding was accountable towards the latter, and not towards the citizens and government of Albania that were going to use the system. While merits about the project results were jointly agreed in the board, accountability for each organization was individual towards the parties they depended on or represented.

The civil status reform is in the post-project stage now. The relationships between the project board organizations existed before this reforms and they continued with other projects and initiatives afterwards. This confirms that institutionalized relationships and discourse between organizations could define the nature of multi-actor projects in a similar manner as rational planning and controlled leadership did in the first case. In both cases, most of the practices are institutionalized by law and in practice now. Yet, the balance in the networks of actors remains fragile due to their complexity in an environment of political transition.

5. DISCUSSION AND CONCLUSIONS

Projects, as temporary and often unique endeavors, are quite the opposite of institutions that are about established patterns and routines. However, the principles and standard guidelines in project management methodologies are nothing but established institutions. Building on this argument, this study suggests that the nature of institutionalized interactions between project actors defines the organizational strategies on which systems build on.

Generally speaking, based on the findings of this study, a control strategy can be more useful when project outcomes are rigorously planned and clearly detached from existing structures like the case of the new National Registration Center in the first project. In this case resources are dedicated to focused initiatives and often originate from a single source. A collaborative approach on the other hand is more suitable when consensus is more important. On-going relationships and discourse are expected to lead the incremental changes to existing structures such as in the case of the General Directorate of Civil Status. Different organizational actors in this case realize that their combined efforts could have a better result.

Although the two case studies have distinguished differences in their control or collaborative project management strategies, they also share a number of similarities. Some of these are for example the focus on change, the environment, the involvement of external key actors such as donors, the outsourcing to local partners, the expertise of foreign IT companies, and finally the direct or indirect detachment of the government agencies until the assisted projects were handed over. Multiple institutional realities and the heterogeneity of organizational responses (Greenwood, Díaz, Li, & Lorente, 2010), even conflicting ones, can coexist in an environment of constant transition. In this light, the findings of this study suggest a less dichotomized view of rational action vs. discursive institutionalisms or control vs. collaboration strategies.

This study gave an example of how rational action (DiMaggio, 1998) and discursive (V. A. Schmidt, 2008) institutionalisms could be in a complementary rather than a contradictory way to analyse e-government project reforms. Its findings show that cultural attitudes can change with open innovation in the public sector by paying closer attention to the organizations involved. Contrasting institutional theories and project management methodologies led to a better understanding of control and collaboration strategies that can be applied in more responsive and open public sector reforms for development. This approach can be valuable for organizational actors, policy makers and practitioners working in complex changing environments.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

245

6. REFERENCES AND CITATIONS

Arellano-Gault, D., Demortain, D., Rouillard, C., & Thoenig, J. (2013). Bringing public organization and organizing back in. *Organization Studies, 34*(2), 145-167.

Barzelay, M. (2001). *The new public management. Improving policy and research dialogue.* USA: University of California Press Berkeley.

Baskerville, R. L. (1999). Investigating information systems with action research. *Communications of the AIS, 2*(3), 1-32.

Benbasat, I., Goldstein, D. K., & Mead, M. (1987). The case research strategy in studies of information systems. *MIS Quarterly, 11*(3), 369-386.

Bertot, J. C., Jaeger, P. T., & Grimes, J. M. (2010). Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tools for societies. *Government Information Quarterly, 27*(3), 264-271.

Cavaye, A. L. (1996). Case study research: A multi-faceted research approach for IS. *Information Systems Journal, 6*(3), 227-242.

Christensen, T., & Lægreid, P. (2007). The Whole-of-Government approach to public sector reform. *Public Administration Review, 67*(6), 1059-1066.

Clegg, S., & Baumeler, C. (2010). Essai: From iron cages to liquid modernity in organization analysis. *Organization Studies, 31*(12), 1713-1733.

Cordery, C., Baskerville, R., & Porter, B. (2010). Control or collaboration? Contrasting accountability relationships in the primary health sector. *Accounting, Auditing & Accountability Journal, 23*(6), 793-813.

DiMaggio, P. (1998). The new institutionalisms: Avenues of collaboration. *Journal of Institutional and Theoretical Economics (JITE), 154*(4), 696-705.

Dunleavy, P., & Hood, C. (1994). From old public administration to new public management. *Public Money & Management, 14*(3), 9-16.

Dunleavy, P., Margetts, H., Bastow, S., & Tinkler, J. (2006). New public management is dead--long live digital-era governance. *Journal of Public Administration Research and Theory, 16*(3), 467-494.

Easton, G. (2010). Critical realism in case study research. *Industrial Marketing Management, 39*(1), 118-128.

Forgues, B., Greenwood, R., & Martí, I. (2013). New institutionalism: Roots and buds. *M@n@gement, 15*(5), 460-467.

Fox-Wolfgramm, S. J. (1997). Towards developing a methodology for doing qualitative research: The dynamic-comparative case study method. *Scandinavian Journal of Management, 13*(4), 439-455.

Greenwood, R., Díaz, A. M., Li, S. X., & Lorente, J. C. (2010). The multiplicity of institutional logics and the heterogeneity of organizational responses. *Organization Science, 21*(2), 521-539.

Gupta, P. P., Dirsmith, M. W., & Fogarty, T. J. (1994). Coordination and control in a government agency: Contingency and institutional theory perspectives on GAO audits. *Administrative Science Quarterly, 39*(2), 264-284.

Hay, C. (2006). Constructivist institutionalism. In R. A. W. Rhodes, S. A. Binder & B. A. Rockman (Eds.), *The oxford handbook of political science* (pp. 56–74). New York, USA: Oxford University Press.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

246

Heeks, R., & Stanforth, C. (2007). Understanding e-government project trajectories from an actor-network perspective. *European Journal of Information Systems, 16*(2), 165-177.

Herriott, R. E., & Firestone, W. A. (1983). Multisite qualitative policy research: Optimizing description and generalizability. *Educational Researcher, 12*(2), 14-19.

Hodgson, D. E. (2004). Project work: The legacy of bureaucratic control in the post-bureaucratic organization. *Organization, 11*(1), 81-100.

Hood, C. (1991). A public management for all seasons? *Public Administration, 69*(1), 3-19.

Joas, H., & Knoebl, W. (2009). *Social theory* Cambridge University Press.

Keating, A. (2013). New modes of governance in Europe: Mapping the multiple actors, institutions, and instruments in a shifting political space. *British Journal of Sociology of Education, 34*(3), 475-485.

Kerzner, H. (2010). *Project management-best practices: Achieving global excellence* Wiley.

Kerzner, H. (2012). *Project management case studies* Wiley.

Kerzner, H. (2013). *Project management: A systems approach to planning, scheduling, and controlling* Wiley.

Kim, S., Kim, H. J., & Lee, H. (2009). An institutional analysis of an e-government system for anti-corruption: The case of OPEN. *Government Information Quarterly, 26*(1), 42-50.

Lane, J. E. (2000). *New public management.* London, UK: Routledge.

Lawrence, T. B., Hardy, C., & Phillips, N. (2002). Institutional effects of interorganizational collaboration: The emergence of proto-institutions. *Academy of Management Journal, 45*(1), 281-290.

Layne, K., & Lee, J. (2001). Developing fully functional E-government: A four stage model. *Government Information Quarterly, 18*(2), 122-136.

Lee, A. S. (1989). A scientific methodology for MIS case studies. *MIS Quarterly, 13*(1), 33-50.

Luna-Reyes, L. F., & Gil-Garcia, J. R. (2011). Using institutional theory and dynamic simulation to understand complex e-government phenomena. *Government Information Quarterly, 28*(3), 329-345.

Meredith, J. R., & Mantel Jr, S. J. (2011). *Project management: A managerial approach* Wiley.

Mignerat, M., & Rivard, S. (2012). The institutionalization of information system project management practices. *Information and Organization, 22*(2), 125-153. doi:10.1016/j.infoandorg.2012.01.003

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* SAGE publications Inc.

Moe, T. M. (1984). The new economics of organization. *American Journal of Political Science, 28*(4), 739-777.

Myant, M. R., & Drahokoupil, J. (2011). *Transition economies: Political economy in Russia, Eastern Europe, and central Asia* Wiley Hoboken, NJ.

Orlikowski, W. J., & Baroudi, J. J. (1991). Studying information technology in organizations: Research approaches and assumptions. *Information Systems Research, 2*(1), 1-28.

Ostrom, E. (1991). Rational choice theory and economic analysis: Towards complementarity. *American Political Science Review, 85*(1), 238-243.

Park, S. H. (1996). Managing an interorganizational network: A framework of the institutional mechanism for network control. *Organization Studies, 17*(5), 795-824.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

247

Park, K. J., & Berente, N. (2012). Institutionalization, embedded rationality, and the escalation of commitment to IT projects. *System Science (HICSS), 2012 45th Hawaii International Conference on,* 4924-4933. doi:10.1109/HICSS.2012.329

Sandeep, M., & Ravishankar, M. (2014). The continuity of underperforming ICT projects in the public sector. *Information & Management, 51*(6), 700-711.

Schmidt, V. A. (2006). Give peace a chance: Reconciling the four (not three) new institutionalisms. *Presentation for the National Meetings of the American Political Science Association (Philadelphia, PA., Aug.31–Sept.1),*

Schmidt, V. A. (2008). Discursive institutionalism: The explanatory power of ideas and discourse. *Annual Review of Political Science, 11*, 303-326.

Schmidt, V. A. (2010). Taking ideas and discourse seriously: Explaining change through discursive institutionalism as the fourth 'new institutionalism'. *European Political Science Review, 2*(1), 1-25.

Schmidt, V. A. (2011). Reconciling ideas and institutions through discursive institutionalism. *Ideas and Politics in Social Science Research,* 47-64.

Schmidt, V. A. (2012). The state and political economic change: Beyond rational choice and historical institutionalism to discursive institutionalism. *State, globalization and multilateralism* (pp. 99-118) Springer.

Söderlund, J. (2011). Pluralism in project management: Navigating the crossroads of specialization and fragmentation. *International Journal of Management Reviews, 13*(2), 153-176.

Thomas, R., & Davies, A. (2005). Theorizing the micro-politics of resistance: New public management and managerial identities in the UK public services. *Organization Studies, 26*(5), 683-706.

UNDESA. (2005). *Compendium of innovative E-government practice, edition I.* (No. ST/ESA/PAD/SER.E/78). New York: Department of Economic and Social Affairs, United Nations.

UNDESA. (2006). *Compendium of innovative E-government practice, volume II.* (No. ST/ESA/PAD/SER.E/96). New York: Department of Economic and Social Affairs, United Nations.

UNDESA. (2009). *Compendium of innovative E-government practice, volume III.* (No. ST/ESA/PAD/SER.E/114). New York: Department of Economic and Social Affairs, United Nations.

UNDESA. (2012). *Compendium of innovative E-government practices: Volume IV.*United Nations.

VanWynsberghe, R., & Khan, S. (2008). Redefining case study. *International Journal of Qualitative Methods, 6*(2), 80-94.

Weik, E. (2011). Institutional entrepreneurship and agency. *Journal for the Theory of Social Behaviour, 41*(4), 466-481.

Weik, E. (2013). Introducing "The creativity of action" into institutionalist theory. *M@n@gement, 15*(5), 564-581.

Wysocki, R. K. (2011). *Effective project management: Traditional, agile, extreme* Wiley.

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). London, UK: Sage Publications.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

248

Yu, K. (2013). Institutionalization in the context of institutional pluralism: Politics as a generative process. *Organization Studies, 34*(1), 105-131.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

249

RESOURCE ENACTMENT IN IMPLEMENTING E-GOVERNMENT SYSTEM: A PILOT E-PROCUREMENT STUDY IN VIETNAM

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Abstract: The paper presents a resource enactment perspective of implementing e-Government system through an interpretive case of a pilot e-Procurement implementation in Vietnam. By conceptualizing e-Government implementation into four phases: initiation, discovery, construction and operation, we unveiled various capabilities that were developed by the enactment of knowledge and social resources in response to climate changes of contextual environment. At both strategic and tactical levels, political, policy and technical elements of the case were analysed to theorise a comprehensive process model of resource enactment. The study, thus, contributes to cumulative theoretical development for academics as well as generate insights for practitioners to governance effectively e-Government project implementation in developing countries towards better transparency, citizenship satisfaction, and openness.

Keywords: e-government implementation, e-procurement, resource enactment

1. INTRODUCTION

E-Government in Vietnam is known to be in an incipient stage in which they were ranked as the 105th in readiness for e-Government adoption (Nations, 2005). Although, since the 1990s, Vietnam's central government has earlier realised the significant benefits of e-Government in saving time and costs, strengthening the development of economics and healthy society, and most importantly promoting transparency (Calvin M.L. Chan, Lau, & Pan, 2008; West, 2004; Yildiz, 2007), their e-Government implementation was hindered. In 1999, the central government commenced Project 112 to build their first e-Government system for computerization of public administration. The project was massively invested with a price tag of US$220 million; however, its implementation was unexpectedly known to be a failure. As a result, in 2007, Prime Minster Nguyen Tan Dung halted the Project 112 and assured to prepare a more comprehensive e-Government program.

In our research, we present a case study of electronic procurement (e-Procurement) pilot project implementation which was efficiently and rigorously championed by the Ministry of Planning and Investment (MPI) in Vietnam. With an investment of US$3 million, the project was expected to build up a strong foundation to stimulate the domestic economy as well as to spur e-Government projects. In a public speech in Vietnam, Dr. Daniel Ayes, shared:

> *"Electronic procurement (e-Procurement) can reduce government's expenses*
> *by 0.7 percent of GDP through transparency and fair competitions. Thus, the*
> *development of e-Procurement will bring great advantages to (Vietnamese)*
> *businesses in particular and the domestic economy in general."*

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

250

This research investigated the success of this project implementation with theoretical lenses of resource-based view (RBV) (Wernerfelt, 1984) and enactment concepts (Boudreau & Robey, 2005; Calvin M L Chan, Hackney, Pan, & Chou, 2011). It contributed to the cumulative theoretical development of resources enactment as a bridge between RBV resources and capabilities. Moreover, with strong case evidences, we drew out a number of findings and implications for both academic bodies and practitioners.

The structure of the paper is as follows. Firstly, we explain our theoretical foundations together with our reviews on the previous work in section 2. Secondly, section 3 describes our research method and data collection in details. We present our case description in section 4 and analyse the case with theoretical lenses in section 5. Lastly, we conclude our paper with findings and contributions of research in the final section.

2. THEORETICAL BACKGROUND

With the increasing popularity of Information Communication Technologies (ICT), the use of these technologies in public administration is no longer unprecedented but necessary and imperative. Hence, in our study, we thoroughly reviewed the existing literature on the concepts of e-Government with theoretical lenses of resource-based view, and resource enactment.

2.1. E-Government in Vietnam

Since the 1990s, Vietnam's central government has been enthusiastic in promoting the use of ICT in public management to achieve their target of building a "government of, by, and for the people" (Chowdbury and Cuong et. al, 2002). This modernization process has been popularly termed as "Electronic Government (e-Government)" (Stratford & Stratford, 2001) which has been considered as a powerful enabler for greater customer orientation, improved efficiency, enhanced effectiveness, citizen satisfaction, transparency and rapid national development (Calvin M.L. Chan et al., 2008; West, 2004; Yildiz, 2007). Similar to other governments around the world which invested significant public resources to implement e-Government (G. Grant & Chau, 2005), Vietnam's government launched the largest e-Government project with a price tag of US$220 million in 2001; however, the project implementation was declared as a failure in 2007. In fact, this is a small example of many e-Government implementations which failed to achieve their intended objectives (Baumgarten & Chui, 2009; Heeks & Bailur, 2007). The chief information expert of the World Bank shared:

> *"Among the e-Government projects in developing countries, according to estimation, 35% totally failed, and 50% partially failed. Only 15% can be considered completely successful"* (Hu, Xiao, Pang, & Xie, 2005)

Therefore, implementing a successful e-Government project has been widely discussed in previous literature such as effective stakeholder management (C. Chan, Pan, & Tan, 2003; Golden, Scott, & Hughes, 2004; Pardo & Scholl, 2002; Tan, Pan, & Lim, 2005), efficient knowledge management (Ciborra, 2005; Devadoss, Pan, & Huang, 2003; Gil-García & Pardo, 2005), and strategic planning (Gil-García & Pardo, 2005; Ni & Ho, 2005; Shi, 2002). In essence, at both strategic and tactical levels, management of knowledge (Ciborra, 2005) and social capitals (Adler & Kwon, 2002) drive organizational collaboration and improve effectiveness of project implementation; thus, coding the case with these concepts promisingly reveals the formula behind the success of e-Government implementation in Vietnam.

2.2. Resource-based view

We investigated Vietnam's e-Procurement pilot implementation in the light of resource-based view (RBV) theory in which the government, as a public organization, is viewed as a collection of organization-specific resources (Penrose, 1959). As one of the most dominant theories in strategic management (Barney, Wright, & Ketchen, 2001; Hoopes, Hadsen, & Walker, 2003), RBV

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

251

has been largely used for explaining organizational performance and competitive advantages (Cockburn, Henderson, & Stern, 2000; R. M. Grant, 1991; Piccoli & Ives, 2005). There are several constructs of RBV that are studied in our research. First, resources are known to be the essential unit of analysis (R. M. Grant, 1991) which can be either in tangible or intangible forms (Collis, D.J. & Montgomery, 1995; Wernerfelt, 1984). Tangible resources such as financial resources, however, were often overrated over intangible assets such as knowledge and social capital (Hitt, Bierman, Uhlenbruck, & Shimizu, 2006; Tanriverdi, 2005). In e-Government projects, we argue that intangible resources play a crucial role in the success the implementation. Second, capabilities are defined as a higher order than resources (Amit & Schoemaker, 1993; Andreu & Ciborra, 1996) which are established through organizational routines which generate interactions among its resources (Amit & Schoemaker, 1993; R. M. Grant, 1991). As Penrose (1959) explained that "the value of resources relied less on its possession but more on the manner in which they are utilised", the process of developing capabilities is a key determinant of organizational performance (Bharadwaj, 2000; Collis, 1994). In e-Government context, Mr. Nguyen Huy Quoc, Deputy Director of E-Government Centre, spoke:

> *"Building e-Government is a long-term process, not a result of a plan."*

Therefore, our study aims to investigate the development of capabilities over a dynamic longitudinal process in which environmental context may vary fortuitously.

2.3.   Resource enactment

In successful e-Government projects, we suggest that the development of capabilities is coupled with the concept of resource enactment. As a key constituent process of organizing (K. E. Weick, 2001; K. Weick, Sutcliffe, & Obstfeld, 2005; K. Weick, 1995), resource enactment emphasises on the actions of human in pursuing certain emergent outcomes (K. Weick et al., 2005). In response to contextual environment, human agents may develop necessary knowledge and skills which are interpretively known as capabilities. Capabilities can be extended, modified, and created which, however, are also changing the environmental climate. This results in a recurring relationship where both enactment process and contextual environment impinge each other.

In the study of ICT systems, or e-Government systems in particular, engagement with a technology is considered to be temporally and contextually provisional, and thus, there is always the possibility of different structure being enacted (Orlikowski, 2000). Therefore, top management is required to aware of situational factors to monitor and regulate accordingly in order to achieve strategic goals of e-Government implementation. As enactment is arbitrated by resources such as knowledge and social capital through social construction (Boudreau & Robey, 2005), these constructs were adopted to develop an effective e-Government enactment framework.
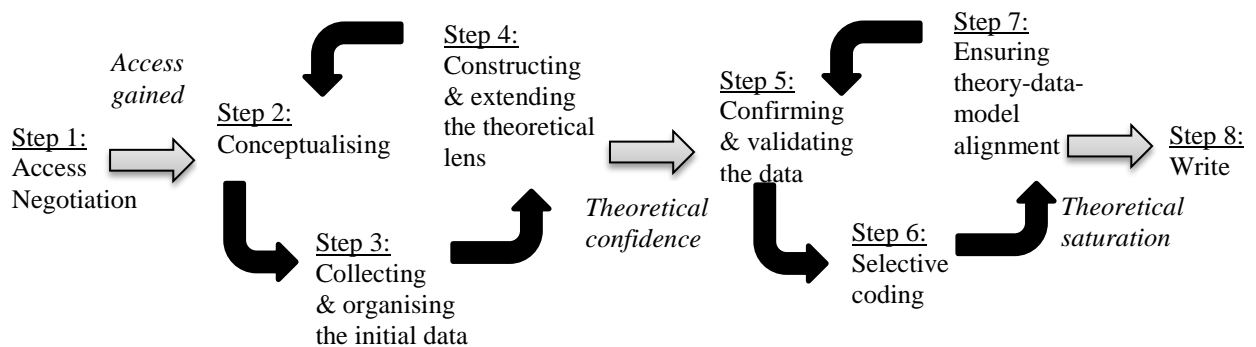
3.   RESEARCH METHOD

Figure 1: The Structural-Pragmatic-Situational approach (Pan & Tan, 2011)

In our study, we adopted the Structural-Pragmatic-Situational (SPS) technique (Pan & Tan, 2011) to effectively analyse our case of e-Procurement pilot implementation in Vietnam. By following a structured process (Figure 1) from gaining access to writing this qualitative case analysis, we developed our theoretical interpretation of the case without diminishing the rigour of our research.

3.1. Data collection

Data were mainly provided by Vietnam's Ministry of Planning and Investment in both Vietnamese and English documents. They consisted of a variety of project reports, summary of interviews and notable published news articles during the closing of the pilot phase. During this period, MPI requested Korea's partners to evaluate the success of the pilot and study the feasibility of the next phase. As the results, detailed inception reports, strategy and roadmap, and comprehensive feasibility study reports were produced. Moreover, interviews were also conducted on groups of involved people. There are three main groups: MPI's officers, the implementation vendor and external users. As the result, a summary of interviews was recorded in various reports. We illustrated our collected data in the following timeline:
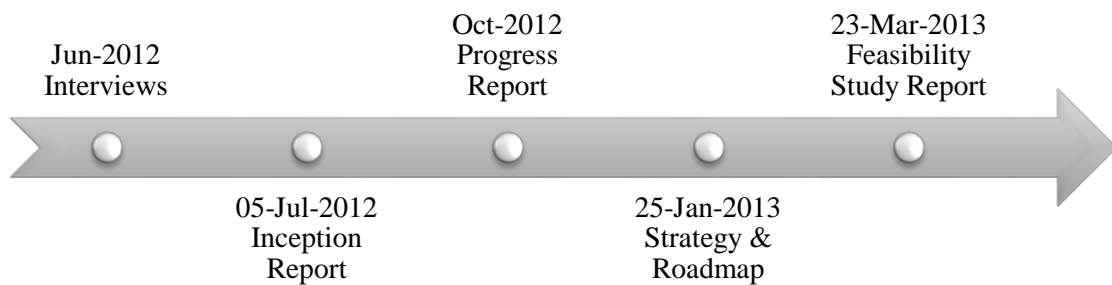
Figure 2: Data collection - Timeline

Besides, in order to paint the overall picture, we collected documentary data from the mass media and the Internet. We then analysed over news articles since the 2000s to acquire exhaustive understandings of Vietnam's context which have shown evidences of the public reception of the e-Procurement system in our research.

3.2. Data analysis

Once collected, the data were iteratively conceived with theoretical lenses of RBV and resource enactment. We organised the pilot e-Procurement implementation into four conceptual phases: "initiation", "discovery", "construction", and "operation" by using the temporal bracketing technique (Langley, 1999). This allowed us to decompose data into periods which enable the analysis of changes in the context of each phase. Hence, resource enactment was revealed through a dynamic process where many situations evolved.

	Social	Knowledge
Strategic	**Advisors** • Stakeholder relationship/commitment • Strategic support/champion • Leadership	**Inventors** • Declarative knowledge (know-what) • Transactive memory (know-who) • Legislation • Business Process and Quality
Tactical	**Ambassadors** • Culture • Organizational practices/norms • Historical legacy • Trust • Publicity	**Engineers** • Procedure knowledge • Technology enablers • Networks and infrastructure

Figure 3: Typology of project resources

We further conducted selective coding to investigate behaviours and actions of various types of resources in the e-Government and enactment concepts. As the result, we posited the following typology of resources in Figure 3:

- Advisors are social resources who are highly strategic. Typical examples of advisors are ministers, department directors and senior officers who play a leadership role and manage high-level stakeholders.
- Inventors who are symbolised for their knowledge and innovations are core workers of e-Government implementation. They produce declarative knowledge and transactive knowledge.
- Ambassadors are social resources who are working at tactical level such as project managers, support team members or news writers. They play an indispensable role in stimulating the use of the system.
- Engineers, at the tactical level, act as a crucial layer to efficiently implement e-Government systems. In this case, examples of engineers are MPI's technical officers or the vendor's technicians.

4. CASE DESCRIPTION

Joining World Trade Organization (WTO) in 2007 as the 150th member, the Vietnamese government has voluntarily signed the government procurement agreement; thus transcending an unstandardised and ineffective state of public procurement has been their key concern.

Prior to the era of electronic procurement, public procurement in Vietnam has been carried out through a manual evaluation process which is tedious and is prone to numerous flaws. Because there was no procurement law in place, procuring entities had their own rights and obligations to conduct tenders. In most cases, they publicised their project by sending out official invitation-to-tender documents using paper forms to only selected external vendors. Therefore, this process is coupled with several issues such as lack of information distribution channel, lack of transparency in preliminary vendor selection and inadequate bidder management. In fact, bidders often found difficulties in approaching tender information which were not always publicly available in one place. In some cases, the vendors had to buy tender documents from larger vendors; however, submitting their proposal was utopian. Mr. Nguyen Son shared:

> *"In some provinces, procurement notices are sent discreetly and selectively to pre-empted vendors. In faulty cases, proposals from unexpected bidders are declined impudently for various reasons"* (TNO, 2010).

Censurably, passivity did not only exist at the investor's side, but also occurred frequently at the vendor's side. For example, some vendors were caught in plotting their own network of bidders to dominate the tender.

Moreover, submitted proposals were typically evaluated in three manual steps. First, the procuring entity preliminarily ruled out bids that were irregular or did not satisfy their basic requirements. Second, a feasibility assessment was conducted based on technical requirements and specifications. Last, proposals which met all necessary requirements with competitive pricings were compared and ranked; and the bidder with the highest ranked proposal would subsequently be awarded. This method, however, procreated competitive advantages for large vendors who had built up their long and strong track records. In contracts, small or medium bidders often found hard to win unless there was collusion involved in the procurement process. Occasionally, there were a small number of investors who pre-empted their favoured vendors by hard-coding tender specifications (Lang, 2012). Apart from possible unfairness on bidding results, these manual steps were inefficient and ineffective, which resulted in longer duration of the evaluation. In scenarios where price comparison is the dominant factor, procuring entities normally wasted unnecessary efforts to conduct technical assessments in a remittent manner. Mr. Mai Thanh Dan, the chief inspector of Can Tho city, noted:

> *"Procuring entities were given overwhelmed privileges which led to a great number of shortcomings in the bidding process... Unfortunately, auditing and monitoring are still incoherent and irregular."*

4.1. Initiation phase

Indeed, the Vietnam government has realised the importance of e-Government and e-Procurement, in particular, since the late 1990s. There have been several official visits between Vietnam and Korea in order to study and exchange information on implementing e-Government projects as Korea is outstanding in early adopting of their e-Government systems in which their e-Procurement system is known the most modern brand in the world.

Understanding the necessity of an e-Procurement, the Ministry of Planning and Investment initiated a number of activities to introduce an e-Procurement system. First, they signed a memorandum of understanding with Korea's Public Procurement Service and conducted a feasibility study to review their current business processes as well as to assess existing legal frameworks. Consequently, a variety of key factors and opinions were raised to actuate changes in Law on Procurement. ICT infrastructure was also discussed internally and thoroughly to identify opportunities and challenges in implementing e-Procurement. Therefore, in the early stage, the top management officers were able to envision an achievable, transparent and effective e-Procurement system. Believing e-Procurement is inevitable trend and indispensable way for a country to build a successful model of e-Government, Mr. Dang Huy Dong, Director of Tender Management department in MPI, affirmed:

> *"E-Procurement is a major push to stimulate IT application in every field".*

After months of high-level discussions and budgetary assessments, the ministry made an official request to Korea's Ministry of Foreign Affairs and Trade to set up a pilot e-Procurement system in Vietnam as a grant program in 2007.

4.2. Discovery phase

The discovery phase of Vietnam's pilot e-Procurement project was activated with an Office Development Assistance (ODA) funding from Korea's government. The total capital investment

for this project was over US$3.3 million in which Korea International Cooperation Agency (KOICA) committed to invest a nonreturnable amount of US$3.0 million. The objective of the project was to develop an electronic procurement pilot system (EPPS) with the core of electronic bidding (e-Bidding). Apprehending the importance of the project than anyone else, the Ministry of Planning and Investment determined to expedite the system in a professional and exhaustive manner. They broke the discovery phase into four steps.

First, there was a need for revising the legal framework of Law on Procurement which was developed during the 1990s. The framework was no longer suitable for e-Procurement; and several officers were sent to Korea to understudy Korea's laws on e-Procurement. As the positive outcome, the officers were able to draft additional terms and conditions which are obligatory to electronically publicise bid-related information including procurement notices and bidding results. These stipulate that the whole process of transactions in public procurement can be handled by an e-Procurement system.

Second, the business processes in bidding were being inspected by MPI's specialists who possess knowledge and skills in both legalization and technologies. Indeed, a Korean group of specialists and consultants were dispatched to Vietnam to assist the MPI's officers in business process reengineering. Four types of tenders were introduced in the context of e-Bidding in Vietnam: tenders with unlimited participants, tenders with limited participants, direct appointment and shopping on procurement of goods. Apart from learning from Korea, the MPI's skilled officers also attended a number of international seminars to acquire comprehensive understandings of e-Procurement with neighbour countries such as Singapore, Malaysia, Philippine and Thailand. At the same time, the officers were told to develop their own best practices based on international experience. They identified two key technologies: Digital signatures and Public-Key infrastructure (PKI) were the uppermost focus of e-Procurement.

Third, Samsung SDS was appointed as the main-contractor by KOICA. With a long history and strong track records on e-Procurement, Samsung SDS was expected to deliver the EPPS in a short timeframe of eight months. The representative of Samsung SDS said:

> *"With this technology, a series of steps required by traditional bidding entailing complicated paperwork will now be performed automatically through just one registration form each from bidders and tenders"* (The Hanoi Times, 2009).

As Korea's e-Procurement system was required to be customised and deployed in the environment of Vietnam, an official bidding process was carried out by MPI to select their sub-contractor. The Information Technology Centre of Vietnam Electricity (EVNIT) which was well-established and experienced in developing e-Government solutions was chosen. As EVNIT is a government unit, the development team was directly placed under the commands of the Tender Management department (TMD) of MPI.

The final step was to decide external users in the pilot phase of e-Procurement. Three major agencies: the Hanoi City government, Vietnam Telecommunications Corporation and Vietnam Electricity Corporation were selected as the MPI's senior officers anticipated a great volume of bidding from the external users.

4.3. Construction phase

In January 2009, the construction phase of electronic procurement system was officially started with the involvements of two large companies: Samsung SDS as the main-contractor and EVNIT as the sub-contractor. The project was aiming to make available to everyone all information related to procurement notices, bidder evaluations and awardee selection.

During this period, an e-Procurement development team was formed by EVNIT and was directly managed by a project management team from the Tender Management department. The man-

agement team adopted the waterfall software development cycle (SDLC) as their development methodology. They conducted meetings with the development team to come up with business requirement documents (BRD) based on their reinvented business processes. The development team was supposed to rapidly translate these requirements into features and functionalities of the system by customizing the Korea Online E-Procurement System (KONEPS). In the event of mismatching between functionalities and requirements such as a necessary module did not fully meet the requirements, discussions were frequently conducted between the teams to immediately resolve the issues. For instance, issuing of digital signatures was agreed by both teams to be semi-automated process as the result of technical difficulties. A representative member of the management team expressed:

> *"During the implementation, we encountered numerous issues on matching our requirements with the KONEPS system; but both development and management team were able to resolve them quickly and effectively"*

Moreover, the server infrastructure was agreed to be asynchronously developed with high availability, security and redundancy. An EVNIT's infrastructure team was put to in charge of procuring hardware and software in order to build a robust data centre for e-Procurement. This data centre was also projected as the e-Government data centre in the future.

Simultaneously, MPI also established a publishing team which was in charge of revising legal frameworks and propagandizing e-Procurement to businesses. On the one hand, the team worked closely with a website vendor to build up an online e-Procurement newspaper for broadcasting necessary updates of the project. On the other hand, the team conducted numerous seminars to educate external users on law circulars and e-Bidding processes.

Throughout the construction phase, milestones and deliverables of EPPS were frequently and thoroughly monitored. The teams were working efficiently in eight months. Most importantly, there were constantly moral supports and incentives from the senior officers which motivate the team members to be on track.

As the development of the EPPS approached completion, MPI conducted User Acceptance Tests (UAT) in which their officers and external users were involved. There were some hiccups in the tests such as login issues with user management or some error messages were exposed to users in Korean. Nevertheless, all issues were rapidly escalated and resolved before launching of the system.

4.4. Operation phase

After eight months of construction, all the systems such as e-Bidding, user management and online newspaper were ready to take off. In September 2009, the e-Procurement systems were launched successfully at Hanoi city with the presence of MPI's minister and Korea's contractors. During the event, Mr. Lee Huk Kiu, Project Director of Samsung SDS, expressed:

> *"Electronic Procurement Pilot System (EPPS) is developed solely based on Korea Online E-Procurement System (KONEPS) with optimizations into the contextual environment in Vietnam. In this pilot phase, EPPS is focusing on the e-Bidding module which expectedly automates a great number of existing bidding processes such as publishing tender documents, inviting bidders, submitting bids, and announcing bidding results."*

After the launch, the operation phase occurred during two years from 2009 to 2011. The reception of EPPS was encouraging with the bidding amount of US$700 million in the first month.

During this phase, the MPI was focusing on publishing guidelines and updates, engaging external users in trainings. Nevertheless, they also encountered countless issues in operating EPPS.

First, there were plentiful technical challenges as the show-stopper of e-Procurement. One major problem was the disruptive connection between external users and the EPPS. In a remarkable case, users reported that they were unable to access to the system to publish procurement notices timely. The reason was subsequently identified because of electrical shortages in the MPI's datacentre and the support team was responding users immediately during the incidence. Mr. Le Van Tang, Director of Tender Management department, admitted:

> *"The biggest challenge of e-Procurement is to deal with the IT infrastructure which is incomplete and unstandardised in this stage"*

On the one hand, the MPI team quickly consulted industrial experts to improve the situation. On the other hand, the team provided an assurance of smooth system operation and timely support to external users.

Apart from issues with asynchronous development of infrastructure, there were also numerous issues with the design of the EPPS. For example, there was a 20MB limitation of file attachment which led to the cancellation of some tenders. In these cases, bidders found difficulties to upload documents and submit their proposals, especially engineering sketches or architecture diagrams. However, MPI's officers were extremely skilful and approachable in tackling the issue. They flexibly incorporated a workaround solution with a file compression tool into their user training.

Second, the user interface of EPPS was cumbersome and hard to use. Even MPI provided a comprehensive user training, external users which mostly were senior officers still found complications in using the EPPS. One VNPT officer complained:

> *"The EPPS was not user-friendly enough for senior officers. Occasionally, I was unable to find necessary information or to perform certain tasks on it."*

Nevertheless, MPI's officers understood the issues and a friendly helpline was established for users those who need assistance in fulfilling tasks in the system. Also, during the period, the management team regularly conducted internal meetings in order to address users' concerns and issues. Often, the user interface of EPPS was the focal topic; and the team was eager to achieve effective information architecture as well as enhanced usability. For instance, users should take at most two clicks away from the home page to reach to their bidding results. With strong rapport built with the EVNIT's teams, their requirements were quickly escalated and fulfilled in a short time.

Last but not least, encouraging user participations was a major concern of the e-Procurement. In fact, during the pilot phase, a parallel system of conventional and electronic procurement was being operated. In certain extent, e-Procurement made participants feel that they lose the powers which hinder them to use the system. At the same time, there was the lack of political determination. Knowing these issues, the management team was working with government to legally stipulate e-Procurement. Mr. Le Van Tang, assured:

> *"In the long run, Vietnam should necessarily stop encouraging localities and businesses to carry out e-Procurement as before. In the near future, the department will have more drastic measures to increase e-Procurement uses.*
>
> *The Ministry of Planning and Investment has sent documents to 15 ministries and localities to urge their subordinated units to implement this activity"*

To date, the success of implementing the pilot e-Procurement system has been marked as an important milestone for e-government implementation in Vietnam. With the great supports from many ministries and organizations such as the World Bank, a number of e-procurement policies have been legalised and a large volume of tenders have been publicised on the pilot system.

These demonstrate imperative movements from the Vietnam government towards better transparency, citizenship satisfaction, and openness.

5. CASE ANALYSIS
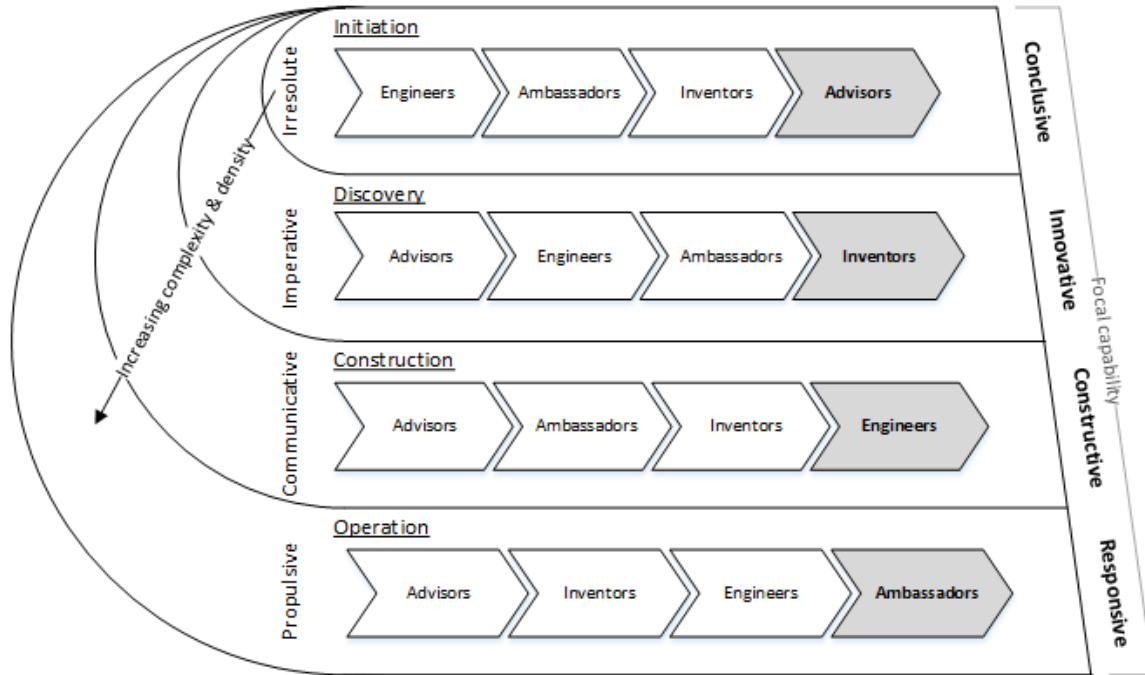
Figure 4: Theoretical model

This case study strongly demonstrated a successful e-Government project implementation. Through the sense-making lenses of RBV and resource enactment, we pointed out that Vietnam's government effectively implemented the project beyond the process of software development cycle (SDLC). Therefore, we analysed the case in four conceptual phases: "initiation", "discovery", "construction", and "operation". During each phase, environmental context was being grown quickly in both size and complexity; however, the acrobat enactment of various types of resources helped in generating necessary capabilities. Figure 4 provided an overview picture of our case analysis.

In the initiation phase, the e-Procurement system was in an irresolute environment which was established by contradictory judgments between two competing sides: businesses who increasingly demanded for an effective and transparent environment, and investors who undesirably worried of losing their power or certain group benefits. Under this circumstance, advisors play an indispensable role to actuate the project with their conclusive capability. On the one hand, senior managers took necessary actions such as organizing high-level meetings, championing budgetary assessments and most importantly request country-level supports from Korea's government. Indeed, these actions were materialised and transformed into momentous forces to initiate the project. On the other hand, there were congenial additions from other types of resources such as: ambassadors established external connections with external experts, inventors proffered ideas by reviewing AS-IN legal frameworks and business processes, and engineers reported the feasibility of existing infrastructure. The below figure summarised the analysis of this phase:
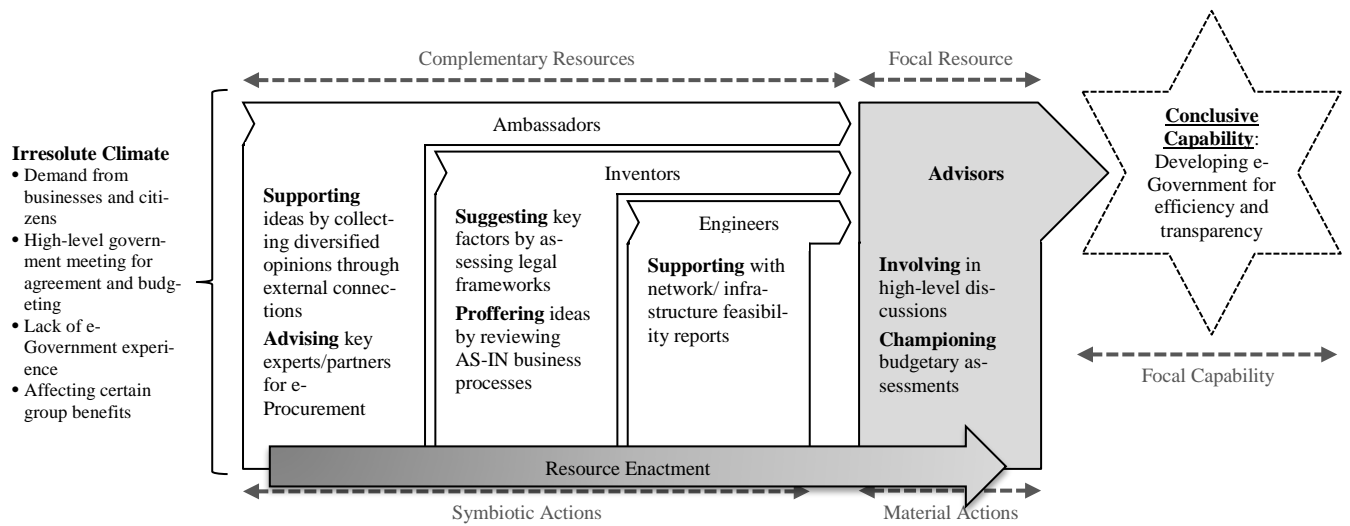
Figure 5: Case analysis of initiation phase

During the discovery phase, the environment is known to be imperative; because there were significant demands and planned budgets for the project. However, the lack of e-Government implementation experience is the key concern of Vietnam's government. This case study showed inventors with their knowledge at the strategic level acted as the keynote of the phase. Indeed, business process re-engineering and legal framework development are extremely important in establishing the foundations of the project. By acquiring comprehensive understandings of various solutions through oversea study trips, inventors built up their capability of being innovative. This is the focal capability for MPI to discover suitable solutions for their e-Procurement. Besides, symbiotic actions of other resources were also equally significant. For instance, the timely financial endorsement from advisors were appreciated; and devoted supports from inventors' subordinators were helpful. In summary, we described our case analysis of the discovery phase as below:
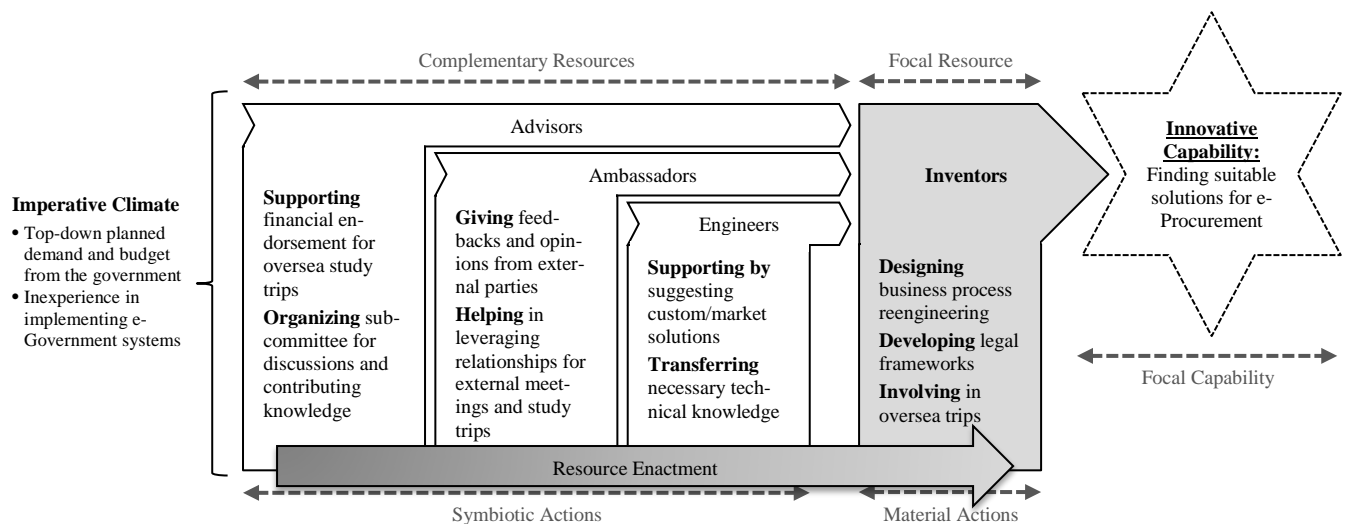
Figure 6: Case analysis of discovery phase

The construction phase occurred in a short-time in which groups of resources were working collectively and efficiently. Therefore, environmental climate was considered as communicative which was reflected clearly in our case. There were gaps in design and development, asynchronous issues between system and infrastructure, and inconsistencies in legal frameworks and system functionalities. Therefore, engineers encountered numerous issues in adjusting system changes to adapt to the context in Vietnam. In order to build an e-Procurement in this climate, engineers were professional and enthusiastic in their development works. Their spirits helped to form a focal capability of being constructive.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

260
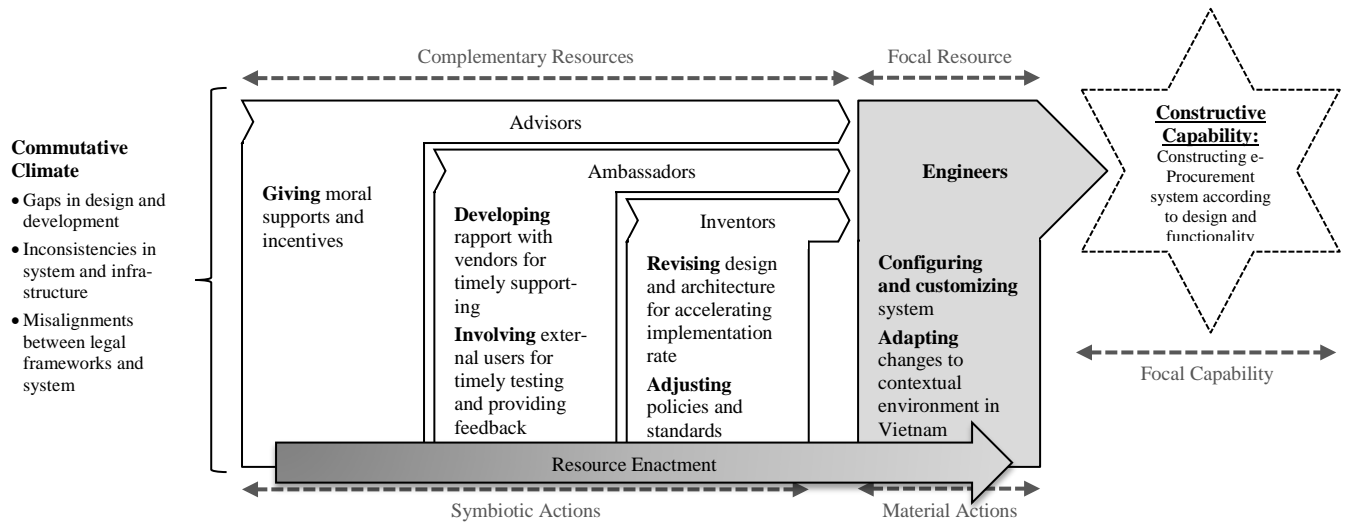
Figure 7: Case analysis of construction phase

The operation phase is typically the longest. In our case, it happened during 2 years with a propulsive environmental climate. There were a great number of technical challenges, user training issues and most importantly the lack of user participations. At the tactical level, social resources acted as a key to stimulate the use of the e-Procurement system. Responsive capability, therefore, was developed through user support and training. In most cases, ambassadors were required to publish news articles, engage users and resolve issues under time pressure. And symbiotic actions of complementary resources enacted ambassadors in their comfort zone. For example, advisors guaranteed their future and gave assurances on demolishing the parallel system. At the same time, inventors and engineers did their best to ensure the smooth operation of the system.
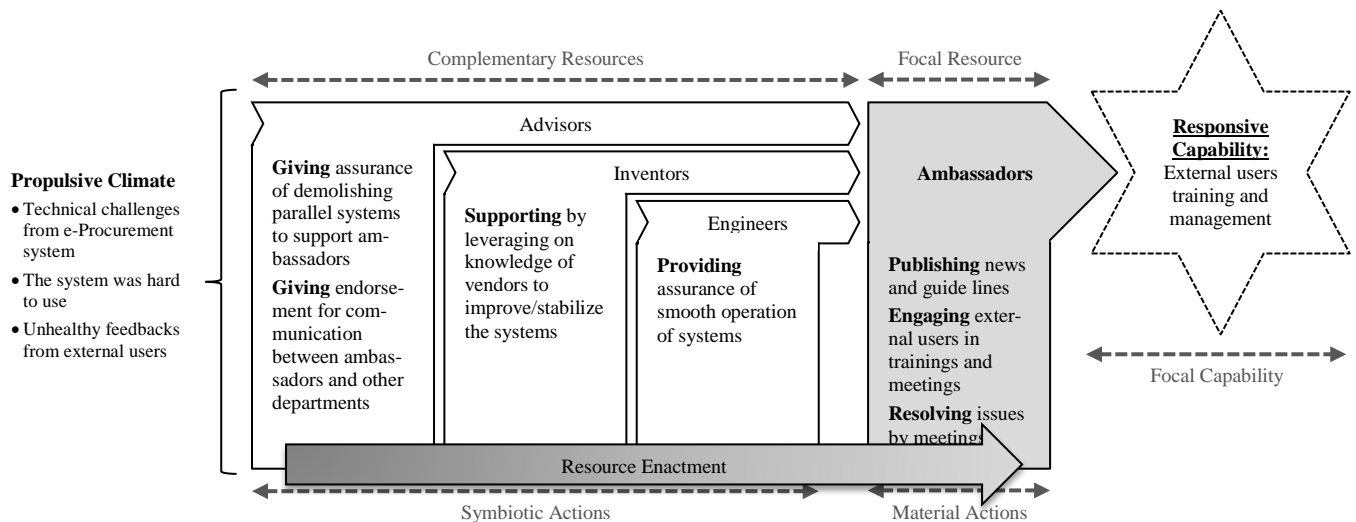
Figure 8: Case analysis of operation phase

In summary, the case analysis showed a rhythmic enactment of various types of resources which led to the success of the e-Procurement pilot implementation.

6. CONCLUSION

In this research, we introduced an interesting qualitative case analysis of implementing e-Government in a developing country like Vietnam. As Chan et al. (2011) suggested, this case study was incorporated with various aspects of political, policy and technical elements. Therefore, the research considerably contributed to the cumulative theoretical development of resource-based view and resource enactment. In our case, we strongly demonstrated that capabilities are developed by the acrobat enactment of various resources. In every phase of e-

Government implementation, we identified the focal resource to establish the focal capability with the inducement of complementary resources. Besides, we proposed a typology of resources in the light of management of social and knowledge capitals at both strategic and tactical levels.

Moreover, our study provided implications for practitioners to successfully implement an e-Government project. First, we provided a framework for managers to envisage the dynamics and complexity of e-Government projects. Managers should look beyond the software development life cycle (SDLC) to achieving the goal of successful implementation. Second, our study pointed out the process of developing capabilities through resource enactment. Managers should also pay attention on symbiotic actions which speed up the project effectively. Last but not least, we proposed a framework for managers to manage their social and knowledge resources efficiently.

REFERENCES

Adler, P., & Kwon, S. (2002). Social capital: prospects for a new concept. *Academy of Management Review*. Retrieved from http://amr.aom.org/content/27/1/17.short

Amit, R., & Schoemaker, P. (1993). Strategic assets and organizational rent. *Strategic Management Journal*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/smj.4250140105/abstract

Andreu, R., & Ciborra, C. (1996). Organisational learning and core capabilities development: the role of IT. *The Journal of Strategic Information Systems*. doi:10.1016/S0963-8687(96)80039-4

Barney, J., Wright, M., & Ketchen, D. (2001). The resource-based view of the firm: Ten years after 1991. *Journal of Management*. Retrieved from http://jom.sagepub.com/content/27/6/625.short

Baumgarten, J., & Chui, M. (2009). E-government 2.0. *McKinsey Quarterly*. Retrieved from http://www.i-gov.org/images/articles/11138/egov20.pdf

Bharadwaj, A. (2000). A resource-based perspective on information technology capability and firm performance: an empirical investigation. *MIS Quarterly*. Retrieved from http://www.jstor.org/stable/10.2307/3250983

Boudreau, M., & Robey, D. (2005). Enacting integrated information technology: A human agency perspective. *Organization Science*. Retrieved from http://orgsci.journal.informs.org/content/16/1/3.short

Chan, C. M. L., Hackney, R., Pan, S. L., & Chou, T.-C. (2011, April 26). Managing e-Government system implementation: a resource enactment perspective. *European Journal of Information Systems*. Nature Publishing Group. doi:10.1057/ejis.2011.19

Chan, C. M. L., Lau, Y., & Pan, S. L. (2008). E-government implementation: A macro analysis of Singapore's e-government initiatives. *Government Information Quarterly*, *25*(2), 239–255. doi:10.1016/j.giq.2006.04.011

Chan, C., Pan, S., & Tan, C. (2003). Managing Stakeholder Relationships in an e-government project. Retrieved from http://aisel.aisnet.org/amcis2003/98/

Ciborra, C. (2005). Interpreting e-government and development: Efficiency, transparency or governance at a distance? *Information Technology & People*. Retrieved from http://www.emeraldinsight.com/journals.htm?articleid=1514947&show=abstract

Cockburn, I., Henderson, R., & Stern, S. (2000). Untangling the origins of competitive advantage. Retrieved from http://18.7.29.232/handle/1721.1/3822

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

262

Collis, D. (1994). Research note: how valuable are organizational capabilities? *Strategic Management Journal*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/smj.4250150910/abstract

Collis, D.J. & Montgomery, C. . (1995). Competing on resources: Strategy in the 1990s. *Harvard Business Review*.

Devadoss, P., Pan, S., & Huang, J. (2003). Structurational analysis of e-government initiatives: a case study of SCO. *Decision Support Systems*. Retrieved from http://www.sciencedirect.com/science/article/pii/S0167923602001203

Gil-García, J., & Pardo, T. (2005). E-government success factors: Mapping practical tools to theoretical foundations. *Government Information Quarterly*. Retrieved from http://www.sciencedirect.com/science/article/pii/S0740624X05000158

Golden, W., Scott, M., & Hughes, M. (2004). Implementation strategies for e-government: a stakeholder analysis approach. Retrieved from http://vmserver14.nuigalway.ie/xmlui/handle/10379/77

Grant, G., & Chau, D. (2005). Developing a generic framework for e-government. *Journal of Global Information Management (JGIM)*. Retrieved from http://www.igi-global.com/article/developing-generic-framework-government/3617

Grant, R. M. (1991). The resource-based theory of competitive advantage. *California Management Review*.

Heeks, R., & Bailur, S. (2007). Analyzing e-government research: Perspectives, philosophies, theories, methods, and practice. *Government Information Quarterly*, *24*(2), 243–265. doi:10.1016/j.giq.2006.06.005

Hitt, M. A., Bierman, L., Uhlenbruck, K., & Shimizu, K. (2006). The importance of resources in the internationalization of professional service firms: The good, the bad, and the ugly. *Academy of Management Journal*, *49*, 1137–1157. doi:10.5465/AMJ.2006.23478217

Hoopes, D. G., Hadsen, T. L., & Walker, G. (2003). GUEST EDITORS' INTRODUCTION TO THE SPECIAL ISSUE: WHY IS THERE A RESOURCE-BASED VIEW? TOWARD A THEORY OF COMPETITIVE HETEROGENEITY. *Strategic Management Journal*, *24*, 889–902. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/smj.356/abstract

Hu, Y., Xiao, J., Pang, J., & Xie, K. (2005). A research on the appraisal framework of e-government project success. *Proceedings of the 7th International Conference on Electronic Commerce*, 532–538. doi:10.1145/1089551.1089647

Lang, V. (2012). Electronic procurement: a solution to prevent corruption. Retrieved from http://www.ktdt.com.vn/news/detail/339788/dau-thau-dien-tu-giai-phap-ngan-chan-tieu-cuc.aspx

Langley, A. (1999). Strategies for theorizing from process data. *Academy of Management Review*, *24*, 691–710. doi:10.5465/AMR.1999.2553248

Nations, U. (2005). *Global E-Government Readiness Report 2005: From E-government to E-inclusion*.

Ni, A. Y., & Ho, A. T.-K. (2005). Challenges in e-government development: Lessons from two information kiosk projects. *Government Information Quarterly*. Retrieved from http://www.sciencedirect.com/science/article/pii/S0740624X04000693

Orlikowski, W. (2000). Using technology and constituting structures: A practice lens for studying technology in organizations. *Organization Science*. Retrieved from http://orgsci.journal.informs.org/content/11/4/404.short

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

263

Pan, S., & Tan, B. (2011). Demystifying case research: A structured–pragmatic–situational (SPS) approach to conducting case studies. *Information and Organization*. Retrieved from http://www.sciencedirect.com/science/article/pii/S1471772711000303

Pardo, T., & Scholl, H. (2002). Walking atop the cliffs: avoiding failure and reducing risk in large scale e-government projects. *Proceedings of the 35th Annual Hawaii International Conference on System Sciences*. doi:10.1109/HICSS.2002.994076

Penrose. (1959). The theory of the growth of the firm. *Basil Blackwell*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/mde.4090020310/abstract

Piccoli, G., & Ives, B. (2005). Review: IT-dependent strategic initiatives and sustained competitive advantage: a review and synthesis of the literature. *Mis Quarterly*. Retrieved from http://dl.acm.org/citation.cfm?id=2017283

Shi, W. (2002). The contribution of organizational factors in the success of electronic government commerce. *International Journal of Public Administration*. Retrieved from http://www.tandfonline.com/doi/abs/10.1081/PAD-120003293

Stratford, J. S., & Stratford, J. (2001). Computerized and networked government information. *Journal of Government Information*, *28*, 297–301. doi:10.1016/S1352-0237(01)00300-8

Tan, C., Pan, S., & Lim, E. (2005). Managing stakeholder interests in e-government implementation: lessons learned from a Singapore e-government project. *Journal of Global Information …*. Retrieved from http://www.igi-global.com/article/journal-global-information-management-jgim/3618

Tanriverdi, H. (2005). Information technology relatedness, knowledge management capability, and performance of multibusiness firms. *MIS Quarterly*. Retrieved from http://www.jstor.org/stable/10.2307/25148681

The Hanoi Times. (2009). E-Government makes test of purchasing system. Retrieved from http://www.apecdoc.org/site/vietnam/2009/09/07/e-government-makes-test-of-purchasing-system/

TNO. (2010). Electronic bidding. Retrieved from http://laodong.com.vn/Kinh-doanh/Dau-thau-dien-tu/36137.bld

Weick, K. (1995). *Sensemaking in organizations*. Retrieved from http://books.google.com/books?hl=en&lr=&id=nz1RT-xskeoC&oi=fnd&pg=PR7&dq=Sensemaking+in+organizations&ots=zF1lE8em6l&sig=Bi4Bn8nSBlJsNW7cq0L8udN2U3k

Weick, K. E. (2001). Making Sense of the Organization. *Blackwell*.

Weick, K., Sutcliffe, K., & Obstfeld, D. (2005). Organizing and the process of sensemaking. *Organization Science*. Retrieved from http://orgsci.highwire.org/content/16/4/409.short

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/smj.4250050207/abstract

West, D. (2004). E-Government and the Transformation of Service Delivery and Citizen Attitudes. *Public Administration Review*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1540-6210.2004.00343.x/abstract

Yildiz, M. (2007). E-government research: Reviewing the literature, limitations, and ways forward. *Government Information Quarterly*. Retrieved from http://www.sciencedirect.com/science/article/pii/S0740624X07000056

USING PERFORMANCE LEAGUE TABLES TO PROMOTE ACCOUNTABILITY AND FEEDBACK IN HEALTH MANAGEMENT IN MALAWI

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Abstract: One of the challenges of health management in developing countries is the existence of weak accountability and feedback practices. This paper assesses the conditions for introducing performance league tables for promoting accountability and feedback in health management. A qualitative approach with an interpretive perspective has been adopted in this study. Data was collected using interviews, prototyping, observations and document analysis. The assessment revealed the importance of having a participatory process in the design and implementation of league tables used within the existing management practices. This ensures flexibility in the use of performance league tables. In addition, appropriate technology should facilitate availability and accessibility of data to stakeholders so that they manipulate it to suit their needs. Collaboration among stakeholders is a critical condition for ensuring access to additional resources for the implementation of performance league tables. A decentralized approach to league table definition allows districts to choose and weight indicators according to their own goals. Relevance, local choices through a participatory bottom up design process leads to broader acceptance and use of the performance league tables.

Keywords: Feedback practices, performance league tables, health management, participatory approach, accountability

1.   INTRODUCTION

Ranking systems have been developed to measure the performance of institutions in various sectors such as sports, education, banking and finance, and health to achieve accountability and comparative evaluation (Kossi, Sæbo, Braa, Jalloh, & Manya, 2013; ALMA, 2013; Edward, Kumar, Salehi, Burnham & Peters, 2011; Republic of Uganda, (undated); Peters, Noor, Singh, Kakar, Hansen, & Burnham, 2007); Adab, Rouse, Mohammed, & Marshall, 2002). One such mechanism is the league table which can be used as an internal tool to improve performance of the institutions (Foley & Goldstein, 2012). A league table can be defined as a *'technique for displaying comparative rankings of performance indicator scores of several similar providers'* (Adab, et al, 2002, p96). Roberts & Thompson (2007) have defined it as *a set of quantitative data designed to present comparative evidence regarding the quality and performance of organizations*. The criteria used in determining these rankings are based on a particular standardized set of performance indicators so that institutions are compared.

While the policy on performance measurement sounds good and easy to implement, it is complex and problematic in practice. Providers may have difficulties agreeing on suitable performance measures to use (McGinnes & Elandy, 2012), on alignment of performance measures (Micheli & Neely, 2010) and may not represent the whole performance picture of an organization. National rankings are based on the availability of existing data from sources such as routine HMIS data, survey data from national statistics offices or other surveys by

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

265

stakeholders. In most cases, the selection of indicators is based on data availability that can measure change over time and not necessarily on relevance of the indicators for health service goals. In such cases, ranking is largely based on what can be measured and not what is relevant and important (Stella & Woodhouse, 2006). As Harvey noted 'the construction of indices by which institutions or departments are ranked is arbitrary, inconsistent and based on convenience measures' (Harvey, 2008, p189). While league tables have been popular in recent years, no single model has been accepted as such there is no one size fits all approach.

League tables for performance monitoring were first used in the Malawi joint annual health sector review in 2006, using selected health sector indicators (Ministry of Health, 2006). The district performance league table was presented at the national SWAp review meeting and received mixed reaction. Some of the stakeholders welcomed the concept as it would promote behavioural change and encourage teamwork. In some cases the league table attracted resistance, criticism and anxiety especially from those districts that were at the bottom of the table. Furthermore, the use of the league table to measure district performance was criticized because of its methodological shortfalls including the selection process of indicators and weights. Some participants wondered what criteria were used for assigning weighting to the selected indicators. Participants expressed concern that the weighting was arbitrary and therefore there was no transparency regarding the methodology used for coming up with the rankings. The data used was from the routine health information system which at that time was considered of poor quality in terms of completeness and timeliness. In addition, others participants reacted by saying that the data used was not audited and verified.

The concept was then used for a couple of years before it was discontinued. However, there has been growing impetus among various stakeholders to revive the use of the league table for comparing district performance. This has resulted in the launching of the African Leaders Malaria Alliance (ALMA) scorecard in Malawi in 2013 (ALMA, 2013). While these efforts are using the scorecard to measure and compare district performance at national level, without an explicit ranking, this paper looks at the ranked performance of health facilities at district level. It identifies parameters that the district considers most important, appropriate and relevant for local action.

The aim of this paper is to assess the conditions for introducing league tables in health management. In this paper, we discuss the current status, challenges and prospects of the scorecard in the form of league table used for promoting accountability and feedback at district level. In particular, the paper draws data from the assessment that was conducted in Malawi.

The paper is structured as follows. The next section presents the relevant literature on the concepts of scorecards and league tables, feedback and open data. Section 3 presents the research setting and this is followed by section 4 on methods. Findings and analysis are presented in section 5 and finally is the discussion and concluding remarks section.

2. LITERATURE REVIEW

2.1. Scorecard and League Table

Ranking systems has a long history and presently, it is generating a lot of interest in many fields. A performance league table is one of the tools used in ranking systems. Arguments for and against performance league tables have been advanced in literature. Proponents of league tables argue that they may stimulate competition among service providers (Adab, et al, 2002), help monitoring and ensure accountability of providers (Smith, 1990). On the other hand, league tables have been criticized in a number of ways. While it may have been used in other sectors without many problems, the use of the league tables in the health sector has 'attracted resistance, criticism and anxiety' (Adab, et al, 2002, p95).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

266

The use of performance league tables has been necessitated by the introduction of health reforms based on the notion of transparency and institutional accountability (Goldstein & Leckie, 2008). League tables show not only that the institutions are held accountable for their performance but also provide an incentive to improve their performance. In addition, performance league tables can be used as a screening system to identify those institutions that may require attention (Goldstein & Leckie, 2008). As such league tables would promote performance monitoring, review and responsiveness. In some instances, the league tables may foster a competitive culture among institutions (Hallgarten, 2001). Performance rankings can provide critical information to help make management decisions by a variety of audience (Hazelkorn, 2007); can stimulate competition among institutions (Harvey, 2008); and promote transparency and accountability (Smith, 1990). These comparative rankings can also be viewed as devices used as part of an institutional improvement programme. This would encourage service providers to review and seek to improve their performance. They can be used for providing feedback regarding their performance. In addition, league tables can enhance learning as institutions and individuals can learn from each other.

Many countries and organizations have used one form of league tables - the scorecard - in the health sector. Scorecards contain the same indicators and calculations as the league tables, but they are not ranked according to the total scores. League tables are used for comparative performance in Sierra Leone (Kossi, et al, 2013), in Uganda, (Republic of Uganda (undated); and in Malawi (Ministry of Health 2006); managing the delivery of primary health care services in Afghanistan (Edward, et al, 2011; Peters et al, 2007); comparing National Health Services (NHS) performance in the United Kingdom (Adab, et al, 2002); monitoring performance for Reproductive, Maternal, Newborn and Child Health (RMNCH) (ALMA, 2013).

2.2. Feedback

The concept of feedback is from the learning theories. It is multi-dimensional and plays a variety of functions including as a provider of information (Kulhavy & Wager, 1993). The role of feedback and the effects of different types on performance and learning have generated a lot of interest of researchers for a long time (Lam, DeRue, Karam, & Hollenbeck, 2011; Lurie & Swaminathan, 2009). Organizations are using feedback for not only motivation but also as a mechanism for both individual and organizational performance improvement (Thurlings, Vermeulen, Bastiaens, & Stijnem, 2012).

2.3. Open Data

Open data efforts are gaining momentum worldwide. These efforts are intended to make data widely available and accessible so that it can be reused and redistributed by stakeholders. The open data solutions fit very well into the domain of transparency and create an environment for providing feedback and ensuring accountability. There are many benefits of open data which include user adaptation, feedback and promotes interaction between data producers and users (Zuiderwijk, Janssen, Davis, 2014; Janssen, Charalabidis & Zuiderwijk, 2012). In order for open data efforts to be useful they require infrastructure that can be used for accessing the data, discussion and feedback (Alexopoulos, Loukis & Charalabidis, 2014). However, institutional and technical barriers in many poor resourced settings are some of the major barriers to realizing the benefits of open data (Janssen, Charalabidis & Zuiderwijk, 2012).

2.4. Implications for Our Study

Based on the above literature review, we summarize some key concepts that seem relevant to guide our research. First, and absolute key for league tables, is *availability of and access to data*. This is dependent not only on data being open, but on the *awareness and skills* of health workers related to properly make benefit of it, and the enabling or constraining effects of *technology*. Previous experience with league tables in Malawi has shown that *interest and attitudes* are important, and that league tables need to *fit in existing management practices*. In addition, we

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

267

see that *institutional collaboration* is important, given that league tables should include indicators across health programs. Lastly, the design process of the league table, both related to the layout and content, will be examined.

3.   RESEARCH SETTING

The organizational structure of the Ministry of Health (MoH) in Malawi has four levels: national, zone, district and facility. The country has a network of health facilities managed by different organizations and delivered at primary, secondary and tertiary levels. In 2014, there were 977 health facilities providing health services in the country (Ministry of Health & ICF International, 2014). Of these, Government manages the largest number of facilities (48%), followed by private for profit (22%). The Christian Health Association of Malawi (CHAM), which is made up of independent church related health facilities, manages 17% of the facilities. The rest (13%) is managed by non-governmental organizations (NGOs) and companies.

The Ministry has a decentralised organizational structure for health information from the health facility level up to headquarters. The Ministry has established a dedicated cadre for information recording and compiling at health facility level. There is the health information officer located at the district health office with a dedicated computer for data management. At each facility there is a statistical/data clerk to assist in data processing and report generation and reporting.

The routine health information system is paper based at health facility level and is computerised at district and national levels, using a web based District Health Information System version 2 (DHIS2.0) since 2012. The Ministry maintains DHIS2 central database for routine data received monthly from all districts and central hospitals. It produces comparative reports for use by different national programmes and other stakeholders, and users can also define their requirements and generate reports according to need.

Since 2004, Malawi has been implementing a health service delivery strategy based on the Essential Health Package (EHP) (Ministry of Health, 2011; Ministry of Health, 2004) under the SWAp implementation framework. The ministry of health compiled the first national league table for the period 2004-05 in 2006 (Ministry of Health, 2006). The league table presented a comparative performance analysis of districts on selected indicators drawn from the national SWAp core indicators matrix. The aim of the league table was to assess district performance; compare performance among districts; provide information to facilitate analysis of circumstances behind performance; form a basis for rewarding better performing districts and develop appropriate corrective measures for poor performers (Ministry of Health, 2006). The indicators used in the league table were selected based on data availability; alignment with health sector goals and other strategic documents such as the Millennium Development Goals and the Malawi Growth and Development Strategy; and weight assigned to each indicators. The weighting was done centrally based on the importance of the indicator and linked to the priorities in the national SWAp programme of work (Ministry of Health, 2006).

4.   METHODS

4.1. Overall Approach

The research presented in this paper comes out of an action research project on health information systems in Malawi. Specifically, the project aims at strengthening local use of information, by improving local access and knowledge on how to analyse relevant data. A qualitative approach with an interpretive perspective has been adopted in this study.

The research was carried out in Malawi through two main work streams; situational analysis of feedback routines and level of information use, and prototyping of a league table with testing

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

268

and input from district and zonal levels (Table 1). The league table was based upon findings from former document analysis, experiences from other countries and practices, and implemented in the DHIS2 software. The goal was to present it as simple as possible to let the users/health workers influence its functionality and design during the data collection period.

	Measles coverage rate	Deliveries by skilled health personnel	Antenatal care during first trimester	OPD utilization rate	Total Score League Table V2
North Zone	115.9	99.8	17	248.8	120.4
South East Zone	79	66.5	10.2	106.4	65.5
South West Zone	65.1	44	7.2	104.5	55.2
Central West Zone	75.2	63.8	6.8	97	60.7
Central East Zone	64.8	51.6	8.4	122.3	61.8

Table 1: A prototype league table at zonal level, Malawi

4.2. Data Collection

Data collection for the study took place in 6 districts health offices, 4 health facilities, 3 zonal health offices, and at the Ministry of health headquarters between July and November 2014. During the meetings, the assessment team was briefed on how data flows from the lowest level to the highest, the feedback practices and flows at district level. The teams also observed how the DHIS2 was functioning, and presented the prototype league table. In addition, focused training sessions on the league table prototype were conducted.

The following methods were used for data collection: semi structured interviews, observations and document analysis. At district level, discussions, with district programme coordinators, health facility in-charges and other informants were guided by open-ended questions. The discussions were audio taped. Participant observations of work practices around health management information system processing were done; and document reviews at both national and district levels.

Using open-ended questions, the study team had face-to-face group discussions with the district health management teams (DHMTs), HMIS officers and district programme coordinators. At the health centre level, the team met with the facility in-charges and facility members.

A total of 69 health personnel, the majority were district programme officers (29), were interviewed or participated during the data collection as summarized in Table 2 below.

Persons consulted or participated	Number
Central Monitoring and Evaluation Division (CMED) (MoH)	5
District health officers	4
District programme coordinators	29
District HMIS officers	7
Officers at zonal health office	14
Health facility in charges	3
Data clerks at health facility	3

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

269

Student interns at district level	2
M&E Technical advisors in projects	2
Total	**69**

Table 2: Individuals interviewed or participated in the discussions

Another data source for the study was document review, including the national SWAp semi-annual and annual review reports. Analysis of official documents such as health information system policies, strategies, procedures and guidelines was done in order to contribute to the interpretation of the significance of the SWAp reviews.

4.3. Data Analysis

Data analysis has been conducted through two stages; one in direct relation to daily work in Malawi, and the second more specifically in the development of this paper. First, at the end of the workday in Malawi, after visiting a clinic, district or zonal office, the authors would have a brief discussion about the findings, and usually carry out some work related to updating the league table design. This forms the basis for the situational report in general. Second, we have had more focused discussion around the experiences of the league table in the process of writing this paper, which has been centred on topics as presented in section 2.4.

5.   FINDINGS AND ANALYSIS

5.1. Availability and Accessibility of Data

The Malawi Ministry of Health has been implementing DHIS2, a web based system aimed at supporting an integrated Health Information System (HIS) at district and national levels since 2012. It is aimed at improving data capture and analysis for programmes, data flows at facility and district and national levels, and establishing a national data repository for indicator data. Aggregate raw summary and programme level health data is available in DHIS2 by different organization unit levels. Available catchment population data by facility can also be incorporated in DHIS2 making it possible to calculate indicators at health facility level. This would make it possible to compare facility performance over time and also do facility or district comparison. Accessibility of data in DHIS2 is possible if one has appropriate users rights. Many district programme coordinators have user rights to view data of their district obtained during initial orientation on the software. However they expressed the need to view data from other districts in order to compare performance. The district programme coordinators had user rights to access such but they were not aware of it. Due to high staff turnover, many new district programme coordinators do not have user rights to access and manipulate data in DHIS2. The districts suggested decentralizing the issuing of user rights to the districts improve timely issuing of user rights at district level.

5.2. Skills Levels and Awareness

There is a dedicated cadre of HMIS officer at the district level responsible for managing HMIS and DHIS2. The district HMIS officer is responsible for data entry in DHIS2, data analysis, report generation and sending data to the central server. These officers have acquired the necessary skills and experience in using DHIS2. While the district programme coordinators are aware of the DHIS2, most of them have not been oriented on the system. For those that had been trained some were not using the system because of intermittent internet connectivity or had forgotten their usernames and/or passwords.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

270

5.3. Availability of Technology

The assessment revealed that there is an integrated DHIS2 that has been rolled out in all the districts throughout Malawi. The software is used for data entry, analysis, presentation and storage. DHIS2 central server for data storage is located at ministry of health headquarters. The use of DHIS2 web based software at district level is constrained by lack of reliable Internet connectivity and subscription.

5.4. Fit in Management Practices

Although the league tables were not continued, the team observed that there are ways in which feedback was provided, including quarterly reviews, supervision and HMIS bulletins (Table 3). Most of the feedback is provided through reviews, which are aimed at providing information as well as motivating the health workers. Ideally, league tables should be used within the existing management practices such as quarterly reviews. Having the league tables in DHIS2 would help to improve management practices.

The assessment team also noted that facilities get feedback from the districts when there are errors and not as a routine practice. As observed by one district programme coordinator, *'Feedback from national programme managers is given when there are errors. Otherwise there is no feedback given'*. The coordinator suggested the need to be given feedback frequently or when a report is submitted.

	Channels of feedback	Frequency	Level	Function
1	Joint Health Sector reviews	Semi-annually, Annually	National	Information, Motivation
2	Programme Specific reviews	Quarterly, Annually	Zonal, District	Motivation, Information
3	Individual Performance reviews	Annually	Individual	Information, Motivation
4	District Implementation Plan (DIP)/HMIS reviews	Quarterly	Zonal, District	Information, Motivation
5	Health Facility HMIS reviews	Monthly	Facility	Information
6	HMIS bulletins	Semi-annually, Annually	National, District	Information
7	Supervision	Quarterly	District, Facility	Reinforcement, Motivation
8	Messaging using mobile phones	Immediately	District, Programme	Reinforcement, Information
9	Data Quality Audits	Quarterly, Immediately	Zonal, District, Facility	Reinforcement, Information
10	Messaging in DHIS2	Immediately, Monthly	Zonal, District	Information, Reinforcement

Table 3: Typology of feedback practices in health management in Malawi

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

271

On the other hand, districts expressed the lack of feedback on data sent to higher levels. As one district programme coordinator commented, *'There is no feedback from the zonal officers. The zonal officers come every quarter during supervision to collect the data and they do not provide any feedback. They ask us if there are any challenges, which we mention, and we do not see any changes in the challenges. Every day they ask us the same things'.*

The majority of the informants expressed that the feedback they received from the national level was inadequate or non-existing. Feedback mostly took the shape of corrections on the data quality and completeness, rather on the performance of the health services. However, contrary to the earlier experiences, most were positive to be compared through performance league tables. The authors were thus able to pilot and get reactions on a new league table, set up inside the DHIS2 application which they were already using for data collection and processing.

5.5. Interests and Attitudes

The assessment revealed that there is general interest expressed among the district programme coordinators on the importance of comparing performance with other districts. The districts and the zones are also interested using a ranking system for comparing district performance. The assessment team noted that one of the five health zones was using a performance league table for ranking the districts using selected indicators. The district performance is linked to the reward or recognition scheme where the best performing district is given a reward. Although the use of performance league table has been discontinued, it is interesting to note that the health zones are reviving the use of the concept for providing feedback to the districts and therefore motivate the health workers. Feedback is important as it motivates the health workers as well as use indicators to compare facility performance. As one district programme coordinator indicated: *'District programme officers feel that feedback is important in the sense that it is a way of acknowledging the role of those collecting the data play. It also helps to correct some of the deficiencies in the systems in terms of data collection, analysis and reporting'.*

When questioned about their opinion on acceptability and usefulness of scorecards and league tables, the responses from the district, zonal and ministry of health levels were encouraging. While some of the zones are not using the league table during review meetings, discussions have been going on, regarding the importance of introducing the league table at zonal level. As observed by one of the zonal health officers: *'A league table has not been produced in the zone, but it is being discussed on how best it can be done...we find it to be good, it also encourages the districts, when the districts that seem to be performing are praised in front of their peers, they feel good and encouraged to do even more'.* The districts also made suggestions to extend feedback to the community and the general public. This was emphasized by one of the district environmental health programme coordinator who proposed that: *'when giving feedback, even the community members need to know what is happening in their health facilities...like for example immunizations if we can display the data to the general public so that they can know how their facility is performing, as they have direct impact on the indicators'.*

5.6 Collaborations

Collaboration among stakeholders within the district was observed at two levels. For instance, within the district health offices there was close collaboration between district HMIS officers and the programme coordinators in the production of district HMIS reports. The programme coordinators ensured that all programme level data was available for the production of the bulletin. On the other level, collaboration between the district health offices and NGOs working in the health sector to strengthen health management. One of the NGOs was invited and participated in the meetings we had with the district health management team. It was observed that various NGOs were supporting districts in DHIS2 implementation in the provision of internet connectivity and subscription, support district and facility review meetings and providing logistics for support supervision to health facilities. However, these activities have

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

272

huge cost implications districts are unable to sustain from their own budget. Through this close collaboration, districts have mobilized and accessed additional financial and technical resources for managing their districts.

5.7 Process of Designing Layout and Technology

The assessment revealed that the majority of the health workers were interested in utilizing league tables in their management, however they had some concerns regarding the implementation, and it was therefore crucial to involve them in the further development. One of the major concerns was that they wanted to be a part of choosing the indicators to be presented in the league table, to make sure that they would be appropriate. During the discussions we therefore invited the participants to suggest indicators. Many of the indicators mentioned were already included in the league table. However as a result of the discussion one additional indicator was added.

Further on trainings were conducted at two zonal offices and one district office. The trainings were held to teach the participants how they could create the league tables themselves, but also to invite them to discuss further improvements. Both during the trainings and the assessment interest was shown upon having a coloured league table easing the readability for the users. The second version of the league table (Table 4) therefore included colours, as well as a new indicator.

Organisation unit	Measles coverage rate	Deliveries by SHP	ANC visit 1st trimester	OPD utilization rate	Neonatal death rate	Total score
St Gabriels Hospital	51	346,7	18,8	549,8	0	193,26
Chilobwe Majiga Health Centre	51,9	0	30	214,7		59,32
Mc Quire Wellness Health Centre	55,6	0	0	179,7		47,06
Area 25 Urban Health Centre	80,7	80,9	17,1	172,5		70,24
Kang'Oma Health Centre	84,1	27,9	3,4	139,5		50,98
Diamphwe Health Centre	84,8	45,1	6,6	130,1		53,32
Kabudula Rural Hospital	63	143	7,7	124,2	15,6	70,7
Mlale Hospital	50,6	28,7	2	131,5		42,56
Bwaila Hospital	21,7	101,9	4,7	107,1		47,08
Matapila Health Centre	46,8	48,5	7,2	104,5		41,4
Mbang'ombe 1 Health Centre	67,9	67,6	11,1	97,3		48,78
Lumbadzi Health Centre	47,7	29,2	5,8	88,6		34,26

**Table 4: A district league table for selected facilities and indicators,
Lilongwe district, Malawi**

5.8 Process of Selecting Indicators and Weights

Concerning the selection of indicators, districts suggested a participatory bottom up and decentralized process of selecting the indicators in the performance league table as this would ensure flexibility and usefulness of the league table. Districts and health zonal offices suggested that they should propose the indicators while the central office should provide advice on the suitability of such indicators. The assessment team observed that since there are common data elements in the districts and facilities, it is easy for the zonal offices and districts to identify indicators for comparing performance across districts. What was needed was to select a minimum set of indicators to be used for providing feedback in the performance league table. The zonal offices, and districts have suggested potential indicators that could be in the league table including the ones on: Management (Reporting status); Reproductive health (Antenatal coverage, Deliveries by skilled health personnel, Family planning coverage); Immunization (measles); and diseases specific indicators (TB cure rate, HIV/AIDS). The selection of the indicators was based on their linkages. As one District Reproductive Health Programme Coordinator noted, '*These indicators are selected because they are interrelated and reinforce each other. The performance of one indicator will affect or impact on the performance of the other*'.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

273

6.   DISCUSSION AND CONCLUDING REMARKS

The feedback practice of using performance league tables at national level is not new in Malawi. It was introduced some ten years ago. However, it was quickly discontinued due to methodological challenges. The stakeholders were minimally involved in the process of indicator selection and weighting in the league table. Some stakeholders interpreted it as an assessment of individual heads of the districts and not the performance of the district as an organization. In order to gain acceptance, stakeholder involvement in the development process of the league tables is crucial. Unless the stakeholders are engaged from the beginning, they may not appreciate the concept of league tables and use it for providing feedback..

Both the facility staff and the health managers at district, zonal and national levels were surprisingly positive towards the re-introduction of league tables. Health workers in the districts have expressed the need to have rights to access data from other districts so that they can compare their performance with other districts in order to stimulate competition among service providers which is line with the findings of Adab et al (2002). The league table can establish trend analysis and compare performance of a facility or district itself over a period of time; or compare a facility or district with other facilities or districts. It is able to align with the district and national review processes as it provides an input to the reviews. Furthermore, it complements accountability and management processes at all levels. By focusing on few selected indicators at a time, the league table can promote the use of information for local action. The league table can empower the health facility staff to have rights to make changes in the indicators for their use. The DHIS2 web based software makes the health data to be easily available and accessible to users, can be re-used and distributed at various levels thereby improving openness and accountability (Zuiderwijk et al, 2014; Janssen et al, 2012).

In order to counter the previous resistance in the use of the league table, there is need to address institutional, technical and methodological challenges that were encountered. Stakeholders should be involved in the process of indicator identification in the league table in order to appreciate and buy in the concept. The need for greater district and zonal involvement in the selection of indicators for inclusion in the league table to build consensus among the health workers should be encouraged (McGinnes & Elandy, 2011). There is need to identify indicators based on relevance for local use and aligned with health sector goals rather than on data availability. Furthermore, the performance league table should be flexible enough so that districts can select indicators that are relevant for local use. This can promote accountability and transparency as highlighted in other studies (Kossi, et al, 2013; Goldstein & Leckie, 2008), ownership and local participation in the feedback processes.

The three criteria for selection of indicators were data availability, alignment with goals and weight. The Malawi DHIS2 contains a large number of health and service indicators, while financial data are not included. On the national level, indicators can be selected according to health plans, while a decentralized approach to league table definition allows districts choosing and weighing according to their own goals. Availability and use of technology combined with appropriate skills and attitudes of the users would make data easily accessible for the development of the league tables. The importance of collaboration among stakeholders is also a critical condition that enables the mobilization of additional resources for implementing the league tables. More relevant, local choices through a bottom-up design may lead to broader acceptance and use of league tables in local health management.

7.   REFERENCE

Adab, P., Rouse, A. M., Mohammed, M. A., & Marshall, T. (2002). Performance league tables: The NHS deserves better. *British Medical Journal, 324* (7329), 95-98. doi: 10.1136/bmj.324.7329.9524.7329.95

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

274

Alexopoulos, C., Loukis, E., Charalabidis, Y. (2014). A Platform for closing the open Data feedback loop based on web2.0 functionality. *Journal of Democracy and Open Government, 6* (1), 62-68

ALMA. (2013). Reproductive, maternal, newborn and child health management tool, user guide

Edward, A., Kumar, B., Salehi, A. S., Burnham, G., & Peters, D. H. (2007). Configuring balanced scorecards for measuring health system performance: Evidence from 5 years' evaluation in Afghanistan, *PLoS Medicine*, 8 (7),1-9

Foley, B., & Goldstein, H. (2012). Measuring success. League tables in the public sector. British Academy Policy Centre

Goldstein, H., & Leckie, G. (2008). School league tables: What can they really tell us? *Significance, 5* (2)

Hallgarten, J. (2001). School league table: Have they outlived their usefulness? *New Economy,* 8 (4)

Harvey, L. (2008). Rankings of higher education institutions: A critical review. *Quality in Higher Education.* 14 (3) 187-207

Janssen, M., Charalabidis, Y., & Zuiderwijk, A. (2012). Benefits, adoption barriers and myths of open data and open government. *Information Systems Management (ISM),* 29 (4), 258-268.

Kossi, E.K., Sæbø, J. I., Braa, J., Jalloh, M. M., & Manya, A. (2013). Developing decentralised health information systems in developing countries -cases from Sierra Leone and Kenya, *Journal of Community Informatics,* 9 (2)

Kulhavy, R. W., & Wager, W. (1993). Feedback in programmed instruction: Historical context and implications for practice. In J. Dempsey & G. Ales (Eds.), *Interactive instruction and feedback* (pp. 3–20). Englewood Cliffs, NJ: Educational Technology Publications.

Lam, C.F., DeRue, D. S., Karam, E. P., & Hollenbeck, J. R. (2011). The impact of feedback frequency on learning and task performance: Challenging the 'more is better' assumption. *Organizational Behaviour and Human Decision Processes,* 111, 217-228

Lurie, N.H., & Swaminathan, J. M. (2009). Is timely information always better? The effect of feedback frequency on decision making, *Organizational Behaviour and Human Decision Processes,* 108, 315-329

McGinnes, S., & Elandy, K. M. (2012). Unintended behavioural consequences of publishing performance data: Is more always better? *The Journal of Community Informatics,* 8 (2)

Micheli, P., & Neely, A. (2010). Performance measurement in the public sector in England: Searching for the golden thread. *Public Administration Review, 70* (4), 591-600.

Ministry of Health. (2004). A joint programme of work for a health sector wide approach (SWAp) (2004-2010), Ministry of Health, Lilongwe, Malawi

Ministry of Health. (2006). 1st Annual Review on progress on the work of the health sector, 2004-2005: A joint report by ministry of health and development partners, Lilongwe, 19th -22nd September 2005, Lilongwe, Malawi.

Ministry of Health. (2011). Malawi: health sector strategic plan, 2011-2016: Moving towards equity and quality, Lilongwe, Malawi

Ministry of Health, & ICF International. (2014). Malawi service provision assessment (MSPA) 2013-14, Lilongwe, Malawi, and Rockville, Maryland, USA: MoH and ICF International

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

275

Peters, D. H., Noor, A. A., Singh, L. P., Kakar, F. K., Hansen, M., & Burnham, G. (2007). A balance scorecard for health services in Afghanistan, *Policy and Practice,* 85 (2), 146-151

Republic of Uganda. (undated). Annual health sector performance report: financial year 2009/2010

Roberts, D., & Thompson, L. (2007). University league tables and the impact on student recruitment, *Reputation Management for Universities*, Working paper Series No. 2, The Knowledge Partnership

Smith, P. (1990). The use of performance indicators in the public sector. *Journal of the Royal Statistical Society. Series A (Statistics in Society),* 153(1), 53-72.

Stella, A., & Woodhouse, D. (2006). Ranking of higher institutions. Occasional Publications series no. 6 (Melbourne, AUQA)

Thurlings, M., Vermeulen, M., Bastiaens, T., & Stijnem, S. (2013). Understanding feedback: A learning theory perspective. *Educational Research* Review, *9, 1-15*

Wiggins, G.P. (1998). Educative assessment: Designing assessment to inform and improve student performance. Jossey-Baa, San Francisco

Zuiderwijk, A., Janssen, M., & Davis, C. (2014). Innovation with open data: Essential elements of open ecosystems. *Information Polity, 19* (1), 17-33, IOS Press

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

276

OVAHIMBA COMMUNITY IN NAMIBIA VENTURES INTO CROWDSOURCING DESIGN

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Abstract: Mobile crowdsourcing presents a new avenue for remote communities to participate in socio-economic activities. We are co-designing a mobile crowdsourcing platform to support rural indigenous communities in formulating their own tasks to be crowdsourced rather than completing tasks for others. We present one full simulated cycle of task formulation and evaluation by a pilot indigenous community in Northern Namibia. Observations and interactions led to a set of requirements and design implications to support the inclusion of the OvaHimba tribe communities into crowdsourcing activities.

Keywords: Crowdsourcing, Namibia, Indigenous People, Indigenous Knowledge, Task Formulation, ICT4D, Requirements Evaluation, Openness

1. INTRODUCTION

In this paper we present a community-based approach to co-design of a mobile crowdsourcing platform, with a rural indigenous OvaHimba community in Northern Namibia.

Crowdsourcing as an activity and topic has established itself rapidly in the commercial, scientific and academic sector. Companies and institutes have realized major benefits in terms of economizing on resources through outsourcing tasks to a wider crowd. Crowdsourcing has shown significant benefits due to the fact that a single task can be solved by thousands of different individuals with different skills, work ethics, flexible working times, and open innovation (Pedersen et al, 2013), (Bartling & Friesike, 2014). The task requestor therefore has a variety of cheaper high quality delivered products to choose from. A few prominent examples from developed countries where crowdsourcing has made a large income turn over are: Threadless – t-shirt design competition, InnoCentive – solving complex scientific problems by research and development, iStockphoto – allows random photographers to upload photos and get paid if their photo is downloaded, and Goldcorp challenge – allowed the crowd to examine proprietary geographical data to spot where the gold might be.

With overall good coverage and access to mobile communication devices in Sub-Saharan Africa, even members of rural communities can now participate on equal terms, -in theory-. Sub-Saharan African region has the highest mobile subscription penetration in the world with an increase rate of about 20% per year, according to GSMA Intelligence (2014). Mobile crowdsourcing presents a new avenue for job creations and consequently socio-economic developments in rural to peri-urban Africa (Maradona, 2012). Initiatives such as txteagle, now renamed to Jana (Jana, 2014), are targeting emerging markets like Kenya and Rwanda, where

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

277

the active platform was launched in 2009 with the premise of creating employment opportunities. Another initiative is the Ushahidi (Ushahidi, 2014) project from Kenya which collects data from the crowd and presents it in a well visualized format for the public to make informed decisions.

As local researchers involved in rural software development in Namibia, we are interested in reversing the roles and creating a mobile crowdsourcing platform which supports rural communities to formulate their own tasks to be crowdsourced. Not much research has been published in this area which presents a set of special challenges. While internet connectivity and English literacy could be identified as hurdles, our major concern at this stage is task formulation and refinement to obtain desirable solutions.

Crowdsourcing in the traditional sense of distributing tasks is inherent in the daily lives of rural OvaHimba and OvaHerero tribe communities (Stanley et al, 2013). Farm activities that require many people to work together, e.g., branding cows inevitably cause people to work together without expectation of monetary payment. The concept of voluntarily helping each other in the OvaHerero or OvaHimba communities has an adage that goes "Ouzeu kaurarere ndo imwe" translated as "a problem does not always lie on one's hip" (this means that today you might face a problem and tomorrow it might be me with a problem, so let us rather help each other today). In this sense we are promoting the concept of openness of practices in ICT4D through on-line crowdsourcing, as per Smith's (2014) categorisation. Our research approach being action based with co-design practices foster greater participation and inclusion. Moreover, one of the tangible outputs, a rural community crowdsourcing platform, will allow collaborative production of software artefacts and interchangeable transfer of skills, knowledge and objects.

We first describe the research paradigm and methods we work with. We then present the context of the overall research project which scopes the tasks to be crowdsourced. We then report on the activities and findings of the task formulation with the OvaHimba, the development of a solution as well as the evaluation thereof, followed by a discussion and design implications for the mobile crowdsourcing platform. The focus in this paper is on the formulation and investigation of the rural communities' front-end of the mobile platform rather than the crowdsourcing activity itself.

2. RESEARCH METHODOLOGY

We regard the field of ICT4D as being inherently multi-disciplinary and we approach it from an action research based point of view; mostly viewed as a paradigm rather than a specific methodology (McKay & Marshall, 2001), (Reason &, Bradbury, 2013), (Hayes, 2011), (Hayes, 2012). The intention has been to achieve a dual aim of action intervention and research learning; our pragmatist epistemology avoids the separation of action and thinking (Dewey, 1929). Given our background in experimental computer science this has always involved building computing artefacts, intervening with communities and then reflecting on the experience of using such a system: a design-implement-reflect cycle. This research method needs to be seen in the context of experimental computer science, which traces its heritage from engineering where progress is achieved via the design of a novel computing artefact.

We realize that designers have to work with users as co-designers and together identify the problem that needs to be addressed, the means of tackling the issues and then together decide on measures of success. The systems are designed and evaluated using Community-Based Co-Design (CBCD) methods (Blake et al, 2011), (Winschiers-Theophilus et al, 2012).

2.1. Community-Based

"Community-Based" conveys the fact that we deal with groups of people rather than individuals; whereas in the developed world mobile phones and computers are geared to individual requirements (Reitmaier et al, 2011). We need to remain sensitive to major cultural differences

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

278

and develop ways of entering into design conversations with people who do not have technical skills but who are knowledgeable on their own needs and especially how their own communities operate. We realize too that there is no one community with whom we work. In every design situation there are many communities: the elders, the youth, women, migrants, people with disabilities, and so on. Each of these have to be given a voice in design. In order for that to happen we must recognize groups of stakeholders and consider how all the diverse needs might be investigated.

2.2. Co-Design

"Co-design" derives from the application of the participatory action research paradigm in a design setting: both the computer experts and the community members are designers on an equal footing and work cooperatively. There is an ambiguity in the use of the term "co-design" in the literature. For some co-design is something done in the early stages of eliciting user requirements and signifies using techniques such as cultural probes, generative sessions, technology probes and so forth. From our point of view this is better called "early stage co-design" (Ramachandran et al, 2007), (Yoo et al, 2013) (also see Marti and Bannon (2009) for a critical discussion of different ways of managing user-involvement). We employ all of those techniques where appropriate but co-design goes further when combined with action research and continues to all stages of artefact development and evaluation. This is part of a trend in empowering people and moving away from rhetoric of "compassion" (Rogers & Marsden, 2013): from ICT for D to D with ICT.

Once stakeholders have been identified a common language has to be developed. With sophisticated users this language can be based on crude mock-ups of a computer interface ("paper prototypes") since such people can readily imagine how this might work in an ICT artefact. Where a common understanding of technology does not exist, co-designers have to be given insight into the possibilities offered by the technology by means of approximations implemented using that very technology. A key feature of co-design is for technical experts to keep their own design decisions in abeyance. It is a serious mistake to commit (psychologically) to a design solution before the co-designers have found their voice.

3. RESEARCH AND PROJECT CONTEXT

3.1. Research Context

The investigation into rural communities' crowdsourcing is part of an international long-term research project. The main focus of the research has been twofold. Firstly possible representations of Indigenous Knowledge (IK) in various forms were explored, having concentrated on visual representations in the latest developments. The importance of preserving IK is to avoid valuable IK perishing when the elders passed away. Recognizing IK also instils pride in their traditions with the coming generation. Secondarily our design methods are continuously refined.

3.2. Transferability of Tools and Techniques

A tool named the HomeSteadCreator (HSC) was co-created with OvaHerero Elders in Erindiroukambe, Eastern Namibia. The HSC is a tool in which IK holders can create and navigate a 3D representation consisting of context specific modelled objects. The representation creates the context to embed and structure local knowledge in a spatial manner (Rodil et al, 2012). We need to note here that OvaHerero traditions have a strong location based rule system, in terms of placement and orientation of infrastructures (house, cooking fire, cattle kraal, etc…) as well as activities such as who sits where, who walks which way, where is what cooked, etc…

Our original system was co-developed within a single community. We then investigated the transferability of the tool and associated methods through evaluations with other communities in

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

279

Northern Namibia as well as far as a Penan community in Borneo (Winschiers-Theophilus et al, 2013). While the general features of the system (that is, its 3D nature and interaction methods) were well accepted, the 3D graphical elements definitely require local adaptations. In an effort to deploy our tool at national level to different rural communities in Namibia, numerous graphic designers and developers would be required to fulfil this task. In this light and considering ongoing additions required by the rural communities, we launched into a co-design effort of a crowdsourcing platform allowing the individual communities to request for their own additions.

4. CROWDSOURCING 3D OBJECT CONSTRUCTION

Each ethnic group has their own cultural markers in terms of activities and physical objects, such as the architecture of houses, homesteads, etc. Thus in orders to use the HSC within a locality most graphical object need to be specifically designed and imported into the application. Generic models simply do not work and lead to confusion. Considering the demand on graphic designers and the lack of resources, we are investigating the possibility of crowdsourcing the construction of 3D objects. We promote an independent adaptation process for a number of communities in Namibia based on demands individually formulated by each specific community.

4.1. Community Crowdsourcing Study

Although rural communities in Namibia do have mobile connections they seldom make use of the opportunities available on the internet. Because of language and conceptual differences an involvement in crowdsourcing activities seems challenging. We thus explore an avenue on how to close the gap between rural Namibian communities and the crowd on the internet. We are investigating requirements for a crowdsourcing platform from the rural communities' perspective and therefore a community-based co-design is required.

In order to gain insights into the requirements for the crowdsourcing platform we have simulated one full crowdsourcing cycle with one OvaHimba pilot community in Northern Namibia. At this point the mobile version is not linked to the central database managing the tasks and users. Thus, for the purpose of the solution evaluation by the community, we have simulated the development and pre-loaded the 3D models. We initially spent one day at the village, introducing ourselves and the research project. Three elderly men agreed to spend the entire morning with us and requested us to work with the women separately in the afternoon. We started by introducing the OvaHerero version of the HSC to demonstrate the development of community-based IK preservation. Within this context community members then formulated tasks by requesting for specific 3D objects to be modelled. Upon obtaining a number of 3D objects from a graphic designer, we returned to the same community for one full day of evaluation of those models. Based on the observations and discussion we formulated a number of design implications and identified further research topics.

4.2. OvaHimba Pilot Community

The crowdsourcing task formulation and evaluation took place in Ohandungu, a rural OvaHimba community, in the northern region of Namibia. The OvaHimba and the OvaHerero share a related cultural heritage. The OvaHimba settled in the northern part of Namibia while the OvaHerero live further south.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

280

Thus the decision to work with the OvaHimba tribe was based on the fact that the OvaHimba and the OvaHerero people still share a number of similar traditional practices. Both tribes are semi nomadic cattle and small livestock breeders and perform small scale crop production. For example, they share traditional rituals of the holy fire and the dual descent *oruzo* 'patrilineage' and *eanda* 'matrilineage'. All these similarities could be linked to the fact that both tribes descend from the same matriclan and therefore there are only minor dialectical language differences. However the OvaHimba traditional houses, homestead arrangements, and traditional attire are very different from the OvaHerero. These underlying similarities of tradition with a set of external differences present an ideal case to investigate for the transferability of the HSC technology by maintaining the features yet allowing changes to the interface objects.

For the deployment of the HSC tool, we were particularly interested in the homestead components and setup (Figure 1). The kraal and homestead yard of the OvaHerero are modern designs with poles and wires bought from agricultural shops and are mostly constructed in a square shape, while the OvaHimba materials are mostly cut from the bush and are constructed in circular shapes. The kraal for the cattle and small livestock of the OvaHimba is constructed inside the homestead yard while the OvaHerero cattle kraal is mostly constructed in front of the yard while the small livestock is constructed behind the homestead yard. The main house of the men of the homestead, always face the gate of the cattle kraal for both tribes. The family houses of the OvaHimba people are constructed in a circular line from both side of the main house while the OvaHerero family houses are constructed more in single line from either side of the main house.

5. COLLECTING AND FORMULATING TASKS

5.1. Workshop Sessions Setup

The day at the village was split in two parts consisting of a number of sessions. The morning was dedicated to the three elder men and the afternoon to three women. All sessions were facilitated by the Otjiherero speaking researchers and authors of this paper.

One of the researchers introduced the idea and benefits of digitizing their IK. Thereafter the participants were shown a prototype of the OvaHerero version of the HSC to envisage the possibility on how their IK could be digitized. The elders understood the rationale of digitizing traditional knowledge quite well and enjoyed using the HSC for the first time. This was noted by their joyous laughter when one of the men moved one of the homestead elements to his preferred location on the screen. While enjoying the features of the tool, the three elders clearly expressed the inadequacy of the elements with jokes such as "are we now forced to marry an OmuHerero woman?" Such remarks confirmed the engagement with the system and the need for an adaptation of the system to the OvaHimba culture. The participants were informed that the OvaHerero graphics on the HSC could be replaced with the graphics of the OvaHimba tribe.

We explained to the participants that they could also participate in crowdsourcing by taking pictures of their rural surroundings or uploading drawings to be transformed into 3D format to be added into
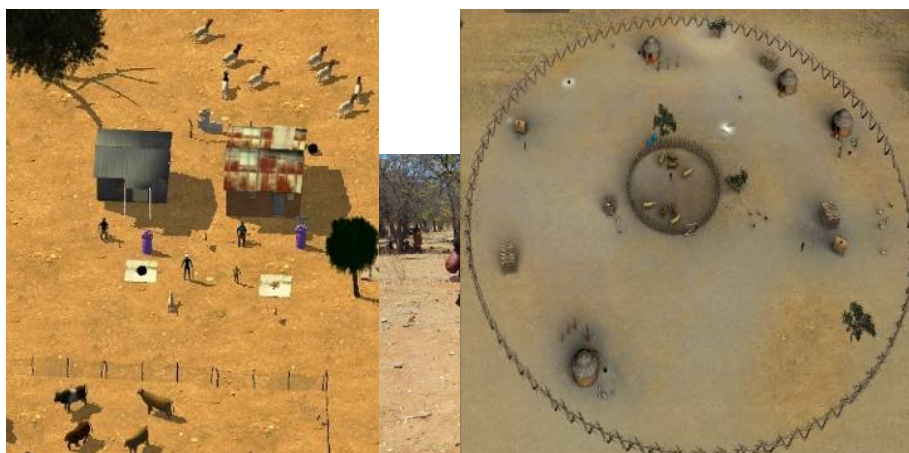

Figure 1 Left: OvaHerero. Right: OvaHimba homestead

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

281

Figure 2 Elder taking photographs

the HSC. An amazing experience was the speed with which the community members grasped the idea of the tool as well as the skills in the technology interactions, which were mostly touch-based. The participants knew exactly what they wanted to be modelled in 3D.

One of the elders was given a tablet to take pictures (Figure 2); he walked directly to the holy fire location to take his first images. After taking the pictures of the holy fire, he instructed the researcher to move to the next object the *Otjoto* (thatched roof) which is constructed close to the cattle kraal. While on the way to the *Otjoto*, he took pictures of the *Ozombande* (*Ozombande* are poles where meat is kept) and he made sure he took the whole of the *Ozombande*. The *Otjoto* is an important place in the OvaHimba homestead, for example, a groom and bride are taken to sleep there during the wedding ceremony. From the *Otjoto* the elders informed the researcher that the next object is their house and while on the way he already instructed one of the ladies to bring out *ehoro*, (*ehoro* is a big cup made of wood used to store *omaere* (soured milk)), *ombako* (a filter used to pour the milk in the calabash). While the items were brought outside the house, the men made a comment that "our tradition would now not vanish if it is given to these people" (meaning: stored in the digital system). The men told the woman precisely where the calabash, *ehoro* and the filter should be placed beside the house. For the next picture he called one of the ladies to come and stand in front of the house beside the calabash for him to take the picture and he showed the lady how he wanted her to sit or stand for different pictures and also asked another lady to stand alone separately from the house to take pictures of her. The next object was a tree and he got everyone including the researchers, goats and dogs to move away from the tree so that he could take a picture of the tree by itself. Next the men photographed the *orutara* (a place where food like maize corn is stored to dry), and *oturia* (a food store). He also took images of the goat and cattle kraal.

After the elder was finished, a woman took the tablet. She walked straight to the holy fire to take her first images. Then she took pictures of the kraal and then she went to the house area to take pictures of the two different houses. The interesting part was that the woman was walking with a young girl who requested taking the next pictures of the *oturia*. This was shows how the youth could work with the elders once the application is deployed. The woman then asked the girl to take pictures of her. From there she took pictures of goats and dogs separately. She asked for pots and took pictures of them.

As the participants from both sessions had taken several pictures, only a few were selected for use on the mobile-based crowdsourcing platform that allows for uploading of photos, pictures and other files (Stanley et al, 2013). A lot of pictures of the same object were taken and the selection criteria were based on the participants' choices of the picture quality and the importance of the objects in their culture. The woman also selected pictures that the man had taken.

6. EVALUATING SOLUTIONS

Two months after the first visit we returned to Ohandungu village with the aim to get some of the ordered 3D modelled objects evaluated by the community members. Similarly to the first visit, two sessions were conducted with the same participants. The sessions included five researchers, three male elders and four woman of the Himba community, respectively. One of the OvaHerero speaking researchers facilitated the sessions. The elders were tasked to evaluate the graphical models based on the images they had taken and selected during our previous visit. The graphics were presented on a laptop. The elders gathered together while the women sat in proximity waiting for their turn and meanwhile browsing through the photos taken at the last visit.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

282

The initial discussion centred on the graphics of the hut (Figure 3). The first part the elders commented on was the roof of the modelled hut. The elders jokingly said that it's not their house which was modelled. One of the elders asked who the people are who built these houses. The researcher asked if the house modelled existed in Opuwo. The elder commented that they existed as some other places. Asked to describe his house (the one on the

Figure 3 Left: Real Hut, Right: 3D Modelled

photo) he replied that his house also had grass on the roof, but the tying of the grass in not the same. Jointly inspecting the photo taken of the house they pointed at the tying of the grass. In the discussion around the modelled hut, the elder mentioned that it was the house he would like to have had in real life. "The hut is beautiful" he said. It was represented stunningly; "perhaps cause of the tablet" was a comment from the other elder. Back to the discussion of the roof which was "too perfect", because the cutting of the roof was well structured not like the real one. We then asked whether the representation should be adapted to the real one. The elders concluded that they liked the way it was represented although the roof remained very interesting to them. The elders expressed their appreciation for being able to inspect the model from all sides in the 3D presentation.

Looking at the graphics of the calabash, the elders thought it was an "*orumba*", (*orumba* is a container for fat storage). The elder asked where the neck of the *orumba* was. The researcher then showed the photo of the calabash (Figure 4, left), just for the elder to realize that they are talking about different objects. Again the elder commented that the calabash looks good but that the cap was missing, which prevented flies from going in. The cap must be very small. One of the women commented on the calabash saying it was so ugly and should therefore be deleted completely. She requested for the tablet so that she could show what the real calabash looked like on one of the photos. She showed that they were different in terms of the cap of the calabash. The most vivid

Figure 4 Left: Image, Right: 3D Model

discussion followed about the representation of the OvaHimba woman (Figure 4). Firstly one of the elders asked what kind of a person this was and from where. The elders mentioned that it's not one of their women, especially looking at the clothes. One of the elders pointed at one of the OvaHimba women seated next to them asking her to check the difference with the representation. Another elder speculated that the model was crippled, that she only had one arm (as they could not see the other arm). They further commented that she had no clothes on. The elder kept referring to the real woman next to him. He then contemplated that she was maybe from another tribe, maybe form the "OvaTwa" (another indigenous Namibian tribe) living in the mountains. The researcher asked what needed be addressed with the image, and the elder said that the image should be thrown away. It was not a woman at all. Then the elder inquired if there was a picture taken of the woman. The reference photo was shown (Figure 4, left). After seeing the picture, the elder identified the woman on the photo but remarked that the model was not her.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

283

He mentioned that the woman could be fat, but most importantly the dress code was not right and not the same. The elder asks one of the women to stand up, so that everyone could see how the woman looked. Repeatedly complaining about the modelled clothes, they asked to juxtapose the photo and the model. The elder then called the woman to come around and look at the images. "Is it a ghost or a tree", "the woman has no arms and fingers" were further comments from the elders.

They then requested to inspect the model from different perspectives but due to a technical problem the 3D version could not be demonstrated. In conclusion they agreed that the shape was fine, but the problem was with the clothing. Some significant details were omitted such as the folding of the leather and the ornaments in the hair. We need to note here, that the OvaHimba have codified attire, meaning that different ornaments and hair style signify the marital and societal status. This explains the significance the community members attached to a correct representation of the clothes. One of the elders decided to take a series of pictures of one woman from all the different angles (Figure 2), to be sent to the graphic designers to do a better job.

Since they also needed a good 3D model of the OvaHimba man the same elder decided to pose for a series of pictures from different angles. When he later realized that he was wearing a non-traditional shirt the photos were retaken.

7. DISCUSSION AND DESIGN IMPLICATIONS

Based on the interactions during the two phases we extracted issues that have direct implications for the design of a crowdsourcing platform and further research endeavours.

7.1. Precision in Task Choice

The man and the woman who captured the images knew exactly what they wanted, in what positon and what pose. The confidence of the choices, and the informative conversations during this exercise was an extremely rewarding exercise. The versatility of their use of the system and the overall understanding of the project as well as the concept of crowdsourcing encouraged the research team to pursue development further.

7.2. Realistic versus Ideal Representations

Considering the discussion that took place around the hut, we observed that in the first instance the graphical representation does not get recognized as the reference to the representation. As the discussion progresses about the differences between the real and the represented one, the elders frequently start liking the representation as an idealization or beautification of reality. The question remains, how do we ensure that the representation is to the satisfaction of the client, the community in this case, independent of our own aesthetic understanding?

7.3. Quality of Feedback

Considering the discussion around the woman model where from the beginning till the end the community disagreed with the attempt pointing out all the faults and omissions, suggest that such valuable feedback should be recorded, transcribed, translated and communicated to the graphic designers (Figure 5). Equally the decision to take a series of new pictures demonstrated the elders' understanding of the 3D design process, where folding of leathers can only be seen from a certain perspective.

Figure 5 Community Feedback

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

284

A rapid design approach might be required whereby the first draft of the graphic should be produced within a very short time to just to trigger feedback from the rural communities which then could be added to the photo to constituent the complete task to be published back to the crowd. Another approach could be to let the rural communities annotate the photo to put emphasis on the features that should not be missed. Perhaps if the difficulties encountered by the graphic designer while constructing the 3D objects were communicated in real time to the community it would have aid in refining the task requested.

7.4. Evaluation and Refinement Cycles

We acknowledge that one cycle of delivering the objects was not sufficient considering the likelihood of satisfying the community requirements. Therefore we suggest several cycles for the evaluation and refinement of the objects until they are accepted by the community. The challenge is on how to maintain the refinement cycles effectively. Another open question is that perhaps those graphic designers that created graphics that were not accepted could work faster during the refinement process since they were initially interested in the given task instead of completely new designers. We are aware that there will be a considerable language problem once the intermediate researchers that speak Otjiherero are no longer part of the crowdsourcing cycle and thus we are looking into appropriate solutions to overcome this obstacle.

7.5. Technical Issues

A major constraint was the sunlight reflection (Figure 2) on display screens where one of the researchers had to hold the umbrella to provide shade. We are currently working on a hardware solution to overcome the problem. Physical environmental conditions such as wind blowing dust causes the tablet screen to be frequently cleaned during the sessions. To our amazement the *otjize* which is the reddish body cream used by the OvaHimba women was not a problem on the touch screen.

8. CONCLUSION

Crowdsourcing may be an economically viable option to support model adaptation. However, pursuing the development of a mobile crowdsourcing platform for rural indigenous communities, to formulate their own task and manage user accounts and activities, unveils a number of different challenges on a theoretical and practical level.

In a first attempt to understand the design implications for such a platform we have run a full simulated crowdsourcing cycle with a pilot OvaHimba community. Although the task scope was reduced to the request of 3D models of their choice, the complexity of task formulation, design and feedback was apparent. Photos taken by community members are clearly insufficient to inform the graphic designer where to direct the focus of representation. While some contextual knowledge is necessary the feedback on the first attempts seems most valuable. Refinements on the design of the task formulation as well as the evaluation cycles will have to be considered to ensure a satisfactory solution.

Our investigation further demonstrates the opportunity for co-designing a rural crowdsourcing platform with community members who have not yet benefited from the internet but have bought into the wider idea of crowdsourcing. We have realized how within the interactions, community members have conceptualized the digitalization of their IK as well as on how to communicate requests to an unknown crowd.

9. ACKNOWLEDGMENTS

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

285

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10. REFERENCES

Bartling, S., & Friesike, S. (2014). Opening Science: The Evolving Guide on How the Internet is Changing Research, Collaboration and Scholarly Publishing, *Open Innovation and Crowdsourcing in the Sciences* (pp 255 - 257)

Blake, E. H., Tucker, W. D., Glaser, M., & Freudenthal, A. (2011). Deaf telephony: community-based co-design (case study).

Dewey, J. (1929). The quest for certainty: A study of the relation of knowledge and action. *New York: Minton, Balch.*

GSMA Intelligence. (2014). *Mobile trends in Sub-Saharan Africa*. Retrieved from https://gsmaintelligence.com

Hayes, G. R. (2011). The relationship of action research to human-computer interaction. ACM *Transactions on Computer-Human Interaction (TOCHI)*, *18(3),* 15.

Hayes, G. R. (2012). Taking action in your research. *interactions*, *19(4)*, 50-53.

Jana. (2014). Our Vision. Retrieved from http://www.jana.com/

Maradona, G. (2012). *Predicting Intention to Participate in Mobile Crowdsourcing Initiatives: A Study of Local Kenyan Communities* (Master's thesis, University of Witwatersrand, Johannesburg, South Africa). Retrieved from http://wiredspace.wits.ac.za/bitstream/handle/10539/12467/Research%20report-(final)-revised%20submission-MGatara(494525).pdf?sequence=1

Marti, P., & Bannon, L. J. (2009). Exploring user-centred design in practice: Some caveats. *Knowledge, technology & policy*, *22*(1), 7-15.

McKay, J., & Marshall, P. (2001). The dual imperatives of action research. *Information Technology & People, 14*(1), 46-59.

Pedersen, J., Kocsis, D., Tripathi, A., Tarrell, A., Weerakoon, A., Tahmasbi, N., ... & de Vreede, G. J. (2013, January). Conceptual foundations of crowdsourcing: *A review of IS research*. In System Sciences (HICSS), 2013 46th Hawaii International Conference on (pp. 579-588). IEEE.

Ramachandran, D., Kam, M., Chiu, J., Canny, J., & Frankel, J. F. (2007, April). *Social dynamics of early stage co-design in developing regions*. In Proceedings of the SIGCHI conference on human factors in computing systems (pp. 1087-1096). ACM.

Reason, P., & Bradbury, H. (Eds.). (2013). *The SAGE handbook of action research: Participative inquiry and practice*. Sage.

Reitmaier, T., Bidwell, N. J., & Marsden, G. (2011). Situating digital storytelling within African communities. *International Journal of Human-Computer Studies*, 69(10), 658-668.

Rodil, K., Winschiers-Theophilus, H., Jensen, K. L., & Rehm, M. (2012, October). Homestead creator: a tool for indigenous designers. *In Proceedings of the 7th Nordic Conference on Human-Computer Interaction: Making Sense Through Design* (pp. 627-630). ACM.

Rogers, Y., & Marsden, G. (2013). Does he take sugar?: moving beyond the rhetoric of compassion. *interactions*, 20(4), 48-57.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

286

Smith, M. L., (2014) Being Open in ICT4D (November 17, 2014). Available at
        SSRN:http://ssrn.com/abstract=2526515 or http://dx.doi.org/10.2139/ssrn.2526515

Stanley, C., Winschiers-Theophilus, H., Onwordi, M., & Kapuire, G. K. (2013, December).
        Rural communities crowdsource technology development: a Namibian expedition. *In*
        Proceedings of the Sixth International Conference on Information and Communications
        Technologies and Development: Notes-Volume 2 (pp. 155-158). ACM.

Ushahidi. (2014). *Ushahidi's Mission*. Retrieved from http://www.ushahidi.com/

Winschiers-Theophilus, H., Bidwell, N. J., & Blake, E. (2012). Community consensus: Design
        beyond participation. *Design Issues, 28*(3), 89-100.

Winschiers-Theophilus, H., Winschiers-Goagoses, N., Rodil, K., Blake, E., Zaman, T., Kapuire,
        G. K., & Kamukuenjandje, R. (2013). Moving away from Erindi-roukambe:
        Transferability of a rural community-based co-design. *IFIIP WG*, 9.

Yoo, D., Huldtgren, A., Woelfer, J. P., Hendry, D. G., & Friedman, B. (2013, April). A value
        sensitive action-reflection model: evolving a co-design space with stakeholder and
        designer prompts. *In Proceedings of the SIGCHI conference on human factors in
        computing systems* (pp. 419-428). ACM.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

287

NETWORK GOVERNANCE IN OPEN INNOVATION ADOPTION: CASE STUDY FROM HEALTH DOMAIN

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Abstract: Open Innovation is the use of purposive inflow and outflow of knowledge to accelerate internal innovation and to expand the markets for external use of innovation. Open innovation is often conflated with open source methodologies those empower local knowledge. Health information systems are becoming an integral part of health reform agendas throughout the world. Due to technological and financial limitations, free and open source software is increasingly being considered for health information systems development. Although open source health information system contributes to local innovation, its generic design may demand further customization as required by specific business needs of health programmes. The customization and implementation of open source health information systems in developing country context demands the participation of various health sector and non-health sector stakeholders. In initial phases of implementations the governance of this organizational network is mostly informal and requires sensitive approach for it to evolve. This longitudinal case study was empirically positioned on three open source health information systems implementations in the Sri Lankan state health sector for four years duration. It tries to contribute to the open innovation discourse by analysing the network governance of the open source implementation networks in health information systems strengthening efforts.

Keywords: Open Innovation, Open Source Governance, Free and Open Source, Health Information Systems

1. INTRODUCTION

Open innovation is defined as a paradigm which assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms are advancing their technology (Chesbrough, 2003). It seeks to apply the use of the purposive inflow and outflow of knowledge to accelerate internal innovation. This process combines internal and external ideas into architectures and systems and is quite often conflated with open source methodologies for software development (Chesbrough, 2006). With current advancements in Information Technology, health information systems have become an integral part of health reform agendas of most developing countries, even though efforts are often constrained by technological and financial limitations. In this context, open source health information systems can play an enabling role in the global south through facilitating open innovation to occur by providing not only software solutions with no licensing costs, but also by contributing to local knowledge and technological advancement by ensuring free access to software source code (Câmara & Fonseca, 2007). Open source design and development (Staring & Titlestad, 2006) is seen as empowering strategy in developing country context for coordinating global and local design processes (Staring & Titlestad, 2008; Subramanyam & Xia, 2008; Twaakyondo & Lungo, 2008) by adopting ideas from external partners as open source software artefacts and methodologies.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

288

Unlike in bespoke software, due to wider socio-political motivation of open source software, the design of the architecture is based on generalized and abstract end user requirement specifications and global standards (Braa, Monteiro & Sahay, 2004; Staring & Titlestad, 2007). Due to its generic nature, an open source health information system software may not always fit in to all the business requirements of a health programme during the current software release cycle. The generification approach (Pollock, Williams & D'Adderio, 2007) of open source health information system design and development may pose a significant challenge to healthcare organizations in introducing an *enterprise scale* open source health information system where considerable business process re-engineering is not possible without affecting the quality of care provision. The possible disagreements between user requirements and generified use cases pose a remarkable challenge that health managers and administrators have to face in the open innovation process when compared to the closed innovation (Almirall & Casadesus-Masanell, 2010) approach in custom software development. It was argued that the success of an information system implementation depends on the alignment of the functionality of the information system to the organizational work routines and business context (Heeks, 2006). Hence further customization of open source health information system represents an essential step in the implementation process.

Due to the technical and financial limitations typically existing in the health sector of developing countries, this customization process requires the participation of various health sector and non-health sector organizational actors in a networked manner (Puri, Sahay, & Lewis, 2009). These multi-sectoral actors are often independent from each other (Braa, & Hedberg, 2002) and in the early phases of implementation and operate outside formal contracts, and tend to work in implicit and on open-ended models referred to as a *network organization* by Jones, Hesterly and Borgatti (1997). However, such models typically pose significant challenges of governance as no one if formally responsible. Understanding some of these governance challenges is the focus of this paper, and is empirically examined in the context of three large scale open source health information system implementations from the Sri Lankan state health sector during the period from 2011 to 2014 involving multi-sectoral participation of individual level, locally and regionally operating organizational actors and university initiatives from both the profit and not-for-profit sectors.

2. THEORITICAL DEVELOPMENT

In open source projects, governance could happen at two levels. The first governance model refers to how the development project and developer community are managed (O'Mahony & Ferraro, 2007) while the second refers to the process of open source acquisition by the organization, including code re-use, cataloguing, auditing and monitoring (Kemp, 2010). Within the scope of this article, *governance* refers to the management of open source health information system project including acquisition by the health organization and stakeholder participation in the implementation network.

2.1. Open Innovation and Open Source

Open innovation is defined as a paradigm that assumes that firms can and should use external as well as internal ideas, and internal and external paths to market, as they look to advance their technology (Chesbrough, 2003). Open innovation is both a technological and business model which allows organization not only to re-use external knowledge sources and to collaborate with external partners, but also to implement internal ideas otherwise unexplored. It applies the purposive inflow and outflow of knowledge to accelerate internal innovation, and a process which combines internal and external ideas into architectures and systems. However, it does not assume universal access to knowledge and the use of innovative intellectual property licensing structures to facilitate access, but more restrictively, to make organizations more amenable to inventions and innovations from outside the organization (Katz, 2013). In the open innovation

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

289

practice, software projects can be launched from either internal or external technology sources, entering and exiting the development process at various stages (Chesbrough, 2006).

Open innovation is quite often conflated with open source methodologies for software development (Chesbrough, 2006). Open source represents an ideal external knowledge source, and challenges the mindset of the *Not Invented Here Syndrome* (Katz & Allen, 1985) promoting the adoption of external knowledge. Effective governance may help to overcome some of these opposing viewpoints, especially related to processes of acquisition, defining source reliability, tracking, roles and responsibilities and finally license compliance (Kemp, 2010). The governance would seek to align these processes with organizational strategy. Firms that fail to exploit such external knowledge opportunities may tend to place themselves at a severe competitive disadvantage (Rosenberg & Steinmueller, 1988), raising the need to effectively combine external inputs with in-house research and development. When firms cannot (or don't wish to) develop sufficient absorptive capacity themselves in an open innovation process, networks and alliances are recommended choices to make enabling networks to build these combinations of knowledge (Gulati, 1998, Nooteboom, 1999).

2.2. Network Organization and Governance of Software Projects

A network organization is defined as a select, persistent, and structured set of autonomous firms engaged in creating products or services based on implicit and open-ended contracts to adapt to environmental contingencies and to coordinate and safeguard exchanges (Jones, Hesterly, & Borgatti, 1997). The governance of a network organization is characterized by taking place in clusters of organizations with non-hierarchical collectives of legally separated units (Alter, & Hage, 1993), having long-term recurrent exchanges that create interdependencies (Larson, 1992) and demonstrable lateral and horizontal patterns of exchange(Powell, 1990). The centralization which is defined as the locus of authority to make decisions affecting network organizations (Pugh, Hickson, Hinings, & Turner, 1968) when present is referred to as a process of brokering (Provan & Kenis, 2007). The brokered networks are known as *lead organization-governed network,* coordinated by a dominant, single participant. The network organization is not uncommon to the health sector (Ansell & Gash 2007; Exworthy, Powell & Mohan, 1999) and have been prominent in public health initiatives (Alexander, Comfort & Weiner, 1998). Healthcare organization around open source health information system initiatives demonstrates numbers of features of a network organization for example; representing a cluster of organizations of legally separated units and having long-term recurrent exchanges between participant organizations resulting in inter-dependencies among the different actors.

The process of delegating open source customization to an implementation mediator can be considered as a software outsourcing approach involving several phases of initiation, growth, maturity and possible extension or amicable separation (Sahay, Nicholson & Krishna, 2003). Within the scope of this research, governance dynamics are limited to initiation and growth phases where processes of coordination and control are key (Hirschheim, Heinzl & Dibbern, 2007).

As shown in table 1 below, coordination modes range from non-coordination to formal and informal means. Four modes of control in play are control of self, clan , output and behaviour. Out of which self and clan control are considered as forms of informal control whereas output and behaviour control represent more formal, Clan control is more compatible with the network organisation in early phases with an informal governance structure whereas later it can be replaced by formal mechanisms with formal contracts containing detailed software requirement specifications. The governance mechanism can undergo changes and evolve from none to early and to late governance models.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

290

Coordination	Non coordination
	Formal, impersonal
	Formal, interpersonal
	Informal, interpersonal
Control	Self control
	Output control
	Behavioral control
	Clan control

Table 1. Governance Mechanisms (Hirschheim, Heinzl & Dibbern, 2007)

3. RESEARCH METHODS

This comparative case study research explores underlying governance mechanisms in adopting open source health information systems in three cases in the Sri Lankan state health sector during the period2011 to 2014. The study seeks to analyse the trajectories of the network organizations involved and the supporting governance models answering the research question, "*what are the governance mechanisms that can be identified in successful open innovation adoption process in multi-sectoral networks implementing open source health information systems*". To understand these governance mechanisms, empirically three large scale open source health information system implementations from the Sri Lankan state health sector were studied during the period from 2011 to 2014. The examined projects were carried out with the participation of multi-sectoral stakeholders. The cases were carefully selected to represent participation of a range of categorise of implementation mediators, including individual level, local and regional health sector and non-health sector organizational actors and university sector initiatives.

One project concerned an electronic medical record system called Hospital Health Information Management System (HHIMS) for curative health care and it was characterized with formal contracts and profit-driven implementation mediators. The other two cases are customization attempts of the open source District Health Information System 2 (DHIS2) software for maternal health and tuberculosis and respiratory diseases. The implementation mediators in these two cases operated under not-for-profit (research and academic) mode with informal contracts. All three selected projects were large scale beyond the purview of a single actor and involved multiple stakeholders over time.

3.1. Data Collection

Data was collected focusing on governance decisions observing their control and coordination mechanisms through a multi-method approach (Mingers & Brocklesby, 1997). These included participant observation, semi-structured interviews with health managers and project implementers, focus group discussions, informal meetings and relevant document analysis, including project steering and evaluation meeting minutes and email communications. Non-coordinated self-control observed during the study included internal reports and internal discussion groups whereas formal-impersonal coordination and output control included issue queries, client involvement plans, periodic reports, categorization of issues and project management plans. Status review meetings, conference calls, on-site coordination were formal interpersonal coordination and behavioural control mechanisms in the customization projects. Personal visits, meetings, email communications and phone calls and small group meetings were the informal interpersonal coordination attempts and clan control mechanisms observer during the longitudinal follow-up.

The data collected was analysed to understand the perception of health managers and implementation mediators. The role of the health managers ranged from institutional level

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

291

managers (e.g. Medical Officers of Health, Medical Officers – In Charge) to administrators (e.g. Programme/Hospital Directors, Provincial/Regional Directors of Health Services). Some administrators interviewed (e.g. Provincial Directors of Health Services, Deputy/Programme Director Generals of Health Services) were mainly responsible for managerial and administrative decisions in the health information system project had minimal interaction with the customized health information systems as end users. They however were influential in implementation decisions and implementation trajectories. Decision making processes of health managers from both central and peripheral/provincial level were observed during the data collection process. Additionally, the implementation mediators were interviewed including individual consultants attached to a state health sector organization or other private sector players. Also, in several occasions the author represented the health information system implementation teams which helped to develop deep insights into the dynamics of interaction between the different players. The unit of observation of the study was the implementation network, and the views of top managers were assumed to represent the organizational perspective (Gaur, Mukherjee, Gaur, & Schmid, 2011).

3.2. Data Analysis

The study represents a comparative case study analysis (Yin, 1981; Yin 2003) involving the use of qualitative data (Miles, & Huberman, 1984). Within-case data was analysed and cross-case patterns (Eisenhardt, 1998) were identified to discern governance dynamics of the three network organizations. In both within the case and cross-case analysis, the main aim was to identify the governance decisions by health managers towards the health information system projects. The within-case analysis focused on variations of perceptions of the different actors towards the health information system project, whereas the cross-case analysis tried to identify variations of governance decisions based on the types of coordination and control mechanisms involved.

4. CASE DESCRIPTIONS

Sri Lanka has a well-established and time tested health service both in preventive and curative sectors with a comprehensive paper based reporting system. Health service is free for all and most of the annual health budget is reserved for drugs and medical services. Hence, budget for computerization is rather minimum. Furthermore, the Department of Health is not equipped with a software arm even though there is Information Technology carder in place at both the nation and provincial levels. Sri Lanka has the added advantage of having a training programme in-built to Ministry of Health for medical officers for health informatics. Further to this, Sri Lanka is equipped with an eGovernment Policy[1] and a draft version of eHealth Policy and eHealth Standards and Guidelines. Department of Health Services dominates the health sector governance process. In this centralized governance there is little flexibility provided for external stakeholders such as funding agencies. There are many miniature scale health information systems being implemented in the local scope without proper plans for interoperability or integration. 'My Baby Syndrome' (Littlejohns, Wyatt, & Garvican, 2003) is a frequent observation resulting in neglected systems failing after the initiator has been subjected to mandatory periodic transfer to another health institution.

The electronic medical record system, HHIMS is the open source descendant of the electronic patient information system, Multi-Disease Surveillance project which was implemented in 27 state owned hospitals in the Eastern province of Sri Lanka (Pole, 2010) during 2006 – 2009 period. The system was developed to capture and process admission data and to generate health statistics and administrative reports. Based on the Multi-Disease Surveillance system's design, in 2011, HHIMS codes were officially released as HHIMS version 1. In 2012, HHIMS version 1.2

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1   http://www.icta.lk/en/programmes/re-engineering-government/129-policy-documents/1344-e-government-policy.html

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

292

was released under the open source license *Affero General Public License*[2] and in 2013 a feature rich HHIMS version 2 was released under the same open source license.

The District Health Information System version 2.0 (DHIS 2) is a flexibly customizable, open-source health management information system developed by the Health Information Systems Program of the University of Oslo, Norway. The software development process is a global collaboration (Staring, & Titlestad, 2006). DHIS2 was first introduced to Sri Lanka as a public health information tool in the curriculum of master's degree program in Health Informatics conducted by the Postgraduate Institute of Medicine.

4.1. *Hospital Health Information Management System* Implementation Network

With the initial success of the Multi-Disease Surveillance system in the Eastern province of Sri Lanka, the project brought the system to the attention of Ministry of Health suggesting it to be expanded to the rest of the island. Ministry of Health reviewed the system and did not agree with the licensing of the Multi-Disease Surveillance system, which was free to be implemented only in the *2004 Asian tsunami* affected areas of the country (not free and open source). A request for the Multi-Disease Surveillance system to be implemented in another hospital in Sabaragamuwa Province was the turning point of the project. The Regional Director of Health Services invited Multi-Disease Surveillance team to develop an open source patient record software, and to implement it in 5 pilot sites in the province. With this request, it was decided to convert the Multi-Disease Surveillance system to an open source system and the local maintenance team was organized as the open source developer team. The new hospital information management system was developed under open source license and baptised as the Hospital Health Information Management System. Funding for the project was provided by the Information and Communication Technology Agency; the single apex body involved in Information and Communication Technology policy and direction for the nation. With the support of the Provincial Department of Health Services the system was successfully implemented in 5 hospitals within the district.

Then there were requests to the Information and Communication Technology Agency and HHIMS core-team to implement the system in 3 more districts. There was a review meeting for the HHIMS implementation, which was conducted by the Ministry of Health. The Information and Communication Technology Agency was authorized to proceed with the piloting of the system in the 5 hospitals. While being implemented in more than 10 hospitals in different districts, the application reached its next turning point of being implemented in the district hospital Dompe, which was contributing to various innovations in the system design and architecture. In the later part of 2013, the system was selected to be implemented in several hospitals in the Northern part of the island. Also, it was noted that the flagship implementation site, the district hospital Dompe was achieving extraordinary success (Kulathilaka, 2013), and as a result it was made the reference implementation reflecting the standards of the new version of HHIMS. Currently the discussion is going on for the suitable governance model for HHIMS foundation. The main issues to be settled in deciding the governance model includes the composition of the governing body (representation of health sector, IT-sector and other stakeholders), which stakeholder should own and manage the code repository (e.g. Information and Communication Technology Agency or Ministry of Health), the mechanism to regulate prospective HHIMS implementers and managing the feature and architecture under a national roadmap.

4.2. *District Health Information System 2* for Maternal and Child Health

Initially the DHIS2 was customized as a student project of the Postgraduate Institute of Medicine to address information need of the maternal and child health programs in the country

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2   http://opensource.org/licenses/AGPL-3.0

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

293

under the supervision of a senior consultant of public health. After adequate customization, the system was demonstrated to the health managers and public health consultants of the health programme. Postgraduate Institute of Medicine also mediated to seek permission pilot the application in real life settings, but during the demonstration, trustworthiness of the customized DHIS2 application and data security was heavily questioned and approval was not granted to the proposed pilot project. After the initial failure, in 2011, Health Informatics Society, which is the professional association responsible for popularizing health informatics in Sri Lanka negotiated permission for this pilot in the North Western Province of Sri Lanka. For this purpose, the previously customized application instance was used. To support the implementation, it was decided to sign a tripartite agreement between Health Informatics Society, Provincial Department of Health Services of North Western Province and Health Information Systems Project - India who were to provide technical support. Unfortunately, the signing did not materialize. However, North Western Province permitted Health Informatics Society to conduct a pilot exercise under their supervision before taking a decision on the province wide implementation. The five Medical Officer of Health areas (equivalent to health districts defined by World Health Organization), were selected. Initial training was provided to the staff of the 5 Medical Officer of Health areas and data entry was commenced with a central server provided by the Postgraduate Institute of Medicine. The financial support for the piloting was provided by the Postgraduate Institute of Medicine, Health Informatics Society and University of Oslo. Apart from the local training programs, province staff were offered an international training program collaboratively conducted by Health Information Systems Project - India and University of Oslo. Data entry was done by Public Health Midwives under the supervision of Medical Officer of Health. After the system was piloted for 2 reporting quarters, a project evaluation report was handed over to the Department of Health, North Western province to scale the system to 5 more Medical Officer of Health areas. When the piloting was commenced for the 3rd quarter data entry, the central health programme abruptly halted the piloting process with the concern of the DHIS2 application would negatively interfere with the business process of the health programme.

After about a year's break it was suggested to pilot the maternal and child health customization of DHIS2 in the Southern Province. Postgraduate Institute of Medicine assisted the implementation and the project was entrusted to a Medical Officer trained in health informatics at the Southern Provincial health department. The mediation with central health programme was done through a Medical Officer-Maternal and Child Health attached to the provincial health director's office. Necessary basic hardware was also provided to the all Medical Officer of Health offices of the Galle district and the system was piloted in 17 Medical Officer of Health areas with slight modifications to the previous design. The system was well accepted by the staff and is awaiting scale up as a provincial data repository.

4.3. *District Health Information System 2* **for TB and Respiratory Diseases**
After initial rejection of DHIS2 as a candidate for maternal and child health management, it was considered to introduce DHIS2 to the respiratory diseases control domain customized for Tuberculosis and other chest disease registry management. National Tuberculosis Programme decided to use DHIS2 for Tuberculosis case management first. At the end of 2012, the customization process was started as an internal requirement of the National Tuberculosis Programme and commissioned by the top hierarchy of the programme management. The programme managers noted that the DHIS2 needed to be modified to a certain extent to accommodate all their requirements. Health Information Systems Project - India conducted an end user and implementer training in May 2013. At a later stage, National Tuberculosis Programme decided to use DHIS2 for Asthma case management as well. Since January 2014 Postgraduate Institute of Medicine provided support for the customization process. In July 2014 there was an evaluation of the customized solution to identify its suitability for island-wide

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

294

scaling. Following the evaluation a new funding opportunity emerged through a global donor for the scale-up process.

5. CASE DISCUSSION

Open innovation and open source implementation appear to be possible for a health institution/programme to embark on since the software source code is freely available. Often initial steps towards implementation might be assisted by the open source community to a limited extent. Compared to the custom software development however, it appears that the health organization must own equal or more technical competency and resources to implement an enterprise-wide open source software solution if it is to be completed by the health stakeholder itself.

In HHIMS project the network organization consisted of Ministry of Health, regional and provincial health authorities, hospital authorities, Information and Communication Technology Agency and HHIMS core team and HHIMS implementation team. The HHIMS implementation team was an extension of HHIMS core team. Information and Communication Technology Agency was mainly plaid the role of project and fund management. The main funding agency, the World Bank didn't have any direct role in the project and channelled the financial aids through Information and Communication Technology Agency. Information and Communication Technology Agency and provincial and institutional health authorities had a good mutual understanding in implementations. Hence at this level the project coordination ranged from informal-interpersonal to formal-interpersonal. However the dominant actor, the Ministry of Health has more scrutinizing attitude towards the customizations and implementations. With implementations spread to several hospitals governance mechanism has grown to a formal-impersonal level. This peaked with the suggestion for the HHIMS foundation, where HHIMS source code, architecture and implementations suggested being managed by an independent body in the formal manner. In the initial phase of HHIMS the project demonstrated clan control features including personal visits, meetings and email and telephone conversations. The behavioural control mechanism, such as project status review meetings, conference calls and on-site coordination, appeared when the project grows to new implementation sites. Toward the maturity of the project where HHIMS version 2 was released, project demonstrated strong output control efforts such as change control mechanisms (mediated by health managers form the institutions where HHIMS implemented), problem queries (handled by HHIMS team), follow-ups and client involvement plans, periodic reviews and interim deliverables (included in formal contrast through the tender procedures).

From the initial phase of HHIMS implementations, it was noted that the Ministry of Health was attempting the governance of open source acquisition. Following are some of frequent debates quoted from project implementation meetings.

"Does Hospital Health Information Management System has an open source license and if so, what is the type of license ? "

"Does Hospital Health Information Management System have license to use SNOMED[3] [a medical nomenclature/terminology] within the Hospital Health Information Management System software?"

"Is the database management system used by Hospital Health Information Management System, free and open source? If it is only free for personal use, do hospitals have to pay an additional fee to use it with Hospital Health Information Management System?"

This open source governance, even though which is not comprehensive, has a remarkable effect on open innovation process so that HHIMS developers has to limit their innovation to open

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3   http://www.nlm.nih.gov/research/umls/Snomed/snomed_main.html

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

295

standards. Tender procedures also demonstrated a certain influence over the open innovation process. Initially the tender procedure was based on a high level (abstract) requirements where there is more room for innovative approaches. Towards the later part of the study, tendering was more comprehensive and consist of a detailed technical documents. Tender documents included minimum required functionalities expected from the customization with the comprehensive software requirement specification and use-cases. It was noted minor disagreements during the open innovation process between the health managers who contribute to the design and the implementation mediators who delivered the new software artefact. The conflicts were noted more on graphical interface design and modelling clinical care process in health information system functionalities. The health care organization looked at the issues in patient confidentiality and quality of care context whereas developers and implementers frequently had more technological perspective. HHIMS design and architecture was favourable for open innovation approach allowing external knowledge to be merged to software core and to transferring the innovation to new and existing implementations which can be seen as technology spin-offs (Chesbrough, 2006) for new markets.

In DHIS2 customization for maternal and child health, the network organization consisted of Ministry of Health, Family Health Bureau, regional and provincial health authorities of North-Western and Southern provinces, Health Informatics Society, Postgraduate Institute of Medicine and Health Information Systems Project - India. The Family Health Bureau was the dominant stakeholder during these implementations. Initial phases of the North-Western provincial pilot project ran with the informal-interpersonal coordination which was later became a formal-interpersonal coordination. During the Southern province implementation the formal-impersonal was the coordination mechanism of choice. At North-Western Province the project demonstrated clan control with minimal output control. However, in Southern province implementation the project utilized behavioural control mechanism, such as project status review meetings and on-site coordination in combination with output control mechanisms, such as client involvements in planning and periodic reviews. In the Southern Province, provincial health authorities played a major role in governing the implementation providing administrative leadership and liaise with the Family Health Bureau.

DHIS2 customization for Tuberculosis and other respiratory diseases management was carried out under the governance of National Tuberculosis Programme. Other members of the network organization were, Postgraduate Institute of Medicine, Health Information Systems Project - India, core DHIS2 developer team and Health Informatics Society. The coordination mechanism of the project was formal-impersonal and the control mechanism was noted to be formal with behavioural and output control measures, such as status review meetings, conference calls, on-site coordination, problem queries, change control, follow-ups, client involvement plans, interim deliverables and periodic reviews.

In DHIS2 implementations, externally developed and managed (requirement generification and version control) software core based on advanced technology was a barrier to open innovation adoption until recent. This disadvantage was more prominent under the frequent release cycles of DHIS2 adding new features to the code base with each release. This was remedied by the concept of DHIS2 Apps which itself is an adoption of open innovation by the core DHIS2 developer team by incorporating the Mozilla Open Web Apps[4] to DHIS2 architecture. This feature allowed country implementation mediators to extend DHIS2 functionalities by developing specific installable App (lightweight module) to address the necessary user requirements. Furthermore, it functions as an open innovation spin-off to the global DHIS2 community, if the newly developed functionality can be matched with the domain requirements of another health programme (new markets). With the decision to implement District Health Information System for respiratory disease control programme, open innovation adoption was

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4   https://developer.mozilla.org/en/Apps/Quickstart/Build/Intro_to_open_web_apps

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

296

prominent than the DHIS2 customization for maternal and child health. The programme managers of the National Tuberculosis Programme were more realistic about the gap between the capabilities of current District Health Information System releases and software features required by the National Tuberculosis Programme. Towards the later part of the customization, this understanding was very yielding so that the National Tuberculosis Programme understood that it can be benefited by developing a DHIS2 App for the Tuberculosis and other respiratory disease management.

Governance Feature	HHIMS project	DHIS2 projects
Coordination	Formal, impersonal	Formal, impersonal in successful open innovation process
Control	Initially clan control, later developed to strong behavioral and output control	Behavioral and output control in successful implementation projects
Open Source Governance issues (Kemp, 2010)	Licensing, hidden-cost, open standards	Licensing, unauthorized access to data by implementers/developers, control to data (e.g. cloud hosting), source reliability, tracking (hidden functions, information about other implementations and stakeholders), support (focal point for technical assistance), design-reality mismatch and capabilities (limitations) of the current release
Operational Model	Profit-oriented operational model	Research and academic focus with not-for-profit operational model

Table 2. Comparison of governance features of the considered health information system implementation projects

When considering the coordination mechanisms, formal control was observed from the beginning of the HHIMS project (e.g. project management plans). Informal and interpersonal coordination was observed in North Western province implementation of DHS2 (e.g. meetings) whereas more successful DHIS2 implementations (Southern province and Tuberculosis control programme) adhered to the formal and impersonal coordination mechanisms (e.g. periodic reports). Similar observations were made with regards to control mechanisms as well. The successful projects were embarked on behavioral and output control mechanisms, such as, confirmatory follow-ups, client involvement plans. The less successful approach of North Western province project demonstrated clan control with personal visits and communications such as email and phone calls to govern the project.

During the study it was evident that the open source governance is not a familiar concept among health managers and administrators. However, as summarised in Table 2, open source license, hidden cost, ownership of source code, data security and hidden privileged system access by developers/implementers were some concerns unfavourable for the practices of open innovation (Paré, Wybo & Dellanoy, 2004). Following is an example of such concern noted during the study.

"...How can we trust whether District Health Information System implementers use data entrusted to them for other purposes..."

It was noted that most multi-sector stakeholders were legally independent of each other, even though they were in mutual agreements to cooperate in realizing long-term goal of successful health information system implementation. During the early phases of implementation attempts the mode of control commonly seen in the network organization is the clan control. Later this governance mechanism could consolidate to behavioural and output control. What brings the multi-sector organizations together to form an network organization was their specializations in different disciplines and allocation of technical and financial assets to health information system projects. The interactions seemed to initiate with interpersonal coordination which later

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

297

formalized to impersonal coordination. Medico-legal concerns were also discouraging open innovation process (e.g. possible harm inflicted to patients due to the inadvertent use of the open source health information systems) unless proper legal clauses were not included in contracts.

6. CONCLUSION

Summarizing the above discussion it is possible to conclude that the multi-sectoral participation is to play an essential role in open source health information system implementations in Sri Lankan context. For an open innovation process to be successful, it is recommended to establish a formal and impersonal coordination mechanism at an early stage to facilitate the institutionalization of the health information system avoiding personal dependencies. This is evident since the early phase of the HHIMS project and in the more successful implementations of DHIS2, namely the Southern province maternal and child health system and Tuberculosis and respiratory diseases management system. Interpersonal as well as impersonal mechanisms of coordination were effective under the formal control compared to informal and interpersonal coordination mechanisms. Within the formal coordination mechanisms, impersonal coordination yielded more stable open innovation process compared to formal interpersonal coordination. This was evident by adopting HHIMS as an open innovation artefact by other healthcare institutions more readily, compared to DHIS2 customized to maternal and child health was considered to be scaled up to the national level.

Similar observation was made on behavioural and output control (e.g. on-site coordination, project management plans, periodic communication) leading to successful open innovation compared to self-control or clan control mechanisms. Output control mechanisms, such as interim deliverables would be valuable in open innovation process which allows health stakeholders to evaluate the software artefacts incrementally. To promote open innovation among open source mediators, the open source information system architecture should provide a process to (generalize and) re-use spin-offs in new markets. Interestingly, open innovation process was appreciated and facilitated by lower level health administrators and managers, where are the implementation project governance decisions were made by the top level health administrators and managers mostly.

Due to the technical limitations and uniqueness of business process (clinical care pathway) open innovation appear to be less desirable in Sri Lankan state health sector. However, in combination with open source methodologies, the open innovation demonstrated competitive technological and financial advantages to the health programme. Technology spin-offs those are resulted from open innovation process could be valuable software artefacts to open source implementation mediator, even though these spin-offs may not be relevant (sometimes, could be discouraging) from a health programme management/administration point of view. Pre and post implementation support were identified as a major barrier to adopt open innovation in open source implementation projects in Sri Lankan state health sector. Similarly, hidden cost models and unauthorized access of health information by external open source implementers and developers were considered seriously in arriving at implementation decisions by health managers and administrators.

7. ACKNOWLEDGEMENT

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

298

8. REFERENCES AND CITATIONS

Almirall, E., & Casadesus-Masanell, R. (2010). Open versus closed innovation: A model of discovery and divergence. Academy of management review, 35(1), 27-47.

Ansell, C., & Gash, A. (2007). Collaborative governance in theory and practice. *Journal of Public Administration Research and Theory*, 18. 543-571.

Alexander, J. A., Comfort, M. E., & Weiner, B. J. (1998). Governance in Public Private Community Health Partnerships: A Survey of the Community Care Network SM Demonstration Sites. *Nonprofit Management and Leadership*, 8(4), 311-332.

Alter, C., & Hage, J. (1993). *Organizations Working Together*. Newbury Park, CA: Sage.

Braa, J., Hedberg, C. (2002). The Struggle for district-based health information systems in South Africa. *The Information Society, 18,* 113-127.

Braa J, Monteiro E, Sahay S, Staring K, & Titlestad O H.(2007). Scaling up local learning: Experiences from South-South-North Networks of Shared Software Development. In Proceedings of the 9th International Conference on Social Implications of Computers in Developing Countries. Sao Paulo.

Câmara G, Fonseca F. (2007) Information policies and open source software in developing countries. Journal of the American Society for Information Science and Technology. 58(1), 121-132.

Chesbrough, H. (2006). Open Innovation: A new paradigm for understanding industrial innovation. Chesbrough, H., Vanhaverbeke, W., & West, J. (Eds.). (2006). Open innovation: Researching a new paradigm. Oxford university press.

Chesbrough, H. W. (2003). Open innovation: The new imperative for creating and profiting from technology. Harvard Business Press.

Eisenhardt, K. M. (1989). Agency theory: An assessment and review. *Academy of management review*, *14*(1), 57-74.

Eisenhardt, K. (1998). Building theories from case study research. *The Academy of Management Review, 14*(4), 532-550.

Exworthy, M., Powell, M., & Mohan, J. (1999). Markets, bureaucracy and public management: the NHS: quasi-market, quasi-hierarchy and quasi-network? *Public Money and Management*, 19(4), 15-22.

Gaur, A.S., Mukherjee, D., Gaur, S.S., & Schmid, F. (2011). Environmental and firm level influences on inter-organizational trust and SME performance. *Journal of Management Studies, 48*(8), 1753-1781.

Gulati, R. (1998). Alliances and networks. Strategic management journal, 19(4), 293-317.

Heeks, R. (2006). Health information systems: Failure, success and improvisation. *International journal of medical informatics*, 75, 2, 125-137.

Hirschheim, R., Heinzl, A., & Dibbern, J. (2007). Information systems outsourcing: Enduring themes, new perspectives and global challenges. Springer.

Jones, C., Hesterly, W.S., & Borgatti, S.P. (1997). A general theory of network governance: Exchange conditions and social mechanisms. *The Academy of Management Review, 22*(4), 911-945.

Katz, A. (2013). Everything Open. In Free and Open Source Software: Policy, Law, and Practice. (Eds) Shemtov, N., & Walden, I. Oxford.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

299

Katz, R., & Allen, T. J. (1985). Organizational issues in the introduction of new technologies (pp. 275-300). Springer US.

Kemp, R. (2010). Open source software (OSS) governance in the organisation. Computer Law & Security Review, 26(3), 309-316.

Kulathilaka, S. (2013). "eHospital-Dompe" project–the story of the transformation of a district hospital in Sri Lanka. *Sri Lanka Journal of Bio-Medical Informatics*, *4*(2), 40-43.

Larson, A. (1992). Network dyads in entrepreneurial settings: A study of the governance of exchange relationships. A*dministrative Science Quarterly, 14*, 189-209.

Littlejohns, P., Wyatt, J. C., & Garvican, L. (2003). Evaluating computerised health information systems: hard lessons still to be learnt. Bmj, 326(7394), 860-863

Miles, M.B., & Huberman, M. (1984). Drawing valid meaning from qualitative data. Towards a shared craft. *Educational Research, 13*(5), 20-30.

Mingers, J., & Brocklesby, J. (1997). Multimethodology: towards a framework for mixing methodologies. *Omega*, *25*(5), 489-509.

Nooteboom, B. 1999. Inter-Firm Alliances: Analysis and Design (Routledge: London)

O'Mahony, S., & Ferraro, F. (2007). The emergence of governance in an open source community. Academy of Management Journal, 50(5), 1079-1106.

Paré, G., Wybo, M. D., & Delannoy, C. (2009). Barriers to open source software adoption in Quebec's health care organizations. *Journal of Medical Systems*, *33*(1), 1-7.

Pole, D. (2010). Computerization of clinical records in out-patient departments of Sri Lankan hospitals. *Sri Lanka Journal of Bio-Medical informatics. 1*(4), 200-204.

Pollock, N., Williams R. & D'Adderio, L. (2007). Global Software and its Provenance: Generification Work in the production of organizational software packages. Social Studies of Science. 37:254-280.

Powell, W. W. (1990). Neither market nor hierarchy: Network forms of organization. Research in Organizational Behavior, 12, 295-336.

Provan, K.G., & Kenis, P. (2007). Modes of network governance: Structure, management, and effectiveness. *Journal of Public Administration Research and Theory, 18,* 229-252.

Pugh, D.S., Hickson, D.J., Hinings, C.R., and Turner, C. (1968). Dimensions of organization structure. *Administrative Science Quarterly, 13*(1), 65-105.

Puri, S.K., Sahay, S., & Lewis, J. (2009). Building participatory HIS networks: A case study from Kerala, India. *Information and Organization, 19,* 63–83.

Rosenberg, N., & Steinmueller, W. E. (1988). Why are Americans such poor imitators?. The American Economic Review, 229-234.

Sahay, S., Nicholson, B., & Krishna, S. (2003). Global IT outsourcing. Software Development across borders (Cambridge: London)

Staring, K., & Titlestad, O. (2006). Network of open source health care action. *Open Source Systems.* US. Springer. 135-141.

Staring K, & Titlested, OH.(2008). Development as free software: Extending commons based peer production to the south. In proceedings of the 29th International Conference on Information Systems. Paris.

Subramanyam, R & Xia, M. (2008). Free/Libre Open Source Software development in developing and developed countries: A conceptual framework with an exploratory study. Decision support systems. 46(1), 173-186.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

300

Twaakyondo, H.M. & Lungo, J.H. (2008). Open Source Software in Health Information Systems: Opportunities and Challenges. *Tanzania Journal of Engineering and Technology*, 2(1), 36-45.

Yin, R. K. (1981). The case study crisis: Some answers. *Administrative science quarterly*, 26(1), 58-65.

Yin, R.K. (2003). *Case Study Research: Design and Methods*, Sage, Thousand Oaks, CA.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

301

ROUTINISING WAITING TIME SURVEYS WITHIN HEALTH INFORMATION SYSTEMS

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Abstract: Long waiting times is an irritation to and frequent complaint of patients who utilise public sector health services. It therefore behoves management to investigate and solve this problem. A routine survey which measures the waiting times of patients and the efficiency with which staff utilise their time, has been developed and implemented in several locations in South Africa. Preliminary observations suggest that the routine assessment of waiting times is possible at low cost and with high benefit. The universal implementation of such routine Waiting Times Surveys presents the potential for an enriched health information system, particularly in resource-constrained settings, where efficient use of limited resources is critical. The paper describes the rationale for undertaking routine Waiting Time Surveys in health facilities and the methodology used. It outlines lessons learned in attempting to routinise its implementation within a health information system, including pragmatic challenges faced and it proffers systemic recommendations to enhance the integration of Waiting Time Surveys into routine health information systems. The paper concludes by asserting that conducting routine waiting times surveys is an easy and efficient way of ensuring continuous quality improvements in health care provision, and the surveys can easily be performed by health workers themselves.

Keywords: Waiting time surveys, Health information systems, Routine surveys, Low cost, High benefit, Information officers, Health staff conducted surveys

1. INTRODUCTION AND LITERATURE REVIEW

The collection, processing, reporting and use of routine health information are ineluctable for the effective and efficient functioning of health delivery systems (WHO, 2004). Routine health information systems (HIS) are important to guide and improve decision making and control resources such as finances and personnel (Lippeveld et al, 2000). A number of health facility-based information systems such as public health surveillance, health system monitoring and mortality information systems exist, and to varying degrees have been successful in meeting some of the aforementioned potentials. Routine large-scale surveys however, exemplify an underutilised source of information that could enable health departments to gain insights into the performance of health service provision from both the stand-point of providers and users (Boerma & Stansfield, 2007). Amongst these, Waiting Time Surveys (WTS) directly responds to the commonest complaint of users of health care services, which is that they have excessively long waits at public health facilities (Dansky and Miles, 1997).

Long waiting times is a well known irritation to and frequent complaint of patients who utilise public sector health services in South Africa and many developing countries, and impacts on patients' perception of the quality of health services they received and the acceptability of the services (Pruyn & Smidts, 1998; Reagon & Igumbor, 2010). Hence to provide high quality health care, the prevailing long waiting times must be reduced. It therefore behoves management to investigate and solve the problem of long waiting times. Adding urgency to this is that South

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

302

Africa has proposed that a national health insurance fund be established, which will merge the private and public health services in the country, to ensure country-wide universal health care (National Department of Health, 2011). The biggest stumbling block towards this is the poor state of public health services and in particular the extremely long waiting times present in the public health system, which private sector patients do not encounter and which will hamper the amalgamation of private and public health services.

The effective functioning of health systems is reliant on good quality information being available for decision-making (WHO, 2001). Routine surveys exemplify an under-utilised source of such information that could enable health departments to gain insights into the performance of health service provision, from both the stand-point of the providers and users (Task Force on Innovative International Financing of Health Systems, 2009). Prominent amongst these routine surveys are Waiting Time Surveys, which directly respond to one of the chief concerns and complaints of users of healthcare services, namely the long amount of time they spend waiting for the health service they came to the health facility for. However in order for Waiting Time Surveys to be incorporated into health information systems and to be conducted routinely, a standardised methodology is required, as well as analytical tools that can easily handle the vast amounts of data generated by the surveys. Equally important is the availability of staff with the requisite skills and the mandate to routinely conduct, analyse and interpret the survey results, which is unlikely to be present in health provision organisations as not unexpectedly they usually deem this to be a function of research organisations and hence they do not usually employ staff skilled in this area (Lopez et al, 2006).

A handful of software products have been developed to assess waiting and service times, however most have been plagued with inflexibility and methodological problems. However the Waiting Time Survey developed by the School of Public Health at the University of the Western Cape incorporated an analytical tool in the form of an Access based Waiting Times database, which had been evaluated in Southern and Eastern Africa and found to be valid, user-friendly and comprehensive (Reagon et al, 2008). Linked to the database software is a robust standardised methodology for implementing Waiting Times surveys at any health facility, from a small primary care level one-nurse clinic to a large tertiary level complex hospital with thousands of staff. Although the methodology is standardised a high degree of flexibility, which allows customisation of data collection options, to suit local circumstances, is built into both the methodology and the database software. The waiting time survey (WTS) primarily measures how long people wait for a service and the amount of service time they receive at health facilities. Importantly, in addition to identifying long waiting times, the survey identifies the causes of these long waiting times and suggests ways to reduce them. The survey also measures the workload of the staff, the efficiency of service provision and the percentage of time staff spend attending to patients (Reagon et al., 2008). The availability of this WTS provided the prospect for routinely implementing this, and by implication other routine surveys, on a large scale by ministries of health in developing countries. If this could be done then the survey could be conducted within the purview of the normal service activities of health care providers, thus making the routine assessment of waiting times possible at low cost and with high benefit. This WTS therefore seemed to be a good entry point into increasing the capacity of health departments in South Africa and in other developing countries to routinely conduct high quality health systems research and especially those types of research which provide insight into the performance of health care services.

It is relatively easy for researchers to conduct surveys as invariably it is a once off activity. However routine surveys which are done repetitively and iteratively on a wide scale, is a much more difficult undertaking. It is therefore clear that health workers who are expected to undertake these routine surveys by themselves, need to be trained in all aspects of conducting surveys and in particular in the peculiarities surrounding routine iterative surveys. The other requirement is the availability of a standardised methodology and the requisite tools to

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

303

implement the survey rapidly and efficiently. Given the availability of a standardised methodology and an effective and user-friendly analytical database, the only outstanding issue remaining was whether information officers untrained in and unexperienced with conducting research studies could successfully implement routine surveys.

However, as always, things are not as simple as that. Health departments are complex systems and as such implementing new activities, however overtly beneficial, does not proceed in a deterministic rational manner (Walton, 2014). In order for a complex system such as a health department to implement a new activity there has to be sufficient institutional motivation to do so, institutionalised support for the activity, an enabling local environment where the activity is planned to take place and acceptance of task shifting by both the staff expected to conduct the activity and those supervising them (Nordtveit, 2010). The institutional motivation required was provided by the reduction of waiting times being one of the 6 listed priority interventions that the minister of health in South Africa required of all health facilities (National Department of Health, 2011). Institutional support was available as managers in the health department in the City of Cape Town had decided to measure the extent of, identify the causes of and reduce waiting times at their facilities. An enabling local environment had recently been created as information officers who had previously worked in a centralised manner, with one information unit providing health information for the entire city had been split into smaller units, each of which was responsible for the information needs of a sub-district. Whereas before an information officer was responsible for providing only a small segment of health information for the entire city, now they were expected to provide all the health information needs for a sub-district. This required them to engage with different types of information and hence introducing another type of information (routine surveys) was not threatening. Acceptance of task shifting by both the information officers and their supervisors was present, as staff were receptive to new activities as it was a core part of their new role as information officers at sub-district level, and their supervisors were the managers of the sub-district, and since it was these managers who wanted the routine implementation of the waiting time surveys, acceptance was explicit. With all the factors required to implement a routine waiting time survey in place in the City of Cape Town, it was an ideal opportunity to test its feasibility.

The aim of this study was therefore to determine if health information officers employed by the department of health to operate a routine HIS could conduct a Waiting Time Survey by themselves.

Specifically this study attempted to assess whether health information officers would be able to:
- Design and conduct a locally appropriate Waiting Time Survey
- Use a customised free and open source database application for entering, cleaning and analysing Waiting Time Surveys
- Interpret the findings of Waiting Time Surveys and develop implementable solutions to reduce waiting times and improve service efficiency

2. METHODOLOGY

All the health information officers employed at primary level care facilities in the City of Cape Town were recruited for training on conducting a Waiting Time Survey. These training workshops used Waiting Time Survey case studies involving context-dependent and realistic situations. Facilitators were drawn from a team of researchers and faculty of the University of the Western Cape, South Africa. Training was provided in large workshops as well as in small discussion groups, with participants being given the opportunity to identify problems in case studies and work through them. The workshops contents included (i) the value of Waiting Time Surveys in health systems research in developing countries; (ii) principles and methods of conducting Waiting Time Surveys in health facilities in developing countries; (iii) Using the customised free and open source database application; (iv) designing and conducting a waiting time survey appropriate for their setting; (v) entering, cleaning and analysing survey data (vi)

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

304

reporting and interpreting the results of a WTS and; (vii) developing action plans based on the results produced from their Waiting Time Survey.

The theoretical basis of the training workshops and discussion groups was the cognitive flexibility theory (CFT) of Spiro et al. (1988). The theory describes the nature of learning in complex and ill-structured domains. A hallmark of this theory is its focus on participant's 'ability to spontaneously re-structure their knowledge in different ways, in adaptive response to radically changing situational demands'.

A randomised sample of 35 clinics and health centres within the City of Cape Town, South Africa were selected. Facilities included in the sample were visited by information officers to confirm the services they provide and obtain more details on the manner in which the services are provided by each category of staff, as well as the range of time used to provide each of the services. To achieve this they briefly interviewed all staff members present at the facility for 5 to 10 minutes. If no staff members from a category of staff were present on the day, then they returned to the facility on another day when the staff were present. Waiting time survey timesheets specific to each facility were prepared by modifying a generic timesheet, as required, to accommodate the specific activities conducted at the facility. The modified timesheets were then piloted and further modified if so required. An information officer with a group of fieldworkers and with the support of the facility manager, on an average day in the week during an average week in the year, conducted the survey at each facility. Most of the surveys were successfully implemented with only minor logistical problems arising which were effectively attended to as they arose.

The amount of time that patients spent waiting for a service, and the time taken to provide the service, was measured for every patient that visited the clinics and health centres, on that average day. As patients entered the clinic or health centre they were handed a timesheet on which their arrival time was recorded. The patients were then asked some brief questions, such as their age, whether they had an appointment and how they travelled to the health centre. Each of the health workers (such as receptionist, clinician, pharmacist, nurse, etc.) who saw the patient on that day, then filled in the time they started seeing the patient and the time they finished seeing the patient. When the patients left the clinics/health centres the departure time was recorded and they were asked questions about how long they were willing to wait at the clinic/health centres for the services which they had just received. All the health workers at the facilities completed a personal timesheet. On their personal timesheet they recorded the time that they commenced duty at a service point and the time that they completed their duty at that service point. The health workers also answered a few questions on the amount of time that they think it is appropriate for patients to wait and on whether they had sufficient equipment and space to properly attend to the patients. Using a combination of data from the patients' timesheets and the health workers' timesheets, the waiting times and ancillary measures including those required to identify the causes of long waiting times, were calculated. The information officers trained the fieldworkers and supervised them during the running of the waiting time surveys. The information officers and/or data capture clerks entered the data into the customised database. The information officers cleaned and analysed the waiting times data and then interpreted the analysed information to uncover and report on the length of the waiting times prevailing and the causes of long waiting times, if any were experienced.

The performance of the information officers was assessed based on direct observation of their conduct during the survey by university researchers and during their induction and training period. Similarly the performance of fieldworkers who were used to assist the information officers with the survey by recording the arrival and departure times of the patients was assessed. A workshop was held after the data collection phase of the survey to discuss information officers perceptions on the implementation of the survey and on any logistical and methodological challenges encountered as well as their response to them. Similarly a discursive workshop was held during the data interpretation phase.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

305

3. RESULTS AND DISCUSSION

The waiting time surveys were generally perceived as being well run by the information officers and were enthusiastically received by patients. At most of the facilities the surveys were successfully implemented with only minor problems arising which were effectively attended to as they arose. At some facilities however major problems arose, which could not be rapidly solved and this resulted in an invalid assessment of some service points and in 2 cases an invalid assessment of the entire facility. This occurred at a total of 7 service points which were spread over 6 facilities. At two facilities major problems mainly linked to a lack of staff participation in the surveys arose, resulting in an inadequate assessment of those facilities.

The response from staff working at the facilities was varied and ranged from great enthusiasm with staff providing lots of support to the information officers and the fieldworkers, through to absolute refusal by the staff to participate in the survey. Facility staff discontent with the survey manifested in several ways namely: discarding patient and staff timesheets in drawers and dirt bins; repeatedly and deliberately making the same errors on the timesheets even after repeatedly being informed of the errors and being shown how to complete the timesheets properly; filling in the timesheets of some of the patients but ignoring the timesheets of other patients; filling in only patient timesheets and not the staff timesheets; and absolute refusal to participate in the survey. Reasons staff advanced for not participating in the survey were: that they were not informed that the survey would be held (despite specific meetings to inform staff of the survey being held, despite advertisements of the survey being placed on the facility bulletin board and displayed at prominent places on the walls, despite several reminders of the survey being made at general staff meetings); that they were too busy to participate in the survey (despite it taking only 10 seconds to complete each patient's timesheet and only 3 minutes to complete their own timesheet for the day); that they were not interested in surveys (despite long waiting times being the commonest and bitterest complaint of patients); that they just wanted to get on with assisting the patients as best they could without distractions; and that participating in surveys was not part of their job. Although it was disconcerting that at several facilities some staff refused to participate in the survey, this refusal should be viewed from the perspective of a group of professional workers who are largely self-regulated and self-managed and are therefore not used to being 'checked up on' and who may quite possibly feel slighted that their professionalism is being questioned in this way. This was probably due to them perceiving the waiting time survey as an individual staff checking mechanism, due to staff having to complete individual timesheets, rather than as a health systems functioning assessment tool, which it is.

The major problems that occurred could be split into three types namely: inadequate preparation by information officers for the survey which was in turn due to tight schedules giving them insufficient time to prepare; providing inadequate and insufficient training to the facility staff due to both lack of preparation time and poor access to the staff; and inadequate performance by the field workers due to 'stage fright' with most of them being in charge of key activities for the first time and being unsure how to discharge this responsibility on their own. Minor problems that crept up included: staff non-intentionally filling in forms in the wrong places; staff non-intentionally incorrectly filling in forms; service points functioning but not listed on the forms; staff non-intentionally mixing up patient and staff forms; service logistics not fitting in with format of the forms; and forms getting lost. All these minor problems were noted by the information officers at the time of conducting the survey and were easily solved in consultation with their colleagues, demonstrating that collegial problem solving was the norm. The major problems encountered during data collection in the survey are commented on further below and then the other aspects of the survey (data capturing, data cleaning, analysis and interpretation) are scrutinised.

Inadequate preparation by information officers for the survey arose mainly because information officers had insufficient time to fully prepare everything required for the surveys and with several preparatory tasks being done in a rushed and patchy manner. Certain key preparation

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

306

tasks were either not done or inadequately done and there was no process to check whether they had been adequately performed or not. Fortunately none of the problems due to inadequate preparation resulted in an unsuccessful survey at any facility or service point, but they did cause information officers and facility managers considerable stress and resulted in lots of 'running around' to solve them during the survey. The 'running around' besides being stressful and tiring, also in some cases created a perception of disorder and chaos, even though that was not the case. Hence solving this issue is important both for the actual integrity of the survey, as well as the perceived integrity, as it will reduce any frantic appearances. Solutions might include having a longer lead time in the preparation phase and using comprehensive key activity checklists.

Inadequate training of facility staff on their role within the survey and how they should fill in the patient and staff timesheets was a serious problem in several facilities. Indeed it was the key reason why some of the surveys were unsuccessful. As staff are the main data collectors, their willingness and prior preparation to complete the timesheets is critical for the success of the survey. In all cases where the survey was unsuccessful there were some staff who were not prepared for the survey at all and had no idea what to do. Others were inadequately prepared and seemed to think that the fieldworkers would complete the timesheets for them. Interestingly the size of the facility and the complexity of service provision were unrelated to the adequacy of training and degree of preparedness of the staff. Indeed at facilities where staff were unwilling to complete the timesheets this may have been due to them being unaware of the need for them to do so, or being inadequately prepared for doing so and then being peeved that they were belatedly shown how to do it, while the survey was in full swing. Plausible explanations for staff being unprepared for the survey include that information officers had insufficient time to properly prepare and train all staff for data collection; that information officers had insufficient access to staff before the survey; that on most occasions staff were trained in groups and hence individual comprehension of their role was not assessed either informally or formally; and that staff were not expected to practice filling in the timesheets beforehand and few of them did so.

To enhance inclusivity fieldworkers were recruited by health committees attached to each of the facilities being assessed. Rudimentary screening of fieldworkers was however not done during the recruitment process and several fieldworkers recruited did not fit the key selection criteria of being literate, numerate and proficient in English (the language used in training and during the survey). Those who were illiterate or insufficiently literate could not assist patients to complete the patient questionnaire, while those who lacked numeracy skills were unable to correctly complete timesheets. Those who were not proficient in English could not be adequately trained as the training was in English and they could not complete the questionnaire properly as that was in English as well. It is quite clear that if a fieldworker does not meet the basic criteria, then they will be unable to be adequately trained to conduct the survey in the time allocated for training. That some fieldworkers were neither numerate nor literate became obvious during their training, however in the context of a 40% unemployment level, it was extremely difficult to dismiss them at that stage, as even short term work was valuable to them. They were therefore paired with high functioning fieldworkers, but this did not help as the other fieldworkers simply did not have the time during a busy survey to assist them, and in practice their work was simply shared amongst the competent fieldworkers. This effectively resulted in an insufficient number of functional fieldworkers being deployed. Clearly fieldworkers should in future be more carefully selected to ensure that all of them meet the selection criteria. To aid in this a simple literacy and numeracy test should be administered, with candidates only being accepted into training if they pass that test.

Information Officers were trained to capture the data on the customised Waiting Time Database but data capturing proceeded at a far slower pace than anticipated. The slow pace of data capture was due to delays in getting permission to load the database onto the health department computers and lack of dedicated personnel to capture the data. Even though senior health managers had endorsed, and indeed requested the survey and the use of the customised database,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

307

it transpired that the information technology department has the final say regarding which software can and cannot be loaded onto the computers of all government departments, including the health department. It transpired that the information technology department was not informed of the survey until the time came for data entry and hence formal permission had then to be requested to load the customised database onto the computers of the information officers and health department clerks, which took some time to be granted. Although the information officers were designated as the staff responsible for the implementation of the waiting time survey, they were not relieved of any of their other duties and conducting the waiting time survey was not formally listed in their job performance agreements as an official function which they had to do. This gave rise to frustration and resulted in time pressures as they were being expected to both capture the WTS data rapidly and provide timeous outputs for their usual HIS functions. Faced with this scenario most information officers prioritised their usual functions thereby slowing down data capture considerably. Eventually responsibility for data capture was handed over to clerks, but this had its own problems, as unlike the information officers the clerks were not trained in the use of the database, with most just being given a cursory tutorial by the time-pressured information officers and then expected to capture the data. Not unexpectedly many errors occurred during data capture by the clerks and in turn impacted upon the data cleaning processes. Data cleaning instead of being a quick check on relatively accurate data, became a laborious time consuming process whereby many data capture errors, such as 'captured the incorrect form', or 'missed capturing several service points which the patient attended' had to be corrected.

Analysing the data was easily accomplished by the information officers as this function was automated within the customised database and required only that they request the correct analysis. However many difficulties were experienced by them when attempting to interpret the analysed information, as it transpired that they had little experience in interpreting information, as despite being information officers this had not been one of their core functions, with typically managers and senior staff providing the interpretation for all the other reports which they produced, via the routine health information system. Additionally the analysed information from the WTS is inherently more difficult to interpret validly than most routine information, as it requires that one simultaneously considers the results reflected in a composite table and 2 composite graphs. Traditionally routine information is presented as simple tables or simple graphs, requiring only that one understands the single measurement and the context within which it was measured, for one to be able to validly interpret it. With the waiting time survey, as the depth of information generated is greater, one requires the understanding of several measurements and the interplay between the measurements, in addition to being aware of the context within which the measurements took place, in order to arrive at a valid interpretation. Even though this was the first time that information officers were expected to provide written interpretations of analysed information and even though the information was more difficult to analyse than most other routine information, the information officers rose to the challenge and with support and coaching performed the task reasonably well.

The overall performance of the information officers has to be judged within the context that they were functioning in, however since they had managed to execute the survey in 33 of the 35 facilities, capture, clean, analyse, interpret and report on the surveys, this suggests that, despite the problems detailed above, they were reasonably successful in implementing the surveys. Since this was their first attempt at a considerably complex survey they should be able to implement it much better the next time, thus making it reasonable to assume that waiting time surveys could be incorporated into routine information systems, provided that information officers are availed with sufficient time to successfully pursue them and provided that their execution is formally adopted as a core function of the information officers.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

308

4. CONCLUSION

Given the current standardised, simple and yet robust WTS methodology and given the user-friendly customised database, it is possible for health facilities in developing countries to routinely conduct Waiting Time Surveys. Existing human resources within health systems can be used to implement the survey in its entirety – including planning, data collection, data cleaning, analysis and contextualised interpretation of the results. The ensuing benefits of reducing in waiting times and increasing systems efficiency, allows increasing improvements in quality of services over a period of time. As health workers undertake the survey themselves, not only is the survey conducted at a low cost, but it also eminently impacts high staff morale, as service provision improves and staff assume the role of researchers in their own right.

With the addition of large scale surveys such as the WTS to their routine health information system, health ministries would be in the envious position of having an unprecedented amount of high quality information to guide strategic and operational planning, as well as to assist with day to day decision making. Further value could be obtained by integrating the customised survey database with other large databases utilised by ministries of health in developing countries. The universal implementation of routine Waiting Times Surveys presents the potential for an enriched health information system, particularly in resource-constrained settings, where efficient use of limited resources is critical.

5. REFERENCES

Boerma, JT., Stansfield, SK. (2007). Health statistics now: are we making the right investments. Lancet, 369: 779-786.

Dansky, KH., Miles, J. (1997). Patient satisfaction with ambulatory healthcare services: waiting time and filling time. Hosp. Health Serv. Admin. 42(2): 165-177.

Lippeveld, T., Sauerborn, R., Bodart C. (2000). Design and Implementation of Health Information Systems. Geneva: WHO, 2000: 1-10.

Lopez, AD., Mathers, CD., Ezzati, M., Jamison, DT., Murray, CJL. (2006). Global Burden of Disease and Risk Factors. Oxford University Press and The World Bank, Washington DC.

National Department of Health. (2011). National health insurance in South Africa. Policy paper. Government printers, Pretoria, South Africa.

Nordtveit, B. H. (2010). Development as a complex process of change: Conception and analysis of projects, programs and policies. International Journal of Educational Development, 30(1), 110–117.

Pruyn, A., Smidts, A. (1998). Effects of waiting on the satisfaction with the service: Beyond objective time measures. Intern. J. of Research in Marketing 15: 321–334.

Reagon, G., Igumbor, E., Abie, Z., Adams, G., Koopman, F., Titus, N. (2008). Service efficiency and waiting times in primary level care facilities: Case studies within Cape Town. 4th Annual Conference of Public Health Association of South Africa, Cape Town, South Africa. 2-4 June 2008.

Reagon, G., Igumbor, E. Strengthening health systems through training of health care providers in the conduct of routine waiting time and system efficiency surveys. Studies in Health Technology and Informatics 2010; 160:590-594.

Spiro, RJ., Coulson, RL., Feltovich, PJ., Anderson, D. (1988). Cognitive flexibility theory: advanced knowledge acquisition in ill-structured domains. In: Patel V. ed. Proceedings of the 10th Annual Conference of the Cognitive Science Society. Hillsdale, NJ: Erlbaum, (online). http://www.ilt.columbia.edu/ilt/papers/Spiro.html (last accessed 21/11/2014).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

309

The Task Force on Innovative International Financing of Health Systems. (2009) More money for health and more health for money. Task Force Report. (online) http://www.internationalhealthpartnership.net/ (last accessed 24/1/2014).

Walton, M. (2014). Applying complexity theory: A review to inform evaluation design. Evaluation and Program Planning, 45:119-126.

World Health Organization. (2001). WHO multi-country survey study on health and responsiveness 2000-2001. GPE Discussion Paper 37. Geneva, World Health Organization.

World Health Organization. (2004). Developing Health Management Information Systems: A Practical Guide for Developing Countries. Geneva, World Health Organization.

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Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

310

DESIGNING OPEN AND SUSTAINABLE TECHNOLOGIES FOR DEVELOPMENT

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Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

311

TRAINING MENTORS OF HEALTH INFORMATION SYSTEMS THROUGH eLEARNING

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Abstract: The district health information system (DHIS) is currently used in more than 40 developing countries. The project aims in finding effective training methods to improve user's learning outcomes and in grooming mentors that can attract new users. Based on literature recommendations and a user survey, an eLearning course through an in-app in the software is under development to be used in low connectivity areas. The eLearning course will emphasize interactivity, motivation, practice exercises and feedback. In addition to the normal user level, this course also has a mentor level to be taken by some users in each site where the system is used, such that the mentors can guide new users locally.

Keywords: Health Information System, Low Income Countries, Superusers, eLearning.

1. INTRODUCTION

The introduction of ICT in developing countries has been marred by "pilotitis." A seemingly endless stream of ICT interventions die out after the donor has left due to poor institutionalization. There are several reasons why ICT systems are unsustainable, and this research addresses low user competence, which is, particularly in rural areas, one system killer (Kimaro & Titlestad, 2008). Training in basic ICT plus system specific skills followed up by regular support visits were found necessary for a health information system innovation to succeed (Ngoma, Kaasbøll, & Aanestad, 2008). The need for local support has been addressed through training some users more than others, such that they become mentors who are able to support, guide and encourage other staff on using an ICT system (Coulson, Shayo, Olfman, & Rohm, 2003; McNeive, 2009). While acknowledged as a viable strategy towards sustainability of the systems, the approach so far has been to just provide more training for those selected to become mentors. This is an expensive method when scattered trainees need to join up for several days in a central city. The research in progress reported here aims at developing efficient methods for training mentors in rural settings in low and middle-income countries, thus contributing to sustainable information systems.

Reaching out to potential mentors in rural districts can be achieved through a distant learning approach supported by an eLearning course. Based on review papers, we establish nine conditions that such training should meet. Distance training by means of ICT has in general had modest success (Hattie, 2009), and intermittent electricity supply and unpaid internet subscriptions which are often the case in the relevant setting make eLearning more challenging. However, studies suggest that the following functionality will enhance learning (Cook et al., 2010);

1. Feedback
2. Practice exercises
3. Repetition
4. Online discussions

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

312

5. Audio

Many conditions are required for people to use at work what they have learnt in courses (Grossman & Salas, 2011). Some of these can be affected during training:

6. Motivation. Learners find the training useful and are motivated to learn and apply new competence at work,

7. Self-efficacy. Can be improved through watching a peer believed to have similar abilities as yourself, solving a problem.

8. Realistic training environment with close resemblance between the subjects taught and work tasks. This implies the same software being used for training and work.

9. Learning anticipating and handling problems.

Based on these factors, the project will develop an eLearning course implemented as an app extension to the web enabled routine District Health Information System (DHIS, 2014), which can work in locations with poor connectivity. Such an approach can reduce training costs, thus contributing to a sustainable training approach for learning of information systems.

The research questions are

1. What is the necessary training and support to make people who are neither managers nor computer scientists able to champion and support a health management information system at their workplace?

2. How can eLearning courses be designed to improve user competence in areas with poor connectivity?

3. What is the outcome of eLearning courses compared to face-to-face training?

2. SETTING

This project builds on achievements made in health information systems research (Braa & Sahay, 2012), particularly the implementation of the DHIS in more than 40 countries.

The setting for this research will be the health management information system of Malawi, where the integrated DHIS has been implemented. Malawi has 29 district health offices where data is entered from paper forms to the web system. In each district office, there are 20 or more health programme coordinators, one Health Management Information Systems (HMIS) officer who has HMIS with the DHIS system as their prime task, and a few clerks who help out on data entry and other system related tasks. The total of 600 programme coordinators at district level need to learn the DHIS for analysing their monthly data collected from facilities on paper and entered into the database in the district offices. The coordinators in districts are often transferred, such that new ones have not taken part in any DHIS training. HMIS officers and clerks are more stable, such that the training will target these groups.

The DHIS is run through a web browser and stores data in a national server. Due to the number of data concepts (organisation unit, data element, period, data set, validation rule, indicator, graph, …) there is no easy fix to make it look simple at the user interface. Therefore, considerable learning efforts are required to be able to use it efficiently.

3. METHOD

The research is carried out in three stages.

1. Survey of mentor competence. A questionnaire was sent to the global DHIS user e-mail list asking about their opinions of what a mentor should be able to do. The list had 716 members in six continents, most living in LMIC. Fifty useful responses were received,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

313

which is a 7% response rate. Wilcoxon's signed-rank test was used for testing differences between high and low Likert scale responses, since no normal distribution was assumed.

2. Development of Apps & Learning material – iterated. Each iteration will consist of a design and an evaluation phase. The purpose of the evaluations will be to find as many issues in the learning material as possible, thus variation amongst the test subjects is valuable, while representativeness is of little concern. The data from the observations and interviews will be analysed qualitatively, aiming at finding reasons for learning and non-learning in the learning material. This project is currently in the design phase of its first iteration.

3. DHIS aims at providing indicators to health management. To measure the effect of the training, the final evaluation will assess the average number of reports generated from the system per health manager. This number is found in system logs. Around 20 health managers work in each of the 29 district offices. eLearning will be carried out in ten offices, while no intervention will be carried out in a control group of ten other offices. To gauge the effect of the eLearning over time, the average number of reports will be measured monthly from month 4 to 9 after training commenced and at the same period in the control group. Assuming that face-to-face training is more effective than eLearning, face-to-face training will be carried out in the remaining nine districts, and the same evaluation will be carried out there. The evaluation will thus provide a measurement of the effectiveness of the eLearning vs. no training and vs. face-to-face.

4. SURVEY RESULTS

Table 1 lists the rank and mean scores of responses to the question on what mentors should be able to do. On the 1-6 scale, all mean scores are above the middle choice of 3.5, implying that mentors should be able to do everything. However a couple of findings seem relevant when designing mentor training.

Rank	Ability	Mean score
1	encourage other users to use the system	5.4
2	guide other users such that they become able to solve other problems themselves	5.3
3	guide other users such that they become able to solve the particular problem themselves if the problem reappears in the future	5.2
4	communicate with IT people	5.2
5	achieve trust from others	5.2
6	learn new IT solutions, changes, and updates	5.2
7	solve IT related problems	5.1
8	argue convincingly for the purpose of the system towards other users	5.1
9	achieve social ties with others	5.0
10	observe misfits between IT and business	4.7
11	carry out IT related tasks which other users don't want to do	4.6

Table 1. To which extent should a mentor be able to ... (Shaded area: significantly lower scores than Rank 1)

Mentors' abilities to get others to use a system are ranked highest amongst the scores. It would be likely that "argue convincingly for the purpose of the system towards other users" would have had a similar score. However, this alternative is marginally significantly below the rank 1 score. One reason may be that the ability to encourage is deemed more important than the ability to argue. This may imply that mentor training should aim at developing their capacity for encouraging others, which is in line with previous studies (McNeive, 2009; Poe, Abbott, & Pronovost, 2011).

The ability to learn solving problem yourself came out as rank 2 and 3 in the question. Based on other questions, the results were split into respondents being help givers versus receivers. The

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

314

outcome was that those who mainly *receive* help think that mentors should be able to guide other users both such that they become able to solve the particular problem and other problems themselves to a significantly higher degree than those who mainly *provide* help. Hence the less skilled want to learn to be able to solve problems themselves, while the more advanced do not seem to acknowledge that the less skilled want this.

5. APPS

The DHIS can be extended by apps, which are also running on the users' computer. Having in-app training as part of the software to be learnt meets condition 8. It will show up in a separate

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

315
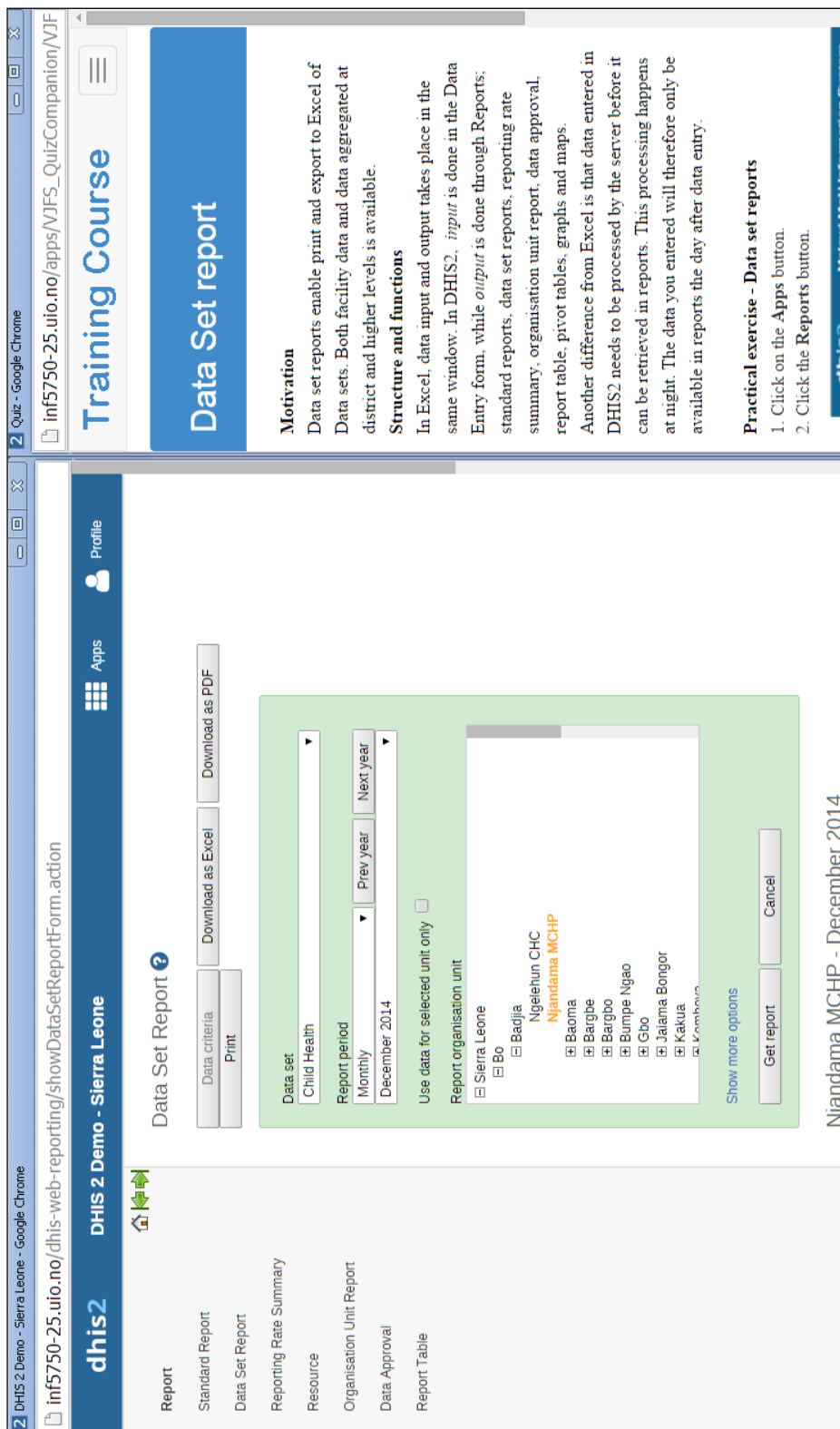
browser window with no overlap with the application see illustration above.

The DHIS operates in areas with poor internet connectivity through minimised data transfer and offline mode when the network is down, and the training apps will follow suit, again fulfilling condition 8. Functionality for sharing experiences during course taking may also be implemented in a mobile phone app, meeting condition 4.

The course evaluation app will be able to log the activities of a chosen group of users for specified time periods. The output will be anonymised in order to avoid ethical issues on surveillance of health workers.

6. LEARNING MATERIAL

The user learning material will consist of one module per topic. For each topic, there will also be a mentor module aimed at bringing the users to the level where they can support others.

A user course will consist of 3-5 modules like this:

1. Presentation (2 pages, possibly a few seconds of video (5)).

    a. Motivation for the usefulness. (Condition 6)

    b. Structure & function. Presentation for understanding in order to be able to solve problems and guide others (9).

    c. Practical exercise. Sequence of steps for doing the operations for learning the skill (2).

2. Assignment. One or more of

    - System log showing that the Learner has accomplished the task on the system, requiring that the task is repeated during three days (3)

    - Quiz with feedback on the answers (1).

    - Approval from a more experienced colleague. (1)

For completion of a course, the learner also has to contribute to an online learning community, meeting Condition 4. After completion, the user will receive a certificate from the Ministry of Health and the UiO, confirming management recognition.

After completion of a user course, the learner will be allowed to start up the mentor course on the same topics. The mentee will be a colleague, possibly with higher status than the mentor (Condition 7 for the mentee). A module:

1. Presentation (2 pages with links to User Manual and other documentation, possibly video).

    a. Prerequisites for the mentor to prepare.

    b. Guidelines of how to supervise the mentee during the corresponding tasks in the User course (2).

    c. Issues, which people have when learning this topic (9), also preparing for problem solving as was suggested in the survey.

2. Assignment. One or more of

    - System log showing that the Mentee has repeatedly accomplished the task on the system (3).

    - Quiz (1).

    - Approval from the mentee (1).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

316

- Write issues that arouse during mentoring in online mentor community.

5.Data Set report

Motivation

Data set reports enable print and export to Excel of Data sets. Both facility data and data aggregated at district and higher levels is available.

Structure and functions

In Excel, data input and output takes place in the same window. In DHIS2, *input* is done in the Data Entry form, while *output* is done through Reports; standard reports, data set reports, reporting rate summary, organisation unit report, data approval, report table, pivot tables, graphs and maps.

Another difference from Excel is that data entered in DHIS2 needs to be processed by the server before it can be retrieved in reports. This processing happens at night. The data you entered will therefore only be available in reports the day after data entry.

Practical exercise - Data set reports

1. Click on the Apps button.
2. Click the Reports button.

3. Click on the Data Set Report button to enter the data set reports.

4. Choose relevant data set.
5. Choose relevant frequency of period.
6. Select wanted year. If one chooses monthly above, select wanted month.

7. Select organisation unit by using the + / - button until you find correct unit, then mark it orange by single clicking on the name.
8. Push Get report to create the data set report.

9: You can download your report as an Excel sheet, PDF-file or print by a single click on these buttons.

Assignment

1. What is the difference between data input and output in DHIS2?
   a. Output is typing the numbers in the Data entry form.
   b. Output is retrieved from reports, while input is through Data entry.
   c. Input is done through Data entry, and output consists of exporting Data entry to Excel
2. What is a data set report?
   a. The same as the data entry form.
   b. Facility data and aggregated data at district and higher levels.
   c. Facility data and patient data at district and higher levels.
3. How do you choose report period?
   a. Click on get report
   b. Choose year and then frequency.
   c. Choose frequency and then year

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

317

Mentor 5.   Data set report

Prerequisites

Before you start mentoring a user on Data set reports, you need to find data entered yesterday or before. Before the mentee saves the Data set report on their local computer, make sure the mentee saves it on a place where they easily can access it later. An example of this can be to create their own folder where they can save reports.

Added value for the mentee and the health management

As a mentor one will create a larger understanding for how to fetch aggregated data through the data set reports. You'll also help other to fetch this information.

Guidelines

1.   Encourage the mentee to use this report for checking data input.
2.   Make the mentee go to Data set reports and find data from the day before or older. Make him/her create a Data set report.
3.   Make the mentee export the report to an excel sheet. Guide the mentee on where the file should be saved.
4.   Make the mentee find data that has been entered the same day. Ask about why the data is not shown.

Common errors

Fetching a data set report straight after entering data; it takes 24 hours before one can fetch the data set report after entering data.

Assignment

Send or answer a message to the mentor group on some reflections of what you have learned about Data set report.

Creating a community of mentors helps improving their practice (Wenger, 1998), which has also been found beneficial also for more advanced training of DHIS implementers (Siribaddana, 2014).

7. CONCLUSION

Based on literature, the research question on how to design eLearning courses to improve user competence in areas with poor connectivity should fulfil nine conditions. A survey in the user group indicated that encouraging others should be top priority for those mentoring others, and that mentees wanted to learn how to solve problems. A user course plus a mentor course were designed according to these conditions as an in-app that is part of the software DHIS. The mentor course aims at developing local personnel to become IT mentors for colleagues, and such

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

318

courses have not been found in the literature. The same strategy can be used for all distributed business systems.

8. REFERENCES AND CITATIONS

Braa, J., & Sahay, S. (2012). *Integrated Health Information Architecture: Power To The Users - Design, Development And Use*. New Delhi: Matrix Publishers.

Cook, D. A., Levinson, A. J., Garside, S., Dupras, D. M., Erwin, P. J., & Montori, V. (2010). Instructional Design Variations in Internet-Based Learning for Health Professions Education: A Systematic Review and Meta-Analysis. *Academic Medicine, 85*(5), 909-922.

Coulson, T., Shayo, C., Olfman, L., & Rohm, C. E. T. (2003). ERP training strategies: conceptual training and the formation of accurate mental models *SIGMIS '03* (pp. 87-97). Philadelphia, Pennsylvania: ACM.

Grossman, R., & Salas, E. (2011). The transfer of training: what really matters. *International Journal of Training and Development, 15*, 103-120.

Hattie, J. (2009). *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement*. Oxon, UK: Routledge.

Kaasbøll, J. (2013). A Three-level Content Model of Learning IT Use. In T. Fallmyr (Ed.), *Norsk konferanse for organisasjoners bruk av informasjonsteknologi - NOKOBIT 2013* (pp. 173-188). Trondheim: NOKOBIT-stiftelsen og Akademika forlag.

Kimaro, H. C., & Titlestad, O. H. (2008). Challenges of user participation in the design of a computer based system: the possibility of participatory customisation in low income countries. *Journal of Health Informatics in Developing Countries, 2*, 1-9.

McNeive, J. E. (2009). Super Users Have Great Value in Your Organization. *Computers, Informatics, Nursing*, 136-139.

Ngoma, C., Kaasbøll, J. J., & Aanestad, M. (2008, 2008). *From User Training to In-Service Support*. Paper presented at the IST-Africa 2008 Conference Proceedings.

Poe, S. S., Abbott, P., & Pronovost, P. (2011). Building Nursing Intellectual Capital for Safe Use of Information Technology: A Before-After Study to Test an Evidence-Based Peer Coach Intervention. *Journal of Nursing Care Quality, 26*, 110-119.

Siribaddana, P. A. (2014). Making Distance Learning an Effective Health Information Systems Training Strategy: A Combined Social Network Analysis and Content Analysis Perspective. *The Electronic Journal of Information Systems in Developing Countries, 61*(5), 1-18.

Wenger, E. (1998). *Communities of practice : learning, meaning, and identity*. Cambridge: Cambridge University Press.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

319

DESIGNING A MOBILE PARTOGRAPH FOR REAL-TIME DECISION SUPPORT FOR SAFER DELIVERIES IN INDIA

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Abstract: Obstructed labour is a leading cause of maternal deaths worldwide. The partograph is a paper-based labour-monitoring tool designed to support clinicians in identifying prolonged or obstructed labour. However, compliance with the paper tool is negligible in large because of the complexity of the form and inadequate training on its proper use. We have tackled several barriers to partograph use, by creating an innovative mobile application, which provides decision support, automatic graphing, and reminders prompting clinicians to conduct patient exams. Our design was influenced by extensive formative research, and wireframe and prototype testing in several facilities in India. The device will be tested in a formal usability study in early 2015.

Keywords: partograph, mLabour, intrapartum, usability, mobile applications

1. INTRODUCTION

The most recent statistics from the World Health Organization (WHO) state that approximately 800 women die every day from pregnancy and childbirth complications (WHO, 2014). Although this number is an improvement from prior years (WHO, 2013), 99% of maternal mortalities still occur in developing countries, and most of them are preventable. Prolonged and obstructed labour is one of the leading causes of maternal and new-born mortality and serious maternal morbidities, such as obstetric fistula (Ali and Masakhwe, 2010; Underwood et al., 2013; Alkire et al., 2012). Between 2003-2009, approximately 73% of all global maternal deaths were a result of direct obstetric causes (Say, et al, 2014). In Southern Asia, 2.8% of all maternal death was associated with obstructed labour (Say, et al, 2014). Despite renewed efforts to improve health outcomes, in 2012, India's maternal mortality ratio (MMR) remained high at 178 maternal deaths per 100,000 live births. The Indian government's National Rural Health Mission has identified prolonged and obstructed labour as two primary causes for maternal mortality and these are key focus areas in its strategic approach to reproductive, maternal, newborn, child, and adolescent health in IndiaOne tool that has demonstrated success in preventing prolonged and obstructed labour is the partograph, a paper-based labour management tool recommended by the World Health Organization (WHO). Several partograph studies have illustrated higher detection and prevention of obstructed labour with correct use of the partograph form (WHO, 1994).

2. THE PAPER PARTOGRAPH

The partograph is a one-page graphical record of labour progress, designed to assist birth attendants in detecting and responding to delays and labour abnormalities. It is used by clinical birth attendants to track the progression of labour. It typically consists of three sections. The first section is the **foetal record** used to log the foetal heart rate, the colour of the amniotic fluid, and the extent of overlap of the foetal skull bones (moulding). The second section is the **labour record**, which includes the dilation of the cervix and how far down the birth canal the baby's head has progressed (descent of the head). The labour record graph includes pre-printed "Alert" and "Action" lines which indicate when, based on standard labour curves (Friedman, 1954),

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

320

cervical dilation is progressing slower than the usual 1cm per hour. When the alert line is crossed, birth attendants should prepare to transfer the woman to facilities with emergency care capacity. If the cervical dilation crosses the action line, it is a strong indication of obstructed labour, and WHO recommends that birth attendants prepare for a caesarean section. The third section is the **maternal record**, which tracks contractions, pulse, blood pressure, temperature, respirations, urine output, and drugs administered over time.
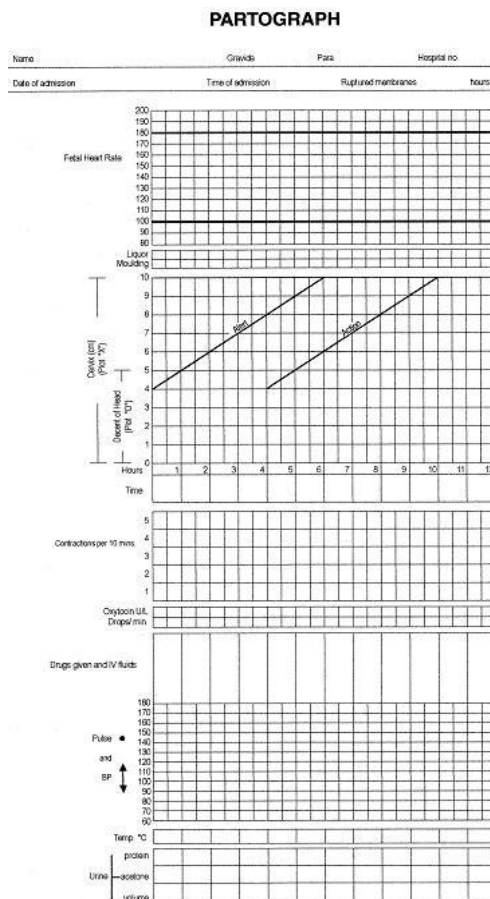
Figure 1. Example Paper Partograph (Mackeith, 2013)

3. BARRIERS TO PROPER USE OF THE PAPER PARTOGRAPH

Correct use of the partograph can help prevent and manage prolonged or obstructed labour and serious complications, including ruptured uterus, obstetric fistula, and stillbirth (Fistula Care, 2012). However, due to the complicated multi-axes graphs, the competent use has remained low among healthcare providers in developing countries (Fistula Care, 2012). Engender Health's Fistula Care and Maternal Health Task Force 2011 "Revitalizing the Partograph" summarizes the current state of partograph use in the following way: "in short, the partograph has failed to reach the potential of its original design: to provide an inexpensive and simple 'early warning system' for identifying complications during childbirth" (Fistula Care, 2012).

The meeting report describes the cultural context and key barriers that limited its use, including:

Barrier	Description
Complexity of the partograph	While WHO has simplified the partograph, many users still find it challenging to use, as the graphical format of the tool (See above) is

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

321

form	different from more narrative conventional records.
Capacity of Providers	Poor quality and inconsistent partograph training, staff shortages, and high staff turnover rates have resulted in insufficient staff knowledge and skills to interpret and act on partograph findings.
Accountability	There is often insufficient supervision to promote consistent and correct partograph usage and to reinforce its value in decision-making. Many providers fill out the partograph after delivery.
Health system support	The fact that protocols are not directly linked to the partograph limits its value to prompt emergency action. This is further limited by weak referral mechanisms and lack of emergency obstetric care.

Table 1. Barriers to Partograph Use (Fistula Care, 2012)

4. RELATED WORK

With the proliferation of mobile devices in health centres and homes throughout the developing world, the opportunity exists for mobile technology to help address some of the barriers identified above. Given the novelty of this particular area, there is a paucity of refereed journal articles; however, several projects have attempted to use various technology solutions to address partograph compliance, use, and training.

The non-profit organization Johns Hopkins Program for International Education in Gynecology and Obstetrics (JHPIEGO) is prototyping the "e-partogram," an electronic version of the partograph that helps health providers graph data and share data among facilities (JHPIEGO, 2012). This tablet-based system closely models the paper partograph on a tablet interface, with benefits including reminders and automated graphing. This project is the design phase with testing expected in Zanzibar later this year.

A 2013 doctoral student from the University of Colorado's Atlas Institute designed and evaluated the PartoPen, a digital pen system that provides instructions, real-time decision support, and patient reminders to birth attendants during labour. The digital pen system works with the traditional paper partograph form. Writing with the pen on the paper form captures the data electronically, interprets what was written, and provides the health provider with audio feedback that reminds them to enter data and helps them interpret it (Underwood, 2013).

The mLabour tool presented below aims to be a more comprehensive redesign of the partograph for low-resource settings. It incorporates lessons learned from the PartoPen experience yet provides a tool that is supported and available on Android devices available on the Indian market, thus leveraging existing (and therefore lower-cost) hardware supply and support channels. The mLabour tool is available on CommCare, a scalable cloud-based open source product.

5. mLABOUR: CREATING A MOBILE DECISION SUPPORT TOOL FOR LABOUR WARDS

Working in collaboration with local and international design consultants and content experts, we have built a mobile-based partograph prototype to address the challenges and complexity associated with substandard partograph use to date. mLabour is designed to be an intuitive and compelling tool for intrapartum healthcare providers that will also provide real-time information and web-based reports to supervisors and health system administrators. The mLabour tool is built on an open-source, configurable and extensible CommCare platform.

mLabour provides real-time decision support to healthcare providers in order to assess the course of labour and promote the appropriate interventions as necessary. Based on the

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

322

partograph and informed by known barriers to its routine use, mLabour includes built-in clinical protocols that detect and manage abnormal labour progress.

We designed the application to address the barriers to paper partograph use outlined previously:

Barrier	Application Design to Address Problem
Complexity of the partograph form	The mobile application eliminates the need for providers to graph any data by hand. Users enter numeric values during exams, which are then automatically plotted on the patient's partograph. This also reduces the likelihood of error from incorrectly plotted or shaded hand-drawn graphs. The application also reduces the complexity of interpreting the partograph. Patients who have crossed into the partograph's alert or action areas are marked as such on the list of patients (by shading their tile's background in yellow or red, reinforcing the visual connection with the partograph, which displays these action and alert areas in yellow and red) and moved to the top of this list. To potentially reduce the need for training, the contractions graph uses a bubble chart, a visualization format used in a variety of disciplines, rather than the traditional, partograph-specific set of shaded patterns used with a bar chart. Within an exam, the application provides support for abnormal measurements. For example, on a paper partograph, an abnormally low foetal heart rate is noted when the heart rate is plotted below a threshold line. The mobile application maintains this indicator - it graphs the heart rate and its graph displays the threshold line - but also notifies the user that this is abnormal and presents suggested protocol, such as informing the doctor and potentially starting an intravenous infusion.
Capacity of Providers	The reduced complexity of the mobile partograph should reduce the need for training on paper-partograph-specific knowledge. The ability to display facility-specific protocol when an abnormal value is recorded may also support new providers, reducing overall staff workload.
Accountability	The application prompts users to fill it out with alert functionality. Users decide when they intend to examine the patient again, and the tablet will make a notification sound at the designated time. In the interest of preventing alert fatigue, the tablet will not continuously ring like a phone, but rather make one sound, and once the user picks up the tablet, the patient list indicates which patients are overdue for exams, and by how much.

5.1. Design Process

The mLabour design process focused on user-centred design and involved extensive iteration and refinement. There have been three key phases of design: formative research, mock-up testing, and prototype acceptability testing.

5.1.1. Phase I – Formative Research

During the formative phase of the project, we conducted labour ward observations at the following sites:
- Primary healthcare centres and a hospital in rural Karnataka
- Primary healthcare centres in rural Bihar
- Peri-urban (secondary) public hospital in Haryana

During this phase, we spoke with mothers, labour ward nurses, obstetricians, and hospital managers, understanding the workflow from multiple perspectives. During formative research, we learned that even though it is mandated at the national level that facilities use a partograph for every birth, state policies vary widely in how strictly they implement this policy. We observed that it was more likely to be used when the partograph was a part of the government patient case sheet, as opposed to a standalone form.

In places where the partograph was used, the two most prevalent themes that emerged from the formative research were consistent with the literature. First, the complexity of the paper partograph meant that clinicians were unsure of how to fill out the form and unable to fully interpret it. Second, busy and understaffed facilities do not allow clinicians to fill out the paper partograph in real-time and they either did not fill it out at all or completed it retroactively.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

323

Retroactive completion does not utilize the decision making support of the paper form and in essence, the form simply becomes a redundant and time-consuming aspect of hospital policy.

It was during this stage that we decided to focus the design of this tool for clinicians in secondary hospitals. Many maternal mortalities occur at such sites, which receive referrals of complicated and high-risk deliveries from primary levels of care. These labour wards face a variety of challenges: understaffing, high patient flow, informal handovers of patient care during shift transitions with minimal context, and otherwise coordinating care across the care team.

5.1.2. Phase II – Wire Frame Mock-up Testing

In the second phase of the project, based on inputs from the formative research, literature review, and consultation with expert obstetricians, nursing professors, labour ward nurses, nurse midwives, and other experts in India, we developed and tested paper mock-ups of the envisioned tool with clinicians from an urban maternity hospital in Telangana, and 3 urban tertiary level hospitals in Delhi.

Mock-up testing consisted of sitting with 10 clinicians for 30-60 minutes, showing them paper mock-ups of the tool, walking them through the sequence of prompts in the paper mock-up, observing their reactions, and discussing their impressions and feedback. In some cases, two design options were presented to enable the clinician to better assess which layout they preferred. For example, through the below comparison testing (an informal form of A/B testing), we learned that clinicians preferred to just see key patient information in the case list view, rather than a full graph for each registered case.

Figure 1. Paper Mock-up Testing

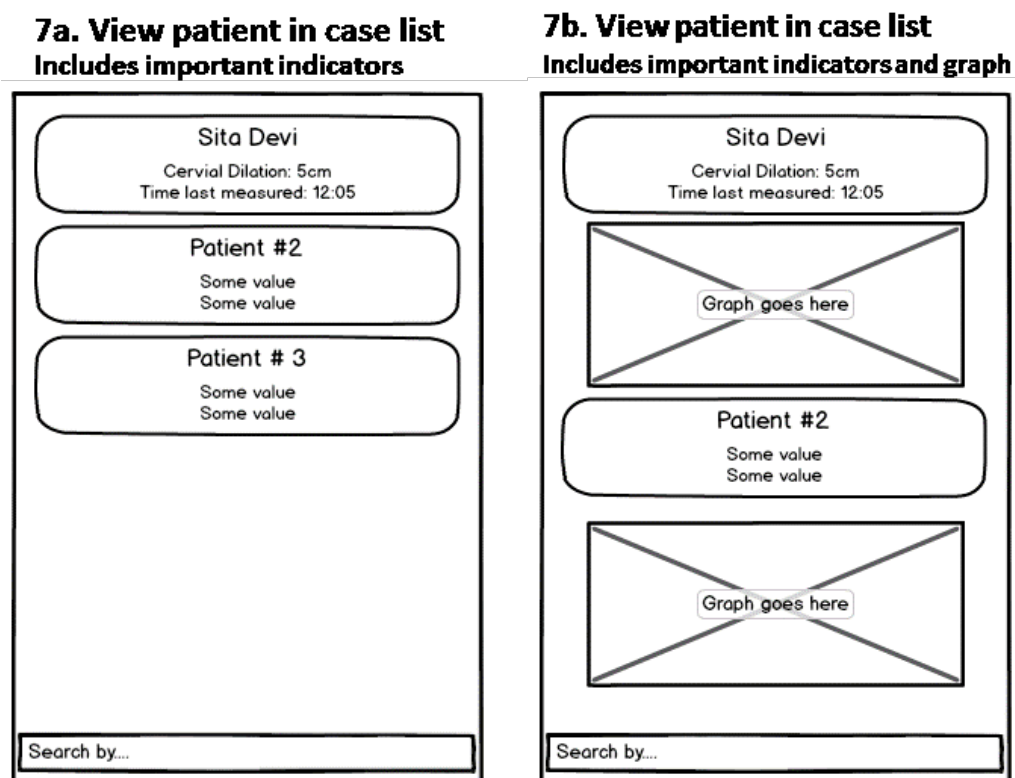Other key input during this phase came from labour ward nurses – the primary people completing the partograph in facilities we visited – who requested that they be reminded when to record the next measurement in order to maximize proper use of the tool.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

324

5.1.3. Phase III – Prototype Acceptability Testing

After developing an initial prototype, we conducted scenario testing with labour ward nurses and masters level nursing students at a hospital in Delhi.[1] The app was loaded on the Samsung Galaxy Tab 4 T231.

We employed two usability testing methods. The first method was structured scenario testing, where we provided a brief explanation of the application and then walked the user through scenarios. Participants manipulated the tablet themselves with some guidance from observers. Scenarios included both normal, healthy patients and obstructed prolonged deliveries that should trigger alerts. For this testing phase, observations were entered into an observations checklist.

In the second method, we pre-loaded the tablet with sample patient data and gave it to the user with no description of the application. Observers then asked them to explore the application and describe how they interpreted the interface, particularly icons and colour use. When participants asked questions, we asked for their interpretation of the application - 'What do you think that icon means?' - before explaining our intent. We then had them register a new patient and do an exam, with someone on the research team acting as "patient" and verbally providing data.

5.2. Tablet Prototype Design

Drawing upon lessons learned from the exploratory fieldwork, literature review, and expert consultations, we developed mLabour, a mobile application designed for clinical health workers in Indian public hospitals. Patients in labour are registered in the device when admitted. When clinicians conduct an exam - vitals, abdominal, or vaginal - they will use the tablet to select the relevant patient, review the patient's profile and partograph, and fill in whichever exam indicators they have chosen. The clinician will set a reminder for themselves, so an alarm will sound when it is time for them to follow-up with the patient; furthermore, when the patient has delivered they can close her case which removes her from the "Active Patients" list but not from the device so that a digital record of the labour is still available after the delivery. Throughout this entire process, all data entered will be submitted automatically to a cloud-based server to facilitate supportive supervision workflows, administrative monitoring, and programmatic oversight.

The application has four major workflows:

1) **Registration**: New patients are registered with the application. The user gathers demographic information, medical history, and any initial emergency signs, such as difficulty breathing. As part of the medical history, a risk score is calculated for the patient, so that patients with multiple risk factors are tagged as such throughout the application.

2) **Record Measurements**: This is the bulk of work done in the application, the recording of measurements during an exam. One workflow covers all types of exams - abdominal, pelvic, and vitals - with the user selecting which indicators they are currently concerned with. While the user records measurements, the system recognizes abnormal values and advises the user of suggested actions. After recording measurements, the user notes if the patient is experiencing any signs of a potential emergency, and lastly decides when the next exam should take place (in 15, 30, or 60 minutes), which sets an audio reminder to go off after the specified time.

3) **Record Notes & Flags**: To allow for unexpected situations, mLabour contains a workflow for a user to mark a patient as in need of extra attention for any reason not already captured. The user can record their rationale, and the application will note this on

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[1] Even though the tool is targeted towards Indian public hospitals at the secondary level, conducted acceptability testing at this tertiary private hospital was deemed an acceptable proxy for this phase of testing.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

325

the patient's profile. This gives users more control over their workflow than a more rigid system would.

4) **Record Delivery / Transfer Patient**: When a patient delivers or is transferred, the user fills out one of two short forms recording this. The patient's information and partograph are retained on the tablet but moved out of the main list of active patients.

For the sake of completeness, the application also includes secondary workflows, such as the ability to update registration information and to remove patients from the tablet.

The mLabour system includes the following key features:

Feature	Feature Description
Real time decision-support	Alerts appear when the user enters information that is outside of an acceptable threshold. These alerts provide a warning message and suggested actions and then makes the user choose one of the following actions: flag patient for increased monitoring and continue exam; record actions taken and continue exam; dismiss warning and continue exam; or stop the exam. If the patient is "flagged," the warning icon appears on the patient's profile tile on the case list.
Automatic Graphing	All data points for foetal heart sounds, cervical dilation, descent of the head, contractions are automatically graphed. The user only needs to enter the integer during the exam and the points are automatically plotted, allowing for a quick reference to the graphs.
Reminders	An alarm is set to go off when a vaginal or general (abdominal and vital signs) exam is due. The user has the option of setting a 15, 30, or 60 minute reminder for a general exam based on the patient's progress, and then selecting a 4 hour reminder for a vaginal exam. Both of these questions to set a reminder appear at the end of the Record Measurements form and are mandatory questions. There is a designation on the case tile for the exams, and the time becomes negative if the exam is late.
Coloured Partograph	We chose to use colour in the partograph to intensify the visual indicator that a patient has crossed into the action or alert zone and is at high risk. . The patient's case tile turns the same yellow or red shade, allowing users to rapidly assess which patients are most urgent.
Patient Profile Tiles	The dynamic patient tiles are organized in the patient case list based on highest priority. If someone has crossed the Alert of Action zone they'll be at the top, followed by anyone screened as High Risk, and then the patients appear in order of who is due for their exam. A clock icon also appears on the tile when a user is due to conduct an exam, and will not disappear until the exam is conducted. Finally, a flag icon appears for when a nurse manually "flags" a patient and leaves a note, nudging the next user can to check patient notes. This flag can be added and removed. Patient tiles also include critical information such as last vaginal exam and time until next exam.
Instruction Videos	The final version of the app will contain open source, locally relevant instructional videos on best practices in intrapartum care, leveraging the availability of high quality material of this nature being available and recognizing the opportunity that this device has to provide value at multiple levels.
Android Tablet	While the application can be loaded on both an Android mobile phone and an Android tablet, it was optimized for the tablet, since there are multiple graphs and data input and graph legibility and interpretation will be easier on a larger screen. This was consistent with informal feedback from received from end users on the matter.
SMS Alerts	In order to render health system support, the on-call doctors will automatically be sent an SMS when a patient crosses into the Yellow Alert zone or Red Action zone.

Table 2. System Features

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

326
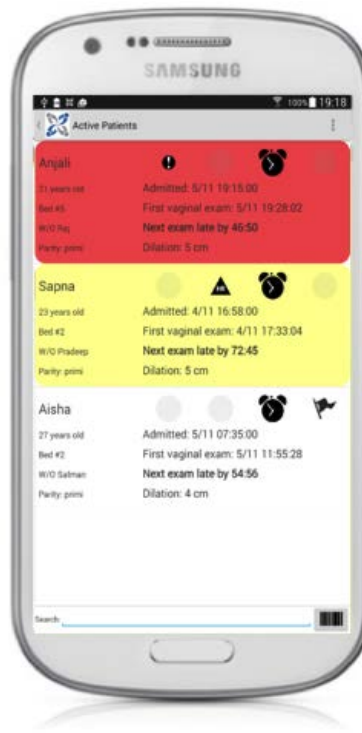
Figure 2. mLabour Prototype: Case Tile

Icon	Meaning
Background	The tile's background is displayed in yellow if the patient's cervical dilation places her in the partograph's alert zone, and red if she's in the action zone and is in likely need of a caesarean. These colours match those displayed on the mobile partograph's dilation graph.
Demographic Data on Left	The patient's name and secondary demographic information to quickly and correctly identify the patient
Emergency Icon	Emergency sign identified with the patient's labour, such as an abnormally high foetal heart rate.
HR Icon	Patient identified as high risk, a result of conditions like advanced maternal age
Clock Icon	Patient's next exam is overdue.
Flag	Staff member has manually marked this patient as needing extra attention; notes are available as to why this flag was added.
Time of patient's admission to labour ward and of first pelvic exam	Time stamps for the provider to quickly reference.
Countdown	Amount of time left until patient's next exam. This is user-configurable; part of entering exam data is deciding when the next exam should occur. If the exam is overdue, this text display show late the exam is, in bold text.
Patient's Last Recorded Cervical Dilation	Quickly know what the last dilation was

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

327

Figure 3. mLabour Prototype: Case Detail Screens

Feature	Description
Case Tile	The same summary Case Tile (See Figure 2, above) used in the patient list view repeats to ensure that the user is looking at the patient they expect.
Tabs	Detailed patient information is broken into three groups for quicker access than a single scrolling list would provide: the set of graphs, the most recent clinical measurements, and demographic information about the patient

Figure 4. Record Measurements form, where the user is presented with a simple input for cervical dilation, which the application automatically graphs.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

328

5.3 Findings

Key findings from the prototype accessibility testing process are as follows.

- **Need for vaginal exam form to be completed by either a doctor or nurse.** We learned that nurses at some facilities are not allowed to conduct a vaginal exam. Thus, we removed the two separate exam forms, and created one more flexible exam form where any set of measurements can be selected, and completed by doctors or nurses.

- **Just-in-time configurability of exam reminders.** Based on our data, we decided that at the end of the exam, the user will be presented with two required questions: the first asking when they want a reminder for this patient's next vitals or abdominal exam, with options of 15 minutes, 30 minutes, or 1 hour; the second asking if they wish to be reminded of the next PV (per vaginal) exam in four hours.

- **Clinician can specify which key indicators will be tracked over time with minimal keystrokes.** Based on variation we saw from clinician to clinician in terms of what indicators they track, we created an exam form that presents 13 indicators. For each exam the clinician, selects only the indicators that they choose to examine.

- **Graphical representation of contraction size.** One piece of feedback we received repeatedly from various field testing sites is that the paper method of tracking contraction size is cumbersome to note and clutters up the visual display of the paper partograph. To address this concern, we plotted contractions in mLabour on a graph where the dot size reflected the size of the contraction.
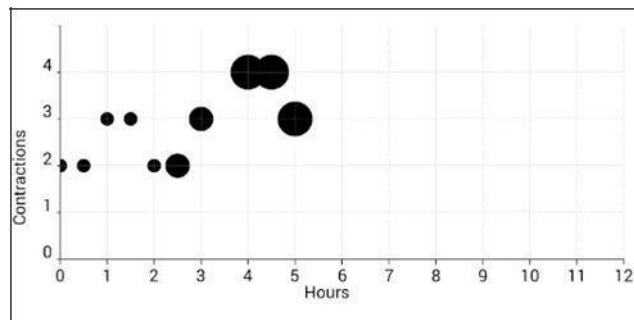
Figure 3. Contractions Graph

- **Keeping logs of past patients.** In the original design, patients who were removed from the Active Patients log after a delivery was recorded disappeared from the application altogether. User feedback revealed that partographs are referenced after birth in the event of a complication. Therefore, we created a "Past Patients" repository to store transferred and delivered patients.

6. NEXT STEPS AND FUTURE WORK

mLabour is being designed to overcoming known barriers to partograph use. As evident from the preliminary usability testing with nurses, we have determined general labour ward workflow and beneficial application features, iterated, and restructured the application. To date, we have incorporated some of the findings mentioned above into the application, and we will continue to make changes. Next steps include finalizing the application, training users, and deploying the application in a hospital in Delhi for a month-long usability study. The study has secured IRB approval from Jamia Hamdard University. Training for labour ward nurses will be three days and for doctors a half-day. During the study, clinicians will be equipped with the device as a real-time job aid to register patients, conduct exams and fill out digital forms, and set reminders for the next time they need to conduct an exam. We have created structured observation forms to

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

329

assess mLabour use in the labour ward during the study. Focus group discussions will happen at the midpoint and at the end to gather additional feedback. We are also tracking indicators such as response time to alerts and reminders on the backend through CommCare.

7. REFERENCES AND CITATIONS

Ali A, Masakhwe BA. 2010. WHO midwifery education module 3: Managing prolonged and obstructed labour. Paper presented at: Training Course in Sexual and Reproductive Health Research 2010. Geneva Foundation for Medical Education and Research. http://www.gfmer.ch/SRH-Course-2010/assignments/Managing-prolonged-obstructed-labour-Ali-Masakhwe-2010.htm

Alkire BC, Vincent JR, Burns CT, Metzler IS, et al. 2012. Obstructed labour and caesarean delivery: the cost and benefit of surgical intervention. PLoS One 2012; 7:e34595.

Fistula Care and Maternal Health Task Force. 2012. Revitalizing the partograph: Does the evidence support a global call to action? Report of an Export Meeting, New York, November 15-16, 2011: EngenderHealth& Fistula Care. http://www.fistulacare.org/pages/pdf/program-reports/EngenderHealth-Fistula-Care-Partograph-Meeting-Report-9-April-12.pdf

Friedman, E. 1954. The graphic analysis of labor. *American Journal of Obstetrics and Gynecology.* 68, 6, 1568-1575.

Hogan et. al. 2010. Maternal mortality for 181 countries, 1980–2008: a systematic analysis of progress towards Millennium Development Goal 5. *The Lancet.* 375(9726):1609-1623. DOI: 10.1016/S0140-6736(10)60518-1

JHPIEGO. 2012. Jhpiego's Innovations in mHealth: the ePartogram. YouTube. http://www.youtube.com/watch?v=5wrQoTsYLrw

MacKeith, N., Wurb, Wal. 2013. The baby has not come: obstructed labour. South Sudan Medical Journal. http://www.southsudanmedicaljournal.com/archive/february-2013/the-baby-has-not-come-obstructed-labour.html

Maine, Deborah and Allan Rosenfield. 1999. "The Safe Motherhood Initiative: Why has it stalled?" *American Journal of Public Health* 89(4): 480-482.

Mathai, Matthews. 2009. "The partograph for the prevention of obstructed labour," *Clinical Obstetrics and* Gynecology 52(2):256-269.

PartoPen. 2013. Maternal Health. Developing Countries. Digital Pens. http://www.partopen.com/

Say L, Chou D, Gemmill A, Tunçalp Ö, Moller A, Daniels J, Gülmezoglu AM,T Temmerman M and Alke L. (2014). Global causes of maternal death: a WHO systematic analysis. The Lancet Global Health DOI: 10.1016/S2214-109X(14)70227-X

Underwood, H., Sterling S.R., and Bennett J.K. 2013. The Design and Implementation of the PartoPen Maternal Health Monitoring System. Accessed online 25 February, 2013 at http://dev2013.org/papers/dev-final41.pdf

WHO. 2012. Maternal mortality. Fact sheet 348. Accessed online 25 February 2013: http://www.who.int/mediacentre/factsheets/fs348/en/index.html

WHO 2013: http://www.who.int/gho/maternal_health/countries/ind.pdf?ua=1

WHO 2014: http://www.who.int/mediacentre/factsheets/fs348/en/

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

330

SUSTAINABLE ACTION RESEARCH: THE NETWORKS OF ACTIONS APPROACH

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Abstract: This paper is motivated by health information systems having the potential to improve health systems and the health of people. The focus is on action research projects in the public health domain, and the sustainability of their outcomes. We discuss how this sustainability is enabled by the actions performed by networks of entities like institutions, organizations and people. Our focus is related to our conceptualization of these processes as *networks of actions*: *the networks necessary for sustainable action research composed of two, interlinked, types of nodes: actions themselves and the entities (individuals, organisations or organizational units) enabling and performing them.* The empirical basis of this paper is the experiences the authors have gained through participating in a global, long-term and large-scale action research project designing and implementing health information systems called HISP. The primary contribution of this paper lies in a rich description of the development of HISP during the last 10 years as a sustainable action research project and the constituents of its underlying networks of actions. This should yield relevant insights for researchers and practitioners participating in action research for development in terms of the sustainability of their outcomes.

1. INTRODUCTION

It is widely recognized that health information systems are key building blocks in health systems in developing countries (e.g. WHO 2009). Managing a public health system requires quality information on the existing health status and challenges, the operation of the health system as well as its performance. Strengthening weak health information systems has the potential to improve health service delivery and development in general. For example, aggregated numbers of disease cases (such as malaria or ebola) on the level of health districts can be used to distribute and direct resources where it is needed the most and having the best effect. This requires institutionalised processes of data collection, management and dissemination as well as actual data use in decision making. Numerous factors are challenging health information systems (HISs) in developing countries. Some examples are weak health systems in general, a lack of information culture, failing institutions and infrastructures, under-investment and the prevalence of numerous but uncoordinated donor efforts (separate, health program focused silo systems). These factors are interrelated, and may enter into a down-spiralling and vicious circle which is hard to break (see for example WHO 2005). On top of this, we observe an excess of pilot initiatives that may very well produce their expected experimental results, but which are never widely used (termed 'pilotitis' by Kuipers et al. 2008). Too much focus is given to technology (a focus which at the same time obviously attracts funding from global donors), and too little attention is given to institutionalized use of health information (Sæbø, 2013).

In 2004, Braa et al. introduced the concept of "Networks of Action" in their discussions regarding the Health Information Systems Programme (HISP) (Braa et al. 2004). In this paper,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

331

we focus on how HISP as a large-scale and international action research project has developed and changed. HISP is a global network of actors (Universities, ministries of health, NGOs, software companies, global donors, researchers, students etc.). It has since its inception 20 years ago focused on the design of a District Health Information System (DHIS) and the implementation of it as a sustainable HIS in developing countries. In 2004, HISP was designing and implementing DHIS in four countries. Today, DHIS is implemented in more than 45 countries (and as a national standard in 15 of these), and is recognized as one of the most successful HISs globally and supported by a range of international organizations and donors.

Based on the relative success of HISP and DHIS, the primary aim of this paper is to contribute to a better understanding of how HIS in developing countries can be made sustainable both conceptually and practically through a networks of actions approach. We do so by focusing on the actions necessary to create sustainability and discuss our approach to action research as *networks of actions*[1] (Braa et al. 2004). The reflections made here are based on the experiences of the authors and their point of view from the University of Oslo (UiO), Norway. The authors have participated in various ways and taken various roles in HISP during the last decade related to strategizing, planning, advocating, research, development, supervision, teaching, implementation, and so on. Through this, they have engaged in continuous discussions with other network participants and nodes in a global network. With the goal of developing a deeper understanding of HISP, and because HISP appears as inseparable from its (global) context, this research follows an interpretative kind of approach (Walsham 1993; 1995). It is based on the researchers' interpretation of the dynamics of HISP and the actions of its participants.

In the next section, we introduce action research and the concept of networks of actions. In the following section, a handful of emergent issues in the HISP network relevant for our approach to action research are introduced. In section four, we discuss how these issues have been dealt with more broadly as part of our action research approach. In the final section we summarize and draw implications for action research more widely.

2. ACTION RESEARCH AND NETWORKS OF ACTIONS

Action research as a research method in Information Systems (IS) is based on the assumptions that reductionism does not work well in the study of the social and that participating in action has the potential to bring about understanding (Baskerville 1999). Based on an interpretative philosophy and qualitative data, action researchers have dual aims: To intervene in a social setting to accomplish change and when doing so interpreting and creating a deeper understanding of change processes (Avison, Lau et al. 1999; Checkland and Holwell 1998). Action research has a strong potential to bridge the common gap between research and practise.

Action research in IS research has a long history (se for example Mumford and Weir (1979) and Checkland (1981)). But it has not been taken up widely in the context of developing countries and development. For example, Choudrie and Harindranath (2011) found that out of the 43 papers on IS in developing countries in top IS journals between 1984 and 2010, only one was based on action research (namely the Braa et al. 2004 paper referred to in this paper). In the proceedings of the 2013 IFIP9.4 conference in Jamaica, 9 out of 73 papers were using action research (out of which six were parts of the HISP project).

Based empirically on the analysis of HISP, Braa et al. (2004) problematized the sustainability of action research based interventions. This was motivated by the observation that many other action research projects outside IS have ended up limited in time and space. Even if the action research projects have resulted in change and generated knowledge about change processes, the changes are not institutionalized and sustainable. They fade away when project is over and the

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[1] In the 2004 paper, the concept of networks of actions is written with action in a singular form (action). To emphasize the need for multiple actions, we do in this paper talk about networks of actions.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

332

researchers turn their attention elsewhere. Braa et al. (ibid) see two key factors behind this situation in the case of HISs in developing countries. First, they point to the challenge of making ISs work over time in a local setting - sustainability. This relates to adapting the system to the local context, cultivating learning processes and institutionalizing use. This takes time, and requires continuous attention and actions. Second, they bring to the attention how making an IS work in the particular developing country setting (*sustainability*) requires it to spread also to other sites - *scalability*. This relates to technology, but equally important the 'transfer' of learning processes and skills: *"local interventions need to be part of a larger network to be robust. In short, scalability is a prerequisite – not a luxury – for sustainability of local action."* (ibid p. 341). Braa et al. (ibid) contributes by elaborating how networks are key components to bring sustainability to action research. They point to sustainability as an outcome of institutionalized collective actions, involving a variety of organizational entities. Networks are discussed as relations going beyond the single workplace or organization, and with a focus on how networks facilitate learning; they facilitate the travel of experience and the cultivation and continuous nurturing of local competence and capacity.

The notion of networks of actions proposed by Braa et al. (ibid) has the intention to capture the complex dynamics of networks of routines, technology and learning. But we find this definition of networks of actions analytically problematic as everything can be seen as a part of the network. We concur with its actor-network theory (Latour 2005) inspired focus on the intricate relations between people and technology. But we find the lumping together of actions, people and organizational entities in networks confusing. In organizational studies, structures in terms of individuals and subunits and the relations between them are commonly foregrounded while actions remain in the background (Pentland 1999). This situation can partly be attributed to the strength of the established theories and conceptualizations of organizational entities, and partly to the intangible nature of actions. But as argued by Lindberg and Czarniawska (2006), organizational entities accomplish nothing by themselves, and are no more than stabilized actions. Organizations are only the context of actions, as well as a product of the outcome of actions. We argue that to strengthen our understanding of the sustainability of action research, organizational entities and actions should analytically be distinguished, and actions should be foregrounded. We therefore conceptualise networks of actions as: *the networks necessary for sustainable action research, composed of two, interlinked, types of nodes: actions themselves and the entities (individuals, organisations or organizational units) enabling and performing them.* In this paper, we put a particular focus on *networks* of *actions* and we explore the analytical power of focusing on actions (rather than the entities performing them) and the relationships between actions.

3. EMERGING ISSUES FOR HISP

In this section, we introduce a handful of emergent issues in the HISP network. These issues are in particular related to and relevant for our networks of actions approach.

3.1. From National to a Global Network of Software Development

In 2004, the focus of HISP was primarily on national networks of actions, creating *"opportunities for sharing of experiences, knowledge, technology, and value between the various nodes of experience."* (Braa et al. 2004 p. 341). The processes of garnering political and financial support, information systems development, and training and education were in parallel and independently pursued by the nodes at the time comprising South Africa, Mozambique and India.

Today, the Department of Informatics at the UiO has taken on the primary role of designing the DHIS software. DHIS was initially based on and serving the needs of the health system in South Africa, proving challenging when introduced in Mozambique, India and Vietnam at the turn of the century (Braa and Sahay 2012). As a response to this challenge, the first international version

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

333

was released in 2004 under the name DHIS 1.4. However, the software development team was small, and the architecture of the system did not allow nor support distributed development. With the aim to refactor DHIS on the Java platform and enable distributed software development as with other free and open source (FOSS) projects, the UiO took the lead from 2004. While open source development may be strongly meritocratic and a challenge the 'periphery' in terms of establishing the required capacity to participate, it is still open for and encourages collaboration in a wider network. This is basically because the code, documentation and development process is transparent and openly available[2]. The stable and sustainable software core development process at the UiO has a key role as a capacity enabling and supporting the wider networks of actions.

As a result of opening the development process, several local software teams now work with the code to serve locally relevant use-cases. This flexibility has acted as an impetus to build software development capacities in countries such as India, Vietnam, The Philippines, and Malawi. These regional nodes serve as capacity to further expand the software as well as the network itself. On the one hand, this approach incentives the establishment and operation of local software development teams in the South. These teams are much closer to the users and are thus better positioned to understand and meet local requirements. Further, they can engage in South-South support activities, without the involvement of the North (Oslo). On the other hand, local changes to and extensions of the code may be in conflict with the global code in terms of code conventions and architectural considerations. If local software code is not accepted as relevant beyond the single use-case (globally), it will not become a part of the global core (and be made available for other countries) and may create local problems when a new version of DHIS is released (quarterly). Braa and Sahay (2012) describe one early example of this, when a team in Ethiopia introduced multi-dimensional data elements. This was not taken into the core, and the local DHIS version became a 'fork', incompatible with new releases.

Once the DHIS software was used beyond South-Africa, the challenge of meeting a variety of different user needs became a core focus for HISP. Currently, this challenge of generification – making generic solutions based on local requirements (see e.g. Gizaw 2014) – is not limited to prioritizing different local user requirements, but also prioritizing which local software innovations (based on local user requirements) to include in the core software.

3.2.　From Aggregated Health Indicators to Health Management

DHIS started out as a tool to support the horizontal flow of information and knowledge on the district level, based on functionality supporting collection, aggregation and analysis of aggregated data. Today, there is a strong drive towards integrated information systems in the health systems of developing countries. From focusing solely on aggregate health indicators, DHIS is becoming a component in a larger architecture where it may take on many different roles (Nielsen and Sæbø 2015). For example, there is a need among health managers to aggregate not only health indicators, but at the same time also analyse the availability and use of commodities such as vaccines and HIV test kits. Because of this, there is a pressure on the different actors promoting different systems to not only stay within their domain but also to integrate with or extend their software components across (previous) logical divisions. This necessitate; 1) new domain knowledge, 2) considerations in terms of how to configure software logically, and 3) relating to other software already present in the new domain. It also prompts intricate coordination and design activities, and the various actors involved must relate to and negotiate roles in a field where boundaries are shifting. And a strategy of extending the scope may include losses as well as gains, such as compromising existing functionalities and the way

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[2] See launchpad.net/dhis2

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

334

they are already used. These are central considerations in the architecting activities going on within and around DHIS related to other software such as openLMIS[3] and openMRS[4].

3.3. From a Centralized System to a Platform for Distributed Innovation

HISP is pursuing a strategy to distribute software innovation and development from the core development team and out in the network. This has at least three different motivations. First, the growing network of developers is maturing and has attained the skills to develop high quality software. Second, with the widening in scope mentioned above, the need for in-depth domain knowledge beyond health information systems necessitates additional resources. The central HISP team is small, it takes extensive time and resources to build new domain knowledge, and there is a risk involved in moving away from a particular health information system focus. The strategy of the Oslo team is to focus on the software core and the health information system domain, while other nodes can take a more active role in developing the software into new domains. Third, from the very beginning, the development of DHIS was done centrally by a core software team. HISP is currently supporting capacity building related to DHIS use and advanced configuration and customization in local nodes. On the long term, however, the aim is that the nodes in the South should acquire the capacity not only to configure and customize, but also to take a more central role by driving software innovation. Thus, it makes sense to distribute domain expertise throughout the network.

To increase innovation and development activities outside Oslo and to 'isolate and preserve' the DHIS core, the software itself is also currently being transformed into a platform upon which innovation can happen. Basically, DHIS is flexible for configuration and customization for a range of organizations and use cases. Further, it allows for development of new functionality by 'external' developers through an architecture enabling web apps and an extensive Web-API to allow other systems to access data from DHIS. Apps can also be shared with others in the DHIS App store. As a generic and generative platform, it is currently supporting a wide range of use-cases also beyond the health sector (for example logistics, facility registries and surveys, disease surveillance and health insurance). This approach apparently allows for distributed innovation and promotes a community of developers working in areas that require special features/adaptations. And it acts as an impetus for the wider network to build the required capacity and participate in app development.

3.4. From Local Servers to the Cloud

Initially, DHIS was implemented based on standalone installation at each health facility. Standalone installations require a large maintenance team traveling around to keep all installations functional, virus-free and up-to-date. DHIS is today web-based, and the system is located in 'the cloud', and thus commonly beyond the physical reach of the users (Shaw and Braa 2014). This approach may be challenged by weaknesses in the infrastructure. For example, during pilot testing of DHIS in Kenya in 2010, frequent power outages showed that fixed-line Internet was too unstable. However, mobile phone networks were up and running. Mobile Internet modems were tested with success around the country and by the time the rollout was completed, it was clear that all districts and district hospitals in the country could use the online DHIS. Going from a non-functioning system with major problems of reporting from the districts, Kenya reached about 80 percent data completeness shortly after completing the rollout in October 2011. Triggered by this success and based on extensive knowledge sharing, both Ghana and Uganda used the same approach and were able to complete their mobile Internet based implementation with less time and resources.

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[3] openlmis.org

[4] openmrs.org

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

335

This centralized approach puts a lot of trust and risk on the central server. To deal with the common challenge that the Ministry of Health is not able to host a central server (due to e.g. poor connectivity, lack of proper power back-up, insecure server environment and lack of hosting competency), HISP supports hosting elsewhere, at least as a provisional solution. HISP has in some cases taken the role of configuring and maintaining the server to speed up implementation processes and offer support until local capacity is in place. Hosting can also be offered by conventional virtual server providers Amazon or BAO systems offering DHIS as software as a service[5]. While this acts as an enabler on the short run for developing countries without the capacity for hosting, it will also take away some of the impetus for them to develop such capacity on the longer run.

3.5.   From Nodes of Knowledge to Regional Capacity Nodes

In the beginning, the HISP training activities were limited to the core institutions involved and the countries they operated in (South-Africa, Mozambique, India and Malawi). HISP was made part of local Master courses in for example public health and user training was undertaken in the districts were DHIS was implemented. HISP had a key role in building Master programs integrating informatics and public health in Mozambique, South Africa, Malawi and Tanzania.

Today, HISP supports various Master programs in the South, and a PhD-programme at UiO for students from the South (approximately 30 PhD-students have graduated, and 30 are currently enrolled). In 2010, HISP also established the DHIS Academy. The Academy has since then developed into biannual regional training seminars in West Africa, East Africa, Southern Africa, Asia, and Latin-America. In 2014, a total of 10 Academies were arranged. The academies are dedicated to DHIS implementers and trainers at regional and country level and participants are typical representatives from Ministries of Health, local Universities, donors and NGOs. Academies are intensive training programs with both theoretical/conceptual and practical sessions. The participants learn the principles of the DHIS design and how to set up, configure, customize and maintain DHIS to support their organisation's data collection, analysis, and reporting needs. This is addressed from a technical perspective, providing a better understanding of the available DHIS software tools and their best practices, as well as from the health management side through sessions on data quality and information use. This acknowledges that health professionals skilled in analysing indicators and data quality constitute a necessary ingredient in a health information system. At the Academies, DHIS software experts are also available to guide participants on practical work with their DHIS implementations, e.g. help designing data sets and collection tools, or indicators and reporting outputs (charts, dashboards, maps, pivot tables etc.). Some of the experts and facilitators at the Academies are from the UiO, but primarily they are local experts with long term experience with DHIS and working within health systems. As facilitators, their role is to support knowledge and best practise sharing. In addition to regional Academies, implementation and expert developer Academies are organised and certain NGOs are organising internal Academies for their employees. Further, in 2015, PSI (Public Services International[6]) arranged on their own initiative a DHIS symposium for NGOs in Washington. With 100 participants, this is an example of a network node building capacity and expanding the network on its own initiative. With the main objective to enable participants to share their experiences across countries, the DHIS Academies have a special role in capacity building. Over time, participants become competent to support the implementation and maintenance of the system in their home country. Some participants also establish themselves as trainers at the Academies and actively provide support to neighbouring countries or their region and provide training to others who in turn conduct training of end users. From being managed and financed by Oslo, the academies are increasingly being managed and taught by nodes in the

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[5] See baosystems.com

[6] http://www.world-psi.org/

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

336

South. In this way, the capacity building in the South is becoming networked, based on South-South cooperation and is now more or less self-funded and thus sustainable.

4. HISP AS A GLOBAL ACTION RESEARCH NETWORK

The primary aim of our approach to action research has not changed during the last decade: sustainable improvements of health information systems. However, our approach has transformed along the way as the network has grown and changed to meet emerging new challenges (exemplified in section 3 above). In this section, we describe and discuss these transformations using the framework of action research dimensions by Baskerville and Wood-Harper (1998): primary goals, structure, process and researcher involvement.

4.1. Primary Goals

In 2004, the primary goal of HISP was to: "… design, implement, and sustain HIS following a participatory approach to support local management of health care delivery and information flows in selected health facilities, districts, and provinces, and its further spread within and across developing countries" (Braa et al. 2004, p. 343). These goals were to be achieved through health information systems design, development and implementation; organizational and human resource development; and developing theoretical and practical knowledge about implementing HIS in developing countries.

The HISP network has grown and the nodes have become more diverse. While the HISP team at UiO has a long-term agenda and is focusing on sustainability, other nodes have a more short-term perspective on their contribution to the network. For example, freelancing consultants may prove critical for capacity building and implementation support in countries, but they are usually only involved within the scope of a project. They have very different time-horizons compared to researchers, and their primary motivation is to contribute to the success of projects as well as getting exposed in the network and building their own careers. And consultants are likely to have an interest in making their "clients" dependent on them, in contrast with UiO working actively to establish self-sufficient and independent nodes and a sustainable network through capacity building. Another example is the team working on the core software at UiO becoming professionalized. From initially being based on PhD- and Master-students working part-time with development, it is now based on full-time software developers with the support of students and researchers. Their agenda is to develop and maintain the software at the highest standard and keep at pace with and leverage on the latest technological innovations as well as emerging use-cases and insights developed from research.

There has never been a clear distinction between practitioners and researchers in HISP, and involvement, interest and commitment varies. As a consequence of the recent diversification of roles, academic research is no longer part of all HISP activities and in the mind-set of all participants. And with the global nature of todays' HISP network, the researchers have expanded their focus towards the 'global' challenges in the HISP network. From a core research focus on the nature of local practices, local participatory design and local implementation strategies, the research agenda now also includes global platforms, health systems architectures and generification processes. In sum, the goals of our action research ranges from organizational development, system design, scientific knowledge and training (Baskerville and Wood-Harper 1998).

4.2. Structure

In 2004, the horizontal relations between countries and vertical relations among institutions within these countries composed the important structures for HISP. At the time, the DHIS software, the PhD program at UiO and Master-programs in public health and informatics were the most important tools available for HISP. From a relatively homogeneous, limited and controlled network, HISP is today composed of a variety of different nodes with a variety of

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

337

different relations. It has reached a size and complexity where no one has the full overview and no one have full control. For example, several international donors support the core development of DHIS, its implementation in countries, as well using DHIS to support their in-country operations and therefore also financing software extensions of the core to support their particular needs. They are also using DHIS for internal reporting as well as reporting globally from the countries they operate in. These extensions can be done by developers at UiO, or other software development nodes in the network. And through this, donors typically support particular health programs and particular countries, and take on a key role in influencing both the choice of countries to focus on and the direction of software development. Another example is the now well-established software development and implementation support nodes HISP South Africa and HISP India. Being operated independently from UiO, these nodes take on a range of projects in their respective regions. Yet another example is the freelance consultants and small HISP teams popping up in a variety of countries in the South. While the 'old' horizontal and vertical relations are still there, the current network is much more complex. Rather than being relatively simple relations between country teams and national health and educational institutions, HISP appear today as an ecosystem – comprised of a range of different more or less independent nodes fulfilling a range of different roles in a highly dynamic manner both nationally, regionally and globally. New roles are continuously being established, and roles are shifting between the different actors as the network changes. Through these complex networks, local interventions are supported based on cross-country support, mutual learning and experience sharing. Thus, rather than rigorous, the structure of our action research is highly fluid (Baskerville and Wood-Harper 1998).

An ecosystem is not possible to control, but still possible to nurture and influence to strengthen and change in a certain direction. The DHIS software, the PhD-program and Master-programs and the regional Academies play a crucial role in this. At the same time, changing the DHIS software into a platform will further empower nodes to innovate but also reduce the control of the team at UiO. The PhD- and the Master-programs build local capacity and link research and practice. Through implementation projects, practitioners are identified and recruited to become PhD-students. They bring with them their practical know-how into academia, and become key local nodes in the network after they graduate. In addition to software and academic education, the Academies play a crucial complementary role. While the Academy is an intensive training program with both theoretical/conceptual sessions, it is not academic. It is a regional and global meeting place for practitioners such as information officers from Ministries of Health, trainers from districts, freelance consultants, NGO based DHIS implementers, donors etc. It is an arena where experiences and best practices are shared; where new software features are introduced; where new use-cases presented and discussed; where newcomers are brought up to speed; and where more advanced customization, analysis and information use practices are introduced. It is a key institution to nurture the networks of actions and maintain the sustainability of local DHIS implementation and HISP as such. And it is an excellent example of the networked nature of HISP.

4.3. Process

HISP consider strong health information systems as the outcome of a range of long-term and simultaneous processes, including software development, training, and garnering political and financial support. And through the last decade, we have seen what long-term means. For example, the implementation of DHIS broke down in Mozambique in 2007 after almost 10 years of involvement, due to political reasons and the initiative has only recently been picked up again. And HISP India has managed to build capacity and implement DHIS in multiple states, but after 15 years, they are not (yet) at a national level.

Today, the global nature of HISP adds another layer of processes. Not only are software development, training and support dealt with nationally, but also regionally and globally. For

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

338

example, in 2012 the integration of health information systems was identified by WAHO (West African Health Organisation) as a key challenge in all 15 ECOWAS (Economic Community of West African States) countries, arising from technical and institutional conditions. Institutional conditions included struggles with vertical and fragmented donor-supported health information systems, and technical issues malfunctioning and the existence of inflexible software which could not interface with other software. Based on a regional assessment of the HIS in West Africa by HISP, 8 objectives across three categories (policies and resources, systems development within an integrated framework, and information use and dissemination) were identified by ECOWAS as the pillars of their HIS policy, with a set of implementation strategies provided for each objective. In 2012, DHIS was selected as a regional data warehouse, a shared list of indicators for reporting from 15 countries developed and agreed, and a test database was developed. The regional data warehouse functions as a health observatory, containing online data analytics down to district level or equivalent across the whole region. This approach was later adopted by EAC (East African Community). Thus, the research focus has expanded from the local to national, regional and global networks. The approach is on the one hand iterative, on the other hand reflective taking into account new needs and challenges and addressing them (Baskerville and Wood-Harper 1998) and thus further expanding the network.

4.4. Researcher Involvement

Braa et al. (2004) described the multiple roles of researchers in HISP to be supervision, training, system design, mobilizing support and generating funding. And all this was based on a reasonably alignment with the Ministry of Health in the country of implementation. The multiple roles of HISP researchers are still the same. And aligning with Ministries of Health in implementation processes is crucial. But again, as HISP has become a global network, these processes are not only on the national level but also regionally and globally. For example, significant efforts are put into engaging and working with international donors. As a consequence, not only do the researchers need to be aligned with Ministries of Health, but also with global donors. And with the established network of local and regional nodes, strongly supported by South-South best practice sharing at the regional Academies, local implementation projects are no longer dependent on the University of Oslo for support. Instead, HISP in Oslo can for example focus on the global arena and on providing support to new and unexplored use-cases. For example, the recent outbreak of ebola in West-Africa triggered a rapid response from HISP by customizing DHIS to improve the quality of information on positive cases and reduce the number of parallel systems. In sum, HISP and the involved researchers are active in many ways, including collaborative, facilitative and as experts (Baskerville and Wood-Harper 1998).

HISP has changes substantively since Braa et al. (2004) published their paper. In particular, it has expanded from a few national networks and into distributed and heterogeneous capacities and multiple nodes and networks including South-South collaboration and regional leadership. This has only been possible through active engagement in building and supporting the development of sustainable networks of actions.

5. DISCUSSION AND IMPLICATIONS FOR ACTION RESEARCH

The IS field has not properly addressed the lack of sustainability in action research projects (Braa et al. 2004). And the networks of actions approach has not been widely taken up in other action research projects within IS and development such as for example Kleine et al. 2012 and Carte et al. 2011. But any research with a development aim cannot overlook sustainability. And in developing countries, 'pilot oriented' action research will not only result in passing changes, but also add to the excess and burden of technology pilot projects.

It is the sum of a range of activities performed by a great variety of organizations that have facilitated the spread of DHIS into more than 45 countries and its implementation and sustenance as national standards in 15. One of the most prominent changes for HISP during the

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

339

last decade is the evolution from a small collection of rather fragmented national projects into a global project. The focus has expanded from local implementation projects to also include supporting regional entities and driving global processes such as generification. HISP has become a network of entities performing a variety of actions which together forms a sustainable eco-system. This eco-system can be traced back to a chain of actions involving capacity building, knowledge sharing, the encouragement of new entities to be established and to join (and the way they are embraced), and the creation of capacity and opportunities for new entities. New entities have joined the network over time, and the role of the various entities and the actions they perform is shifting continuously and dynamically.

In this paper, we have described some of the prominent emerging issues for HISP and how we have dealt with them through our approach of networks of actions. We believe that an understanding of the actions involved in HISP should be useful for other action research projects in developing countries. At the same time, we find it difficult to pinpoint the most important actions, and we must acknowledge that different actions are necessary in different contexts and at different points in time. At the same time, we believe visualizing and representing networks of actions graphically facilitates discussions, it gives an overview over what it takes and enables the identification of key actions and entities in the network. We make an attempt to do this in the table 1 below, summarizing many of the involved entities and the actions they perform. For the sake of simplicity, not all of the entities are broken down to the finest granularity (the individual). We also illustrate the relationships and dependencies between the different actions in an exemplary case of implementing DHIS in a typical country in figure 1 below. Again, this is a simplified and rather static depiction where we only illustrate certain relationships between certain actions. At the same time, it illustrates typical nodes in a network of actions necessarily for DHIS to sustain and how they are related to regional and global networks.

Entities	Actions
University of Oslo	Academic research, strategizing, software development, prioritizing requirements for generification, coordinating software development, demonstrations, piloting, engaging countries and donors, generating funding, facilitating Academies and related knowledge sharing, develop and participate in Master programs in the South, offer PhD-program, provide API's, integrate with other software etc.
Developer nodes in the South	Software development, explore new domains
Implementation nodes in the South	Local and regional implementation support
Software providers (e.g. openLMIS)	Offer complementary functionality, integration with DHIS
Ministries of Health in the South	Training, implementation, knowledge sharing, data use in management
Regional health organizations	Facilitate the establishment of regional standards and regional implementations of DHIS
Universities in the South	Offer Master programs, participate in implementation projects
Independent consultants	Implementation and software development support, training
Academy trainers	Facilitating learning and knowledge sharing
Hosting partners	Virtual server provision or DHIS as software as a service
Health workers	Participate in training and use DHIS

Table 1 HISP Networks of Actions

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

340
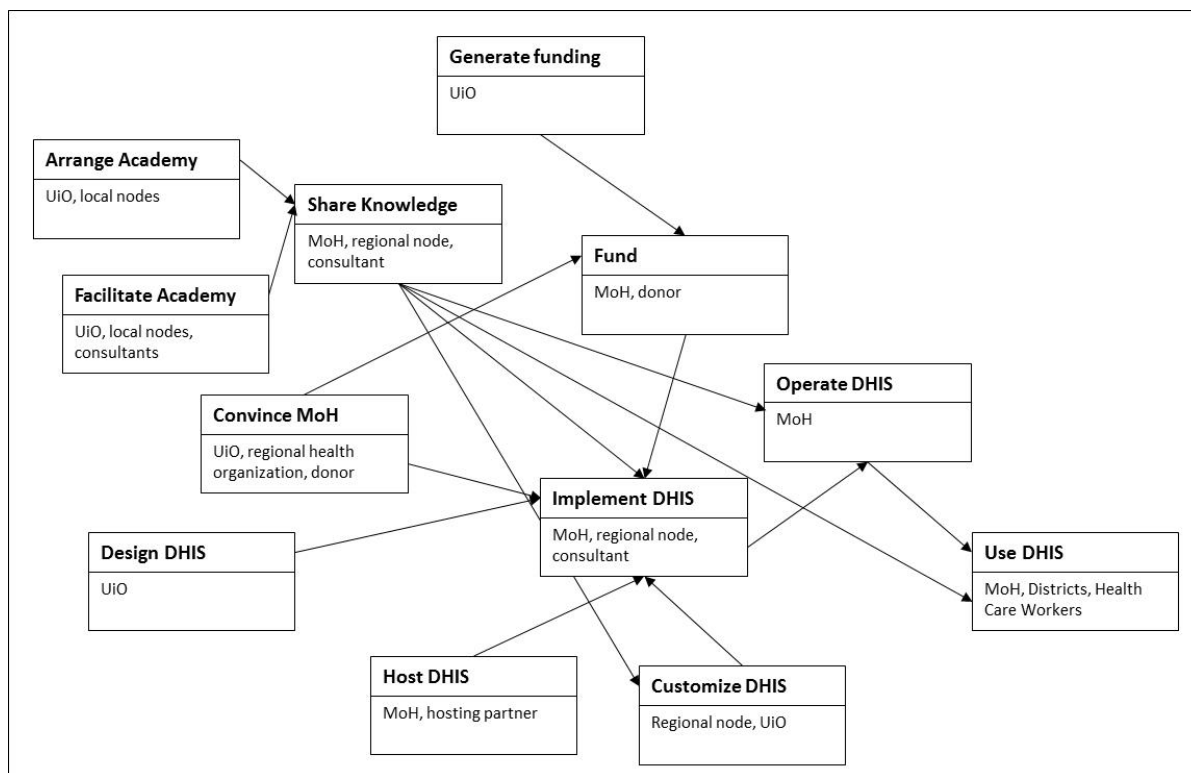
Figure 1 Networks of Actions in a Typical Country (actions in bold)

We find analytically differentiating between different types of nodes into the categories of entities and actions beneficial. First, it is a way to remove some of the clutter when conceptualising and trying to understand networks. Second, it decouples entities and actions and thus enables a more dynamic perspective showing the relationship between different actions and how actions are unfolding outside and across different organizations. Third, concurring with the action net perspective (Czarniawska, 2004), it enables us to put actions as our first and prime focus, and organizational entities second. The sustainability of HISP and DHIS implementations hinges on actions, and usually not which entity that actually performs the action. And finally, it offers us a tool to represent networks of actions graphically to facilitate discussion, a better overview and identify key critical entities and actions (in our example, we would argue arrange academies, design DHIS and knowledge sharing).

Our networks of actions approach has shown successful in terms of sustainability. A key learning from this is that sustainability can be built on networks of actions. Thus, action research projects should appreciate and make an effort to understand the necessary actions for sustainability, the relations between actions and build the required capacity in the entities which can perform them. In the case of HISP, the network has expanded from local and national actions to also include regional and global actions. Improving the understanding of and influencing these networks can be supported by analytically illustrating the actions and the involved nodes as illustrated in figure 1 above. This would be in stark contrast to more technology oriented depictions of HISP and DHIS, typically focusing on the (important, but not sufficient) properties of the software. This perspective should also be relevant in other domains than public health when doing action research for sustainable development.

6. REFERENCES

Avison, D., Lau, F., Myers, M. and Nielsen, P. (1999). Action Research, Communications of the ACM 42(1): 94-97.

Baskerville, R., and Wood-Harper, A. T. (1998). Diversity in Action Research Methods, European Journal of Information Systems (7:2), pp. 90-107.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

341

Baskerville, R. (1999). Investigating Information Systems with Action Research, Journal of the Association of Information Systems, Volume 2, Article 19

Braa, J., Monteiro, E. and Sahay, S. (2004). Networks of Action: Sustainable Health Information Systems Across Developing Countries, Management Information Systems Quarterly, 2004, 28(3)

Braa, J and Sahay, S. (2012). Integrated Health Information Architecture: Power to the Users, Matrix Publishers, New Delhi

Carte, T., Dharmasiri, A. and Perera, T. (2011). Building IT capabilities: learning by doing, Information Technology for Development, 17:4, 289-305

Checkland, P. (1981). Systems Thinking, Systems Practice, Chichester, UK: J. Wiley

Checkland, P. and S. Holwell (1998). Action Research: Its Nature and Validity, Systemic Practice and Action Research 11(1): 9- 21

Choudrie, J. and Harindranath, G. (2011). Analyzing 'IS in Developing Countries' Research: A Bibliometric Study, In Proceedings of the 11th International Conference on Social Implications of Computers in Developing Countries, Kathmandu, Nepal, May 2011

Czarniawska, B. (2004). One Time, Space, and Action Nets. Organization, 11:6, Pp 773-791

Gizaw, A. (2014). Open Generification: The case of District Health Information Software, PhD-Thesis, University of Oslo

Kleine D., Light, A. & Montero, M-J. (2012). Signifiers of the life we value? – considering human development, technologies and Fair Trade from the perspective of the capabilities approach, Information Technology for Development, 18:1, 42-60

Kuipers, P., Humphreys, J., Wakerman, J., Wells, R., Jones, J., and Entwistle, P. (2008). Collaborative review of pilot projects to inform policy: A methodological remedy for pilotitis?, Australia and New Zealand Health Policy, 5(1): 17.

Latour, B. (2005). Reassembling the Social: An Introduction to Actor–Network Theory, Oxford ; New York, Oxford: University Press

Lindberg, K. and Czarniawska, B. (2006). Knotting the action net, or organizing between organizations. Scandinavian Journal of Management, 22. Pp. 292-306

Mumford, E. and Weir, M. (1979). Computer Systems Work Design: The ETHICS Method, London: Associated Business Press.

Nielsen, P. and Sæbø, J. (2015). Three Strategies for Functional Architecting: Cases from the Health Systems of Developing Countries. Accepted for Publication in Information Technology for Development

Pentland, B. (1999). Organizations as Networks of Action, In Baum, J. A., & McKelvey, B. (Eds.). Variations in organization science: In honor of Donald T. Campbell. Thousand Oaks, CA: SAGE Publications, Inc

Shaw, V. and Braa, J. (2014). Approaches to Participatory Design in Africa in the Age of Cloud Computing, PDC '14, October 06 - 10 2014, Windhoek, Namibia

Sæbø, J. (2013). Global Scaling of Health Information Infrastructures: Circulating Translations, PhD-thesis, University of Oslo

Walsham, G. (1993). Interpreting Information Systems in Organizations, Chichester: Wiley.

Walsham, G. (1995). Interpretive Case Studies in IS Research: Nature and Method, European Journal of Information Systems, 4:2 74-81.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

342

WHO. (2009). Systems Thinking for Health Systems Strengthening. Flagship report edited by Don de Savigny and Taghreed Adam

WHO. (2005). Countries need better information to receive development aid, Bulletin of the World Health Organization August 2005, 83 (8)

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

343

OPEN-SOURCE HARDWARE TECHNOLOGIES FOR E-WASTE RECYCLING

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Abstract: Workers involved in e-waste recycling buy materials to extract and resell the valuable parts but suffer health hazards in the process due to inappropriate recycling techniques. An example of this is the scrap yard in Agbogbloshie, Accra, an e-waste processing site known for cable burning. An intervention based on an open source appropriate tool is proposed and piloted. It consists of a pedal-powered cable shredder, designed for low cost of production, high local repairability, and open source licensed. It has been assembled and tested in partnership with a local Makerspace (the Agbogbloshie Makerspace Platform, AMP), which takes ownership of the device for further testing and implementation. In order to succeed, the shredder needs to provide better economic returns than burning and be operated by current cable burners. Other interventions in the area are based on closed technologies, laying out the question of how performances based on open and non-open philosophies compare to each other. E-waste should be considered within the ICT4D realm as it is an inescapable social and environmental consequence of its use.

1. THE E-WASTE PROBLEM AND AGBOGBLOSHIE, GHANA

Electronic components are discarded increasingly often as obsolescence is being built into them. The amount of discarded electronics is foreseen to increase globally, while the recycling capacity is not keeping pace (Yu et al. 2010). E-waste contains several toxic materials, which makes old computers be considered toxic waste. Usually the way in which they are dismantled is what generates the hazard (Seager et al. 2012). For instance: burning cables to recover copper produces toxins and liberates brominated flame retardants (Prakash et al. 2010). Toxic waste regulations include an international agreement: the Basel Convention. Although it has not stopped international e-waste trade, it has strongly influenced legislation like the European Directive on WEEE (Waste Electrical and Electronic Equipment) that renders illegal e-waste exports to countries without recycling capacity.

In Ghana, a receiver of international e-waste, a processing industry compliant with environmental standards does not exist yet. The so called "formal sector" is in its infancy as enterprises look for good business models, while the individuals in the "informal sector" dominate the business, being more flexible to buy and process e-waste with techniques often harmful to the environment and their own health (Grant & Oteng-Ababio 2012). In general, the recycling infrastructure in Ghana is weak (Manhart 2014).

The neighbourhood of Agbogbloshie, in Accra, Ghana (Figure 1), has earned a name both in the academic literature and in the popular media as one of the most polluted places on Earth. Once a green area, the scrap yard processes today a large amount of waste materials including toxic ones. One particular waste stream attracts the most attention, that of electrical and electronic waste, or "e-waste" (Amoyaw-Osei 2011). Agbogbloshie is home to 80.000 people, a great

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

344

amount of them Dagomba people and muslims. Many arrived from the Northern Region due to tribal conflicts in the 1990's. Nowadays the migration continues due to the harsh times in Tamale and surroundings, and the support to the new migrants by the Dagomba community already established in Agbogbloshie (COHRE 2004).

2. THE ENVIRONMENTAL JUSTICE APPROACH

The situation of Agbogbloshie has been claimed to be an environmental injustice, the reason being linked to the exploitative nature of the international e-waste trade (Puckett 2006). Environmental injustice happens when some human group suffers environmental risks or hazards disproportionately more than others (Iles 2004). Some countries, like Ghana, receive more e-waste than others and suffer hazardous and polluting activities (Breivik et al. 2014). The narrative about Agbogbloshie in the media usually focuses on those most affected by this activity: the young workers that burn cables to extract copper (Dannoritzer 2014).

Figure 1: The maps show Accra within Ghana and Agbogbloshie within Accra

(Source: Wikipedia & OpenStreetMaps)

One solution proposed consists on prohibiting e-waste exports from more industrialised countries to less industrialised ones, which are less likely to have proper recycling capacity. This approach is based on considering the e-waste trade as "the problem" generating the global environmental injustice (Puckett 2006). However, the Basel Convention has been unable to stop a market very complex geographically (Lepawsky 2014). On top of that, second-hand computers exports are accepted and considered beneficial for the receiving countries as it gives them affordable access. These computers, although imported legally, will also become e-waste sooner or later.

This work explores a different narrative, based on acknowledging that e-waste processing generates an important income for the local population (Oteng-Ababio 2012), and on considering Agbogbloshie as an industrial area: a large (and dirty) open-air workshop. Beside the cable burning there are many other activities related with disassembling of computers, refrigerators and cars which are not usually covered by the documentaries (an exception is Guardiola 2012). Documentaries often appeal to Western responsibility not to dump waste in Agbogbloshie. However, e-waste is not dumped, but bought by the own workers, who process it and sell it afterwards.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

345

Therefore instead of focusing on international e-waste trade, it is proposed to reframe the environmental injustice argument around the lack of appropriate tools to take advantage of the potentially recyclable material and profitable opportunities that this trade represents. In particular, instead of referring only to the access to tools themselves, the focus is set on the open-source ones, that can potentially be modified and improved by the workers themselves, by similar workers in other places in the world where e-waste is also processed, and by a global network of collaborators. Risks could then be mitigated by increasing informal workers' choices by making available less polluting methods.

3. THE PEDAL-POWERED CABLE SHREDDER: "E-SOURCE"

Based on this new definition of environmental justice, a pedal-powered cable shredder was deployed and tested in Agbgobloshie in June and July 2014. An open source project, their designers have made explicit that the prototype is open to be modified, improved and adapted to the users' needs, and have offered their personal help to do so. It is low-cost, designed to be replicated locally, and to work in low-resource environments.

It is called "E-source", an antagony to the term "e-waste". Designed by Hal Watts, a London-based designer, it is a shredder attached to a bicycle. It reduces cables to tiny bits, separating plastic by flotation (Watts 2012) and therefore providing an alternative to cable burning. A second, improved version (Figure 2) was taken to Accra.

By pedalling, three different components are activated: the shredder, the water pump, and the separation bed. The small bits are filtered down to the separator, where a regulable amount of water makes plastic float. The bed is pushed forward and backwards, making plastic slip forward, while copper jumps backwards.

E-source can potentially reinforce the informal sector. Shredding is considered a "best applicable technique" (Prakash et al. 2010). It can be considered as well a *"suitable engineering design"* being therefore key for the improvement of informal techniques (Chi et al. 2011). Contrary to other setups, E-source does not need economies of scale to be successful (Schluep et al. 2013), as it works at the minimum scale possible. Finally, a preliminary analysis of E-source's characteristics, pairing them with the attributes of innovative technologies (Schluep et al. 2009), yields a good match in many aspects: low net costs, low capital costs, low use of electricity, low use of freshwater, and low health and safety impact, among others. These aspects need to be substained by further research.
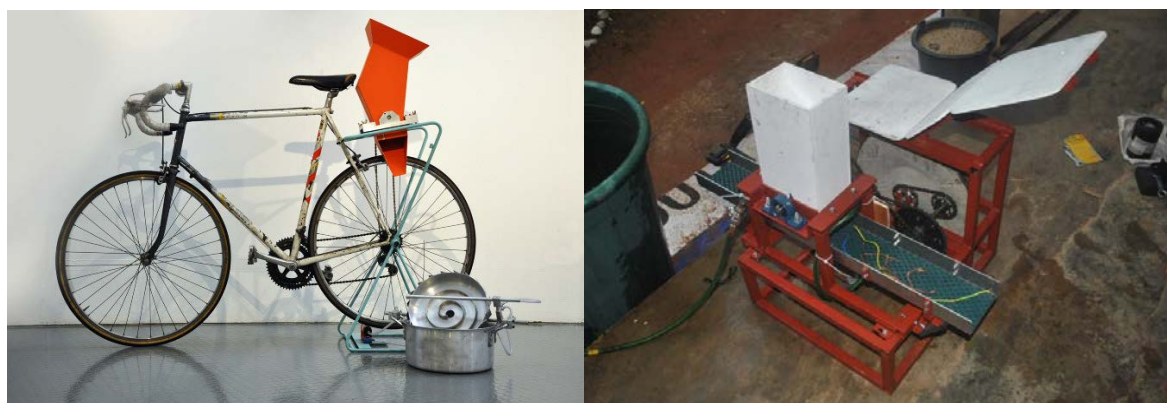
**Figure 2: E-source pedal-powered cable shredder: version 1 (left) and version 2 (right).
Source: Hal Watts and AMP.**

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

346

4. A HUB FOR OPEN TOOLS: THE MAKERSPACE

Agbogbloshie workers use basic tools (Grant & Oteng-Ababio 2012), which provide a solid ground for an intervention based in them and collaborative making, and renders a "makerspace" a suitable space to study. A makerspace is a communal workshop. It contains a set of tools and it is open to the public to carry out their own projects using them, engaging with each other in a culture of collaboration and sharing (Britton 2012), as "openness" is linked to the Makerspaces' philosophy. The Maker movement is about individuals taking ownership over some means of production (Anderson 2012), and applying to the physical world a democratising approach similar to what open source has given to software production. It is common to find open hardware projects in Makerspaces, e.g. Arduino-based ones (Seravalli 2012).　There is an entrepreneurial spirit embedded in the Makerspaces. They are a bottom-up, cost-effective approach to business making.

The Agbgobloshie Makerspace Platform (AMP) is a local Makerspace in the process of being set up. Officially running for longer than one year it is currently building their home space inside the Agbogbloshie scrap yard. They actively involve both Ghanaian STEAM students (Science, Technology, Engineering, Mathematics, and also Arts) and local scrap dealers in their activities.

5. WHAT HAS BEEN DONE SO FAR

The designers in London were linked to a suitable host for the machine in Accra: AMP. The shredder was taken by plane and assembled with help from engineering students from the Kwame Nkrumah University of Science and Technology (KNUST), Daniel Adu and Lolo Atanleyo, both members of a student organisation promoting innovation and science called "Creativity Group".

The machine underwent a small number of fixes and improvements. A holder, broken during last-minute tests in London, was fixed according to the remote instructions of the designers. The transmission to the shredder was not optimal, and it was suggested to drill a new hole in the shaft to improve it. This fix was performed by a local workshop in Agbogbloshie. Cables of various types were bought in the scrap yard in order to test the machine under real conditions (computer, photocopier, electrical and car cables). The feeder was modified in order to achieve a better shredding.　However, it was not possible during this limited time to fix one chain that kept coming off when pedalling at high speed. E-source has now become one more tool for AMP who will take care of finishing it, testing it, and deploying it in Agbogbloshie, thereby combining the support from the designers in Europe with the local maker efforts.

These alterations during preliminary testing were useful for the team to gain ownership of it. Other suggestions were done during this process, including ideas for a new, more modular version of the tool, that would allow to replace some parts: an engine instead of the pedals, a gearbox instead of the chains, or a bigger shredder instead of the current one.

The local capacity has proved enough to ensure that the cable shredder can function well. Local workshops can repair and build parts for it, knowledgeable engineering students can teach to others how the machine works, and there will be a space for making inside Agbogbloshie where design and testing operations can be carried out. Not only the technology seems appropriate, but the environment around it too.

The collaboration established with the engineering students from Creativity Group is starting to develop. Their first mission in Agbogbloshie in cooperation with the author and AMP took place in February 2015, and it is planned to continue during the year.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

347

5.1. Limitations

This experiment has several limitations and leaves many questions open. To start with, not all the cables can be shredded using E-source. There is a maximum diameter allowed, and those cables too thick would still need to be processed elsewhere.

The speed of processing is also an issue, as fire seems to be much faster than shredding. There are several aspects that delay the shredding process, mainly the unbundling of the cables, and the removal of plastic impurities. A slower method could nevertheless be taken up if it provided a proportionally higher income. This extra income could come from new demand for plastic saved from the fire. The potential impact of the tool needs to be further analysed based on those two interrelated aspects: time required and income generation, taking into account the higher price of unburnt copper and the different plastics suitable to be sold.

Introducing a new tool needs to take into account the social conditions of the place. At the moment the burning is carried out by the youngest there: the cable burners. If scrap dealers find a way to process cables themselves, they might do without anyone else. E-source needs therefore to be made first available to the cable burners.

Publishing and licensing the tool is also problematic. It is unclear which tool to use to share an open hardware design. Sites that provide a hosting service for open source software projects are not suited for hardware.

It is worth noting that other projects aiming at solving cable burning through different approaches are also in place, and questioning how this intervention compares to them can be relevant. The NGO Blacksmith Institute has raised funds to set up a station in Agbogbloshie that contains several electrical cable strippers (Blacksmith Institute 2014). These are machines bought off-the-shelf, closed technologies, in contrast with the open nature of the shredder suitable to be built and modified in place. While the strippers are powered by electricity, the shredder is pedal-powered. How their respective performances compare is an open question, as well as to which group in Agbogbloshie they are aimed at (scrap dealers or cable burners).

6. CONCLUSIONS

There are several aspects that converge in order to make this project possible: the creation of a low-cost prototype appropriate for the place; its availability as an open tool; the interest of the designer to have it tested under real conditions; the welcoming of a group interested in the project such as AMP; and the implication of a students organisation with technical skills such as Creativity Group.

Openness has created trust and therefore allowed the collaboration of different people that did not know each other before. It has facilitated the incorporation of different groups of people to the project (e.g. the engineering students) and the appropriation of the tool by them. It has triggered discussions on how to modify and improve the current design. Everything that has been presented here has been possible because of the open nature of the device.

The testing of the tool has been useful to identify challenges and limitations. The cable shredder needs to prove that it can compete with fire, by providing more attractive returns. The question of how to publish effectively an open-source hardware project remains open. The comparison between this project and others in place that do not have an open philosophy is a potential future line of research.

In summary, this paper presents a model to tackle problems generated by e-waste based on shifting the environmental injustice argument to one based on the lack of tools. And it engages in providing such tools from an open philosophy, and in cooperation with the local initatives. Future work along these lines offers an exciting potential to contribute to solving the e-waste problem.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

348

7. REFERENCES

Amoyaw-Osei, Y., Opoku Agyekum, O., Pwamang, J. A., Mueller, E., Fasko, R., & Schluep, M. (2011). *Ghana e-waste country assessment*. SBC e-waste Africa Project, 111.

Anderson, C. (2012). *Makers: the new industrial revolution*. Random House.

Blacksmith Institute (2014). Top ten countries turning the corner on toxic pollution. Blacksmith Institute. Available at: http://www.worstpolluted.org/2014-report.html

Breivik, K., Armitage, J. M., Wania, F., & Jones, K. C. (2014). Tracking the global generation and exports of e-waste. Do existing estimates add up?. *Environmental science & technology*.

Britton, L. (2012). A Fabulous Laboratory: The Makerspace at the Fayetteville Free Library. *Public Libraries*, 51, 30-33.

Chi, X., Streicher-Porte, M., Wang, M. Y., & Reuter, M. A. (2011). Informal electronic waste recycling: A sector review with special focus on China. *Waste Management*, 31(4), 731-742.

COHRE (2004). *A Precarious Future: The Informal Settlement of Agbogbloshie, Accra, Ghana*. Centre on housing rights and evictions (COHRE).

Dannoritzer, C. (Writer and Director). (2014). *The e-waste tragedy* [Documentary]. Germany.

Grant, R., & Oteng-Ababio, M. (2012). Mapping the Invisible and Real" African" Economy: Urban E-Waste Circuitry. *Urban Geography*, 33(1), 1-21.

Guardiola, J.A. (Director). (2012). *Ciberbasura sin fronteras*. [Documentary]. Spain.

Iles, A. (2004). Mapping environmental justice in technology flows: Computer waste impacts in Asia. *Global Environmental Politics*, 4(4), 76-107.

Lepawsky, J. (2014). The changing geography of global trade in electronic discards: time to rethink the e-waste problem. *The Geographical Journal*.

Manhart, A. (2014). *Status of the Project Best of two Worlds Activities and Results in Ghana*.

[Presentation].

Oteng-Ababio, M. (2012). When Necessity Begets Ingenuity: E-Waste Scavenging as a Livelihood Strategy in Accra, Ghana. *African Studies Quarterly*, 13, 1-21.

Prakash, S., Manhart, A., Amoyaw-Osei, Y., & Agyekum, O. O. (2010). *Socio-economic assessment and feasibility study on sustainable e-waste management in Ghana*. Öko-Institut eV in cooperation with Ghana Environmental Protection Agency (EPA) & Green Advocacy Ghana, Ministry of Housing, Spatial Planning and the Environment, VROM-Inspectorate.

Puckett, J. (2006). *'High-tech's dirty little secret: the economics and ethics of the electronic waste trade.'*, in Smith, T., Sonnenfeld, D. A., & Pellow, D. N. (Eds.). *Challenging the chip: Labor rights and environmental justice in the global electronics industry*. Temple University Press, pp. 225-233.

Schluep M., et al. (2009). *Recycling: from E-waste to Resources*. UNEP and United Nations University.

Schluep, M., Müller, E., Hilty, L. M., Ott, D., Widmer, R., & Böni, H. (2013). Insights from a decade of development cooperation in e-waste management. *Information and Communication Technologies*, 45.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

349

Seager, D., Hieronymi, K., McIntrye, K., Guilcher, H., & van Rensburg, R. J. (2012). Producer responsibility when WEEE has a value. *Electronics Goes Green 2012+(EGG)*, 2012 (pp. 1-6). IEEE.

Seravalli, A. (2012). Infrastructuring for opening production, from participatory design to participatory making?. *Proceedings of the 12th Participatory Design Conference: Exploratory Papers, Workshop Descriptions, Industry Cases-Volume 2* (pp. 53-56). ACM.

Watts, H. (2012) - *Esource: An entrepreneurial approach to sustainable electrical-wire recycling systems for Ghana*. Unpublished Master Thesis. Royal College of Arts, London.

Yu, J., Williams, E., Ju, M., & Yang, Y. (2010). Forecasting global generation of obsolete personal computers. *Environmental science & technology,* 44(9), 3232-3237.

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Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

350

A CITIZEN-CENTRIC FRAMEWORK FOR ICTE CAPACITY DEVELOPMENT IN HAITI

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Abstract: This research aims to identify and address challenges of capacity building required to facilitate technological access, information literacy and computer familiarity among students, young adults and teachers in Haiti. To achieve this objective, we use a pluralist methodology that combines qualitative, quantitative, and design science research methods. A citizen-centric framework is adapted for Information and Communication Technologies for Education (ICTE) capacity building. Qualitative research methods were used to guide contextually grounded and user-focused design. Design science approach was used to develop three low-cost adaptable ICTE artifacts: sustainable computing platform, Computer on a Stick (COS), and teacher workstation with Internet in a Box (IIAB). The ICTE solutions were installed at six different sites in the impoverished Centre province in Haiti. The citizen-centric approach presented in this paper addresses a crucial research gap by providing a design framework for ICTE capacity development in resource poor countries.

Keywords: ICT for Education, ICTE, citizen-centric framework, Computer on a Stick (COS), Internet in a Box (IIAB), capacity development.

1. INTRODUCTION

The inability of the Haitian education system to empower students and young adults to participate in the digital economy is alarming. Haiti is one of the poorest nations in the world with more than half the population living in acute poverty (less than US $1 per day) (Gibson, Bowles, Jansen, & Leach, 2013). The country is categorized with 'extreme human suffering'. The devastating earthquake in 2010 ravaged Haiti, leaving an estimated 220,500 persons dead, 500,000 homeless, and at its peak displacing almost 2.3 million people (Brown, Ripp, & Kazura, 2012). The cataclysm exacerbated many pre-existing challenges, gravely threatening the livelihood of an already vulnerable population, and distressing fragile outcomes of service delivery and human development (The World Bank, 2012). The combined consequence of poverty, corruption, vulnerability to natural disasters, and low levels of education impedes the economic growth of Haiti (CIA, 2013).

As a country left behind, desperately poor, and lacking in basic infrastructure of a functioning State, Haiti's need to educate the growing population of students is at a critical high. Although the constitution mandates free public education at all levels, government initiatives have severely fallen short in attaining its educational goals. While the net attendance in primary school was close to 77% in 2013, secondary school participation was less than 30% (UNICEF, 2013). Grade repetition rates are particularly high, leading to over-aged students (67% of children are over-aged in 1st grade and 91% by 6th grade) in already overcrowded classrooms (Suzata, 2011). There is a pervasive lack of learning materials and resources to support teaching in schools resulting in students learning on the bare minimum. The quality of education is low

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

351

because the number of instructors (only 15% are qualified teachers) is not sufficient to meet classroom needs (GTEF, 2010). Most Haitian teachers are those who have just finished grade school and returned to teach what they learned. Although today's global economy is driven by the digital age, the majority of the country do not know what it is to use a computer. The country is pressed to improve its basic level of technology skills and computer literacy.

In many ways, Haiti falls short in preparing its young adults for the technology skills and knowledge needed in the 21st century. With little access to computing resources and digital information content, young Haitians are unable to develop the technological literacy and familiarity required to participate in the digital economy or obtain jobs that may bring them and their family out of poverty. Students, as well as teachers are deprived of a satisfactory education, especially in subject areas of science and technology. The existing education system has not succeeded in finding effective ways to encourage the uninitiated and transform learning to productive skills.

The role of Information and Communication Technology (ICT) in improving the quality and access to education is well recognized (Bonnah Nkansah & Unwin, 2010; Gudmundsdottir, 2010). ICT for Education (ICTE) facilitates the acquisition of basic technological skills such as computer literacy and numeracy (Romeo & Walker, 2002), while simultaneously contributing to poverty reduction and human development (Bonnah Nkansah & Unwin, 2010). In Haiti, the development of ICTE and the diffusion of technological literacy remain at the periphery of educational priorities.

This research aims to understand challenges of capacity building required to facilitate technological competency among students, young adults and teachers in Haiti. Specifically, the study seeks to understand the role of ICTE in facilitating technological access, computer familiarity and information literacy among young Haitians. Through a process of representative user involvement, the study identifies value creation factors that are essential to building ICTE artifacts. This research is not a study on scholastic achievements from the use of ICTE or open source software. Rather, it investigates the development of ICTE solutions that afford easy access to computing technology, achieve modest level of computer familiarity, and sustain interests in computer literacy among young Haitians who are unfamiliar with the technology.

The study targets three objectives. The first objective is to assess the community needs and challenges. Identifying the needs and analyzing the challenges are essential to determine feasible technology options to achieve educational goals of the target community. The second objective is to develop ICTE solutions that advance the short-term goal of preparing the Haitians with technology familiarity, and the long-term goal of improving computer proficiency. The third objective is to elucidate findings that may benefit similar endeavors in other resource poor countries. To address these research objectives, we undertake an elaborate study involving schools at six different locations in the Centre province, Haiti's impoverished central plateau.

The rest of the paper is organized as follows. First, we provide a review of literature on ICTE in resource poor countries, and background on the six locations in Centre province where the study was conducted. We then present our research approach that adopts a pluralist methodology. A citizen-centric framework for ICTE capacity development guides the design of three low-cost adaptable ICTE solutions. A discussion of ICTE challenges, the role of ICT research and innovation, and considerations for utilizing the citizen-centric approach for capacity development is then provided. The paper concludes by discussing future directions of the research project.

2. ICTE IN RESOURCE POOR COUNTRIES

Benefits of using ICT in educational development are widely recognized, as almost every government around world believes that technology and education are key to competitive advantage and economic growth (Selinger, 2009). The rapid development of ICT has changed

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

352

the traditional educational process dramatically (Pulkkinen, 2007). ICT covers a comprehensive range of technologies such as network communications, computer hardware and software, broadcasting technologies (radio, DVDs, televisions), and telephones. Applying these technologies in an educational setting to deliver teaching and learning is referred as ICTE (Khan, Hossain, Hasan, & Clement, 2012). The power and capability of ICTE offer a transformational learning environment that promotes lifelong learning of students (Voogt, 2003). Past research has indicated that implementation of ICTE not only supports education in schools, but also provides non-formal education to children or adults outside of schools (Hattie, 2013).

Introducing ITCE in poor and marginalized areas can have great impacts on learning outcomes because it has the potential to compensate for poorer quality of teaching (Selinger, 2009). Unfortunately, the technology push in developing countries, especially in rural areas, has not achieved prevalent levels as it has in developed countries (Mansell & Wehn, 1998). In addition, most research efforts in ICTE for developing countries are framed in theory and contextual factors of ICTE development and adoption. Below we summarize prior literature that provides the contextual basis for our study.

Lack of electric power is often a critical factor that impacts development initiatives in many rural areas of developing countries (Rusten & Ramirez, 2003). Electricity is an essential prerequisite for deploying ICTE solutions. Extremely low literacy rates in these areas posit another major challenge to ICTE adoption (Buckingham, 2006). Well-designed computer interfaces (pictures, sound and video) can help users, especially young people with little or no literacy to rapidly assimilate the aural and visual cues. The cost-benefit ratio of deploying and maintaining ICTE solutions also requires consideration, as related costs are often too high for a low-income community to afford. Free and Open Source Software (FOOS) is another important option to be considered, as its use incurs no licensing fees (Fitzgerald, 2006). Other contextual factors include low levels of infrastructure development, lack of physical, economic and social access to ICTs, and linguistic barriers (Casal, 2007).

Review of literature also reveals several barriers to ICTE design and implementation. Notable among them are political factors, such as the prevalence of corruption and the political will of people in power towards the use of ICTE (Sharma, 2003). Social and cultural factors (e.g., age, gender, religious beliefs) can also be barriers to ICTE implementation (Sharma, 2003). Keengwe et al. (2008) categorized barriers to ICTE implementation into two types - external barriers such as lack of equipment, unreliability of equipment, lack of technical support, and other resource-related issues; and internal barriers such as the school's culture and teachers' beliefs about ICTE. Lack of knowledge and skills are also hindrances to introducing ICTE (Pelgrum, 2001). Similarly, Rodríguez et al. (2012) identified three types of barriers – infrastructure support (e.g., equipment, technical staff, and other staff), institutional obstacles (e.g., lack of leadership and vision, lack of training), and attitudes of teachers and students.

Although the consideration of contextual factors is important for any ICTE development initiative in poor and marginalized areas, scholarship lacks a definitive framework to guide the ICTE solution design for developing countries. Generalizing ICT solutions from developed countries to developing regions is difficult, if not impossible. To address design challenges in ICT4D (ICT for Development), Tongia and Subrahmanian (2006) attempted to characterize good ICT4D design guidelines. They emphasize focusing on stakeholders' needs and performances of the solution, aligning the design solution with stakeholders' incentives, involving stakeholders in the design process, and obtaining metrics for measuring the design success across stakeholders. These guidelines center on stakeholders, which is consistent with the main goal of ICT development to address end users' needs in a contextually relevant manner. Johri and Pal (2012) also recognized the lack of a clear unified framework to guide contextually grounded user-focused design of ICT. They proposed a capable and convivial design (CCD) framework for ICT4D that include four design principles - accessible easiness, expressive creativity, relational interactivity, and ecological reciprocity. Both research provided some

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

353

principles for ICTD design. However, they do not prescribe a formal process framework towards designing ICT solutions for developing countries. In this research, we address the gap in the literature by developing a design framework for ICTE capacity development in resource poor countries.

3. STUDY BACKGROUND

Haiti is the poorest country in the western hemisphere with 80% of the population living below the poverty line and 54% living in abject poverty. The country ranks at the tail end of the United Nations Development Programme Human Development Index (UNHDR, 2013). Only about 21% of Haitians have access to electricity, and more than 50% of the country is illiterate. In the educational sector, although Haiti has achieved the goal of gender equality in primary and secondary school, enrollment rates remain low (The World Bank, 2012). Retention rates are low, and classrooms suffer from overcrowding and high number of over-aged children (Suzata, 2011). Only 22% of children graduate from the compulsory elementary school (Suzata, 2011). Unaffordable tuition rates are the primary reason for school dropout. Schools have no reliable electricity, and are devoid of basic computer infrastructure and Internet access. There is a severe shortage of qualified teachers. The prevalent norm is for the students who finish high school to become the next generation teachers. Most of the school amenities, teacher salaries, and learning material are supplemented through international NGO donations and parish twinning initiatives in the United States (Hefferan, 2007).

Education system in Haiti starts with preschool, followed by nine years of fundamental education, and then tertiary education. The fundamental education comprises of elementary education and secondary education. Elementary education consists of two cycles of three years each. This is followed by a third cycle of three years. The third cycle is delivered either in elementary or in secondary schools. Starting at the second cycle of fundamental education, students have the option of choosing vocational training programs (Suzata, 2011). This study was conducted in six rural locations in the Centre province of Haiti. The profile of each location is summarized below.

Location 1: Saltadere has three schools identified. St. Michel is the largest of the three with approximately 750 elementary and secondary students. The other two schools are Lagua and Los Cacahos, each with approximately 150 elementary students.

Location 2: Dos Palais is an isolated, rural community. St. Jean Baptiste School is a relatively new school in this area. It is wired for electricity, anticipating that a power source would be added at a future date. The government had built power lines in this town the year before the earthquake. However, after the tragedy, the effort to provide electricity to homes, businesses and schools has been abandoned.

Location 3: Cerca-Carvajal has one elementary school and one secondary school, both managed by the Holy Family Catholic Parish. The elementary school has around 700 students with two classes at every grade level except the 6th grade. The secondary school has 200 students in grades 7-12. Electrical power is limited, and unable to handle the load of all lab computers and projector running simultaneously.

Location 4: Mirebalais is a rapidly transforming part of Haiti. It is considered the hub connecting different municipalities bounded by Lascahobas, Saut d'Eau, Thomazeau, and Boucan Carre. Electricity is available in Mirebalais 24/7, a rare occurrence in Haiti. Affordable fiber-optic broadband Internet is available from NATCOM, a privately owned monopoly service provider. The St. Louis School has approximately 450 students. At the beginning of the 2013-14 school year, the school added a second campus in another part of Mirebalais. A secure computer lab with cement block wall perimeter and a security guard living on-site is planned at this location. A new road is under construction by the United Nations (UN), which would significantly enhance access to the school.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

354

Location 5: Hiche is the capital of the Centre province in Haiti. Saint Martin de Porres School in Hiche has almost 1000 students, not counting the preschool and kindergarten program. The school has for many years had the best results in students' performance scores for 9th graders, 11th graders, 12th graders (Rheto grade) and 13th graders (Philo grade). The long-term plan of the school is to integrate a comprehensive program of education that extends from preschool through grade 13 (Philo grade).

Location 6: Popaye has two schools, one of which is a teacher's college for training school teachers. The teacher's college has a local area network (LAN) with one server that supports five thin clients. Users can access productivity software such as Microsoft Office installed on the server via the thin client. The server uses a USB drive based cellular data network for Internet access. However, signal strength is weak and connection is rarely sufficient for sustained use of the Internet. Teacher trainees lack knowledge in utilizing the cellular data connection to access the Internet. No technology support personnel is available at the location, which hinders confidence among trainees to take advantage of the available computing technology.

The target audience for this research is students, teachers, young adults, and school administrators. Due to the pivotal role of the catholic doctrine and belief (the population is 70% Catholic and 20% Protestant) (Greene, 1993; Hefferan, 2007), (key informants are the head of the Bureau Diocesan d'Education (BDE) and pastors of the Catholic churches that run the schools. They are respected leaders who are involved in all aspects of the community life. Frequent interactions with them helped to determine the best approach for conducting the exploratory study and capacity building at different school locations. They recruited members of the target audience through promotions at churches, schools, and community gatherings. They also organized translators, and approved the content and materials used in the study to ensure cultural sensitivity (Gibson et al., 2013). Participation in the study was voluntary. Individual participants were informed the research purpose and procedure. They were given an opportunity to clarify doubts regarding the study, and decide whether to participate or not. There was no cost or monetary compensation for participation.

4. METHODOLOGY AND RESEARCH DESIGN

This research adopts a pluralist methodology that combines qualitative, quantitative, and design science research methods (Mingers, 2001). Two reasons drive this methodology selection. The first reason is that each research method has its specific focus on different aspects of the study. The second reason is that the research process poses different tasks and problems, which requires different research methods. While pluralist research is both desirable and feasible (Mingers, 2001), it is also important to design the research that provides a systematic approach to link the different research methods. Our multi-method research design involves two phases as shown in Figure 1.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

355
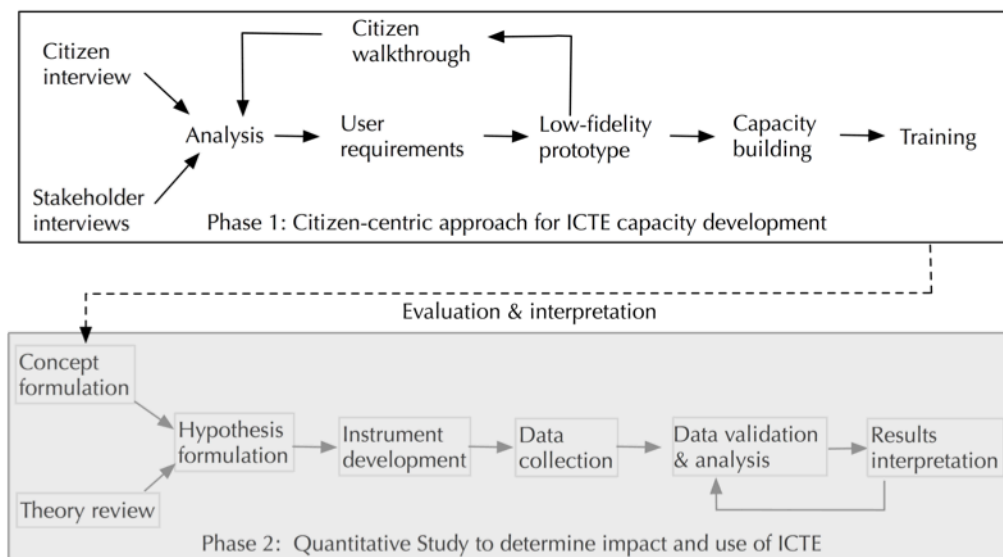
Figure 1. Research Design

Phase 1 adapts a citizen-centric approach (van Velsen, van der Geest, ter Hedde, & Derks, 2009) to develop ICTE capacity in Haiti. Phase 2 uses a quantitative approach (Picoto, Bélanger, & Palma-dos-Reis, 2014) to validate the adoption, usage, and impact of ICTE design artifacts. At the time of this submission, Phase 1 of the study has been completed, and Phase 2 has commenced. The focus of this paper is Phase 1 of the study. Next, we describe steps and applicable research methods of the two phases.

4.1. Phase 1: ICTE Capacity Development

In previous sections, we described challenges in provisioning ICTE in resource poor countries and highlighted the need for a user-centric and culturally sensitive ICT design framework. To ensure the acceptance, usability, and usefulness (Mao, Vredenburg, Smith, & Carey, 2005) of ICTE artifacts, inclusion of stakeholders in the solution design is essential. The citizen-centric framework presented by van Velsen et al. (van Velsen et al., 2009) provides a systematic approach to identify immediate and obvious needs of users, gather feedback for improvement, and incorporate incremental improvements for artifact engineering. It includes five steps: citizen and stakeholder interviews, analysis, user requirement notation, low-fidelity prototyping, and citizen walkthroughs. We added two steps: capacity building, and training, that are relevant and important to the context of developing ICTE solutions in resource strapped countries.

The first step in Phase 1 is the qualitative assessment of user requirements through semi-structured interviews and focus-group discussions with citizens and stakeholders. The second step involves analysis of citizen walkthrough and interview data. Analysis of interview data generates input for user requirement formulation. Feedbacks from citizen walkthrough enable requirement revisions. Participant observations, infrastructure audit, content analysis of existing teaching material, work sample analysis, activity logs and classroom observations are also used for requirement assessment and analysis. The last five steps focus on developing ICTE artifacts. Design science research method is primarily used for developing low-fidelity prototypes based on the assessment of user requirements and functionalities, and improvements identified from citizen walkthroughs. The accepted artifacts are then implemented for on-site capacity building. User training is essential to facilitate computer familiarity and enhance information literacy.

4.2. Phase 2: Adoption, Usage, and Impact of ICTE

ICTE artifacts developed in phase 1 leverage low-cost open source solutions to facilitate the acquisition of basic technology skills and computer literacy. The next step is to validate the

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

356

adoption, usage and impact of ICTE artifacts. Picoto et al. (2014) identified different steps for conducting quantitative confirmatory study. The steps include - hypothesis formulation through theory review and concept formulation, instrument development, data collection, data validation and analysis, and results interpretation. Questionnaire-based surveys can be used to conduct the empirical assessment of ICTE usage and impact among citizens and stakeholders. The survey can also help to evaluate descriptive statistics of the sample population, access to technologies by location, and the extend of technology usage. Phase 2 of the research design adapts this approach (shown in grey background in Figure 1) to evaluate design artifacts and explore their potential for value creation. In the next section, we report on each step of Phase 1 of our study, the citizen-centric approach for ICTE capacity development.

5. A CITIZEN-CENTRIC FRAMEWORK FOR ICTE CAPACITY DEVELOPMENT

5.1. Citizen and Stakeholder Interviews

Introducing ICTE solutions alone is not sufficient to achieve educational objectives (Ale & Chib, 2011). For effective diffusion of ICTE, researchers should first determine factors unique to the economic, educational, cultural, geographic and religious context where the ICTE is deployed. Only then, the development of the ICTE solution should be undertaken.

Citizen and stakeholder interviews are the first step in the ICTE capacity development framework. The objective of interviews in our study was to determine challenges that Haitians face in gaining access to computing technology and obtaining computer skills. In-depth interviews were first conducted with stakeholders (e.g., Haitian education officials and teachers) who are gatekeepers of technology at schools. Interviews were semi-structured, and respondents were encouraged to talk freely. Only lead questions were posed as and when required. The interviews highlighted difficulties of provisioning technology for pedagogical purposes in schools, and helped to understand the challenges faced by teachers in accessing and integrating ICTE within educational curricula. Although questions related to the educational needs of young Haitians were posed to the interviewees, specific functional requirements of potential solution artifacts were not elicited as stakeholders are not familiar with technology. Nevertheless, citizen stories and experiences shared by stakeholders enabled researchers to implicitly conduct requirement engineering, identify information needs, and rationalize expectations.

5.2. Analysis

The analysis of interview data served three purposes. First, it helped us understand contextual factors, and individual perceptions toward ICTE that may influence the likelihood of usage. Second, the analysis helped determine user requirements for developing low-fidelity prototypes suitable for the nascent educational environment in central Haiti. Lastly, systematic data analysis helped identify themes that would impact the deployment and use of ICTE in Haitian schools. Three distinct themes emerged that represented challenges paramount to the diffusion of technological literacy among the young Haitians in this region. They are summarized below.

Infrastructural and information barriers: In most schools, the Internet connectivity was either absent or with inadequate bandwidth. In few schools that had computer labs, there was a lack of skilled manpower to manage and maintain the computing environment. As a result, even minor issues related to operating systems or software would hinder the computer usage due to fear of further damage. Majority of schools had inadequate infrastructure that presented significant barriers to the integration of ICT in education. Power supply disruptions were frequent, and electric grid to schools was not capable of powering the computing lab equipments simultaneously. Owing to makeshift arrangements, keeping the labs dust-free and dry was challenging in this geographic area prone to strong winds and hurricanes. As stated by the principal and pastor at Dos Palais,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

357

> *"Although we believe that everyone should be able to download their own educational videos and go at their own pace, to do this requires a solution that has some 'additional' mechanism because the the single dongle based 3G Internet may not be able to handle 25 laptops streaming videos."*

Information barriers include the lack of educational content and the unavailability of digital information content in the Haitian Creole language. Most Haitians cannot read English text and resort to deciphering the meaning of computer keys and symbols based on icons. Earlier research has recognized that the information barrier from language unfamiliarity can lead to frustration with technology and psychological impediment towards technology adoption (Ale & Chib, 2011). An informatics teacher at Cerca-Carvajal said,

> *"As I mentioned, our current Dictionary Programs require the Internet, so we really have no dictionaries that can be used at the schools, since most schools are without 'real-time' Internet for the Computer Lab. It would be nice to have an encyclopedia."*

> *"... if a student misspells the word Lyme disease...nothing will show up. With a good (non-Internet based) English to French dictionary (and Creole to French dictionary) some of these errors can be found by the computer user assigned to look up the effects of Lyme disease."*

Inadequately trained teachers: In many resource poor countries with scant ICT infrastructure, school teachers are often gatekeepers of access to educational opportunities afforded by the technology (Baki, 2000). Haiti fares no different, especially in schools that have taken initiatives to introduce ICTE in their curricula. There were not enough computers at schools for any class size (only one location had 15 computers, and the rest had less than five functional computers). Teachers were not trained in the instructional use of technology, and lacked basic computer skills. Most teachers were in their thirties with one to five years of teaching experience. Educational institutions were over-dependent on government initiatives that had fallen short in addressing the inclusion of ICTE in curriculum and teacher training (Suzata, 2011). As stated by an education director at Mirebalais,

> *"Haiti works with the blackboard method and rote memorization. A better Haiti solution may well be to show videos to the entire class... sort of like 1990s solutions in the US classrooms. The technical answer is a 'counter cultural' Haiti solution".*

Lack of financial resources for ICTE deployment and diffusion: As a result of the overall underfunding of the education system by the government, there were scarce financial resources available to support ICTE initiatives. Several factors severely constrained the deployment of computing resources at Haitian schools. They included the lack of financial resources to secure computer labs from natural and human created setbacks, difficulty of transportation, much-needed upgrades to the telecommunication infrastructure, and shortage of skilled workforce such as solar power installers and network engineers. The diffusion of ICTE was further restricted by the lack of funds to equip schools with reliable electric power and Internet infrastructure, and employ systems administrators and trained educators. The available funds were barely enough to support other survival needs of the institution. The Director of BDE said,

> *"We cannot begin to meet the technical, educational, or systems support needs in Haiti and build what we need to build to be successful in bringing computers to the schools in Hinche and elsewhere in Haiti. We need to have a 'clean' project with clearly defined boundaries to be successful in getting our students educated."*

5.3. User Requirements

Analysis of the interview data and anecdotal evidences helped to establish the ICTE goals. Three goals were identified that could be addressed by design science - provisioning access to a sustainable computing environment, facilitating information literacy, and improving computer

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

358

familiarity. These identified goals provided the basis for developing ICT artifacts and specifying fit criteria to assess their utility (van Velsen et al., 2009).

Prior to the artifact development, we investigated the differences in economic and educational privileges among different communities where the diffusion of ICTE artifacts would be planned. For instance, students from urban and peri-urban areas (e.g., Mirebalais) were exposed to more basic technology than their counterparts in rural areas (e.g., Dos Palais). Furthermore, due to high repetition rates and over-aged students, not all students in the same class were at the same stage of developing computer skills. For example, at one school with limited computing lab facility, the principal and the informatics teacher decided the best way to proceed was to focus on the oldest students first. Thus, students in the 11th and 12th grades worked on higher level computer competencies, while those in grade 8 were still getting acquainted with the computing technology. The decision was based on the availability of the informatics instructor, time of the day when electricity was available at the computer lab, and the instructional needs of different student groups. In comparison, the principal at another school had decided that all students for all grades would be trained equally for computer proficiency.

5.4. Low-fidelity Prototype

To identify technologies for developing ICTE artifacts, we conducted a thorough review of literature, utilized our own expertise, and consulted with practitioners. Multiple low-fidelity prototypes were developed using potential technologies. To determine their suitability for the Haitian context, trade-offs among the prototypes were discussed with practitioners, and assessed via citizen walkthrough analysis (described in the next section). An excerpt from the discussion with an informatics teacher is below,

"A 'hotspot'....that is...how can we best explain what we might do...St. Martin's School is a large UN style campus facility completely enclosed by 10 ft walls with razor wire on top. There are six or more significant sized buildings made of concrete block with windows. What might we do with an INTRANET so that students could text their friends or answer questions from the teacher? Could we hook up a solar router... like the lights that we see on rural highways...that are using solar panels for power?"

Three prototype solutions were finalized (described in section 5.6) for ICTE capacity development at the study locations. The prototypes were further refined over multiple iterations of testing and consultation with practitioners. Below is an excerpt from discussions with practitioners,

> *"I believe we need to include the e-reader on the individual computer loads for it to work correctly, just as the e-reader is included on the Edubuntu version load for the Sugar on a Stick. Without this, we will not have an e-reader for any textbooks or books... but will be forced to use a text editor. Is that the position at this time? Does Calibre not work on Linux Mint version?"*

Two prototype systems were developed for schools. They represented sustainable solutions designed to operate in an environment characterized by shortage of computer technicians, and inadequate Internet infrastructure. The third prototype system was designed for school students, young Haitians, and teachers. It represented a low-cost solution to provision access to a portable computing platform. The prototype systems included a core set of educational content for students, tools for young adults to develop basic computing skills, and software applications to improve computer familiarity among users.

5.5. Citizen Walkthrough

This step in the citizen-centric ICTE development framework serves three functions. First, it enables stakeholders to gain familiarity with the proposed ICTE solutions. Second, by guiding stakeholders through the prototype functionalities, researchers can observe user responses to the

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

359

low-fidelity prototypes. It also provides an opportunity to gather interactive feedback from users. Third, the citizen walkthrough helps to analyze whether functionalities implemented in the low-fidelity prototypes fulfill the notated user requirements. The citizen walkthrough may assert new requirements, identify revisions or confirm acceptable functionalities of the prototypes.

In our study, the citizen walkthrough focused on the overall perception of ICT solutions (*process analysis*), features implemented based on the user requirements (*functional analysis*), stakeholder response to researcher enquiries (*question analysis*), and social aspects such as expectations and intentions (*sensitizing concept analysis*) (Patton, 1990; van Velsen et al., 2009). In-person demonstrations, multiple hands-on exercises with students and teachers, discussions with teachers and school administrators, and email exchanges with key informants at BDE were utilized for the citizen walkthrough. Three accepted artifacts were finalized for capacity building at six sites in central Haiti. They are described in the next section.

5.6. Capacity Building

The accepted artifacts are sustainable computing platform, Computer on Stick (COS), and teacher workstation with Internet in a Box (IIAB). Six schools in the centre province were identified for capacity building. They included two primary schools, four secondary schools, and one teacher training college. Fifty laptops provided by a non-profit charity were configured as sustainable computing platforms to support schools' educational needs. More than one hundred COS were built for targeted beneficiaries, who were children attending schools at the six locations, young adults in evening classes, and teachers at the primary, secondary, and teacher training schools. One teacher workstation with IIAB was installed at each of the six sites. The laptops along with the teacher workstations and IIAB provided a sustainable computing environment with access to significant educational content and digital information. The artifacts were fully configured and tested in the United States prior to their implementation at the sites in Haiti. The hardware was transported to central Haiti in October 2014 and installed at the six locations over six days' duration. Below we describe each artifact in detail.

5.6.1. Sustainable Computing Platform

Laptops provided by the non-profit charity were reconfigured and updated with open source Edubuntu[1] linux system and software. Edubuntu includes educational software bundled by the grade level. The installer can choose from four educational bundle options – preschool, primary, secondary, and tertiary[2]. Since Haitian Creole was not an available language option in Edubuntu, the laptops were configured with French language setting, the typologically closest language to Haitian Creole.

The educational bundles were intended to expose students to a computing environment, and help them develop keyboard/mouse dexterity, and other basic computing skills. To assist young adults and teachers seeking higher-level skills and problem-based learning, a comprehensive developer toolset was installed. The developer's workbench included applications for intermediate and advanced computer proficiency. It included software for website development (e.g., Bluefish, Bluefriffon), blogging tools with offline capabilities (QTM, wordpress client), interactive development environment (IDE) for programming in HTML, java, and C++ (e.g., eclipse, Jedit, KompZer), stand-alone database (mySQL), and project management software (e.g., Open Office Project).

Due to the shortage of readily available and qualified technicians in the region, the laptops were configured to prevent intentional or unintentional damage to the operating system and software environment. To ensure the stability of the operating system and file system, the laptops were

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[1] https://www.edubuntu.org/
[2] A list of included educational software can be found at http://edubuntu.org/screenshots

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

360

locked with Dafturn Ofris[3] open source software prior to their deployment at the sites. The Dafturn Ofris configuration (Figure 2) would allow students to log on and use the laptop without impacting the computer configuration and application settings. Restarting the computer would simply return the system to its original state.
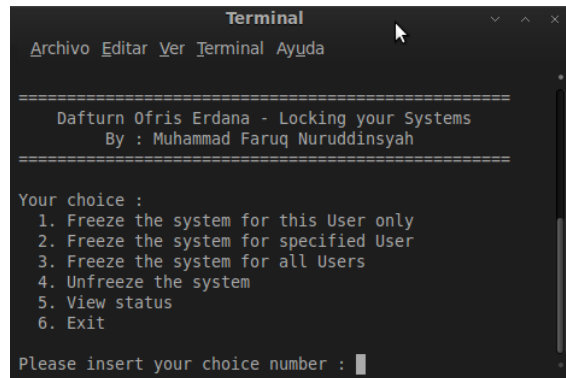
Figure 2. Dafturn Ofris Software Configuration

5.6.2.   Computer on Stick (COS)

COS was designed as a complete computer system installed on a thumb drive and bootable from the USB port of a computer. The COS was configured with Sugar on Stick operating system (Figure 3) specifically designed for young children and primary school students. Edubuntu operating system with persistent storage capability was implemented on the COS for young adults and teachers. The COS computing environment can enable users to store their personal files, applications, books, music, and movies on a lightweight low profile USB thumb drive.
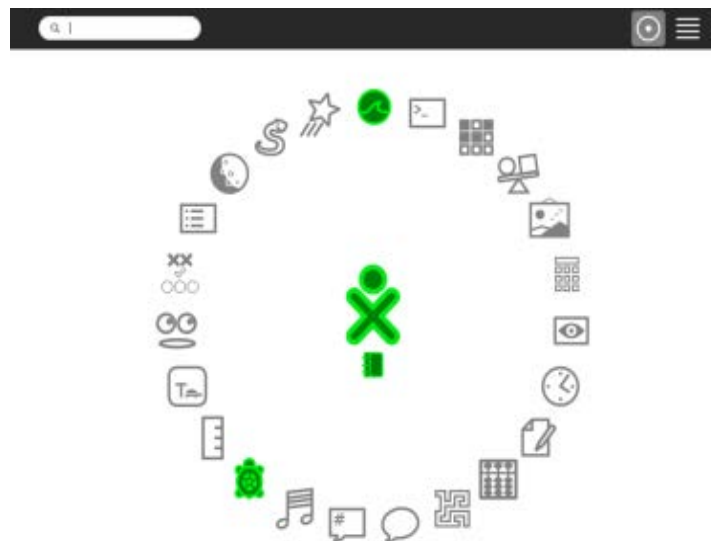
Figure 3. Sugar on Stick

5.6.3.   Teacher workstation with IIAB

Internet in a Box (IIAB) is an open source project that consolidates approximately a terabyte of world's free information in an inexpensive device that can be connected to workstations using local area network (LAN) or using wireless. IIAB provides access to essential Internet based free information and operates without any Internet connection, domain name services, or Internet server configurations. The IIAB content includes more than five hundreds hours of instructional videos on topics such as science, math, art, history, and literature from the Khan Academy[4] . It

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[3] http://sourceforge.net/projects/dafturnofris-id/

[4] https://www.khanacademy.org/

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

361

also includes Wikipedia in 37 languages including Creole, MIT-Haiti STEM classroom initiative content, a library of 40,000 e-books from the Project Gutenberg archives (Gutenberg, 2014), detailed world map down to street level, and a repository of open source educational software (Figure 4). By customizing content in HTML and javascripts, and pre-rendering images as tiles, IIAB provides relatively fast access to information on the browser even on low-end computers (Gaskill, 2014).

Figure 4. Internet-in-a-Box (IIAB)

5.7. Training

The ICTE artifacts were designed to improve access to technology, facilitate computer familiarity and enhance information literacy. Seven training session were conducted at the sites for more than eighty school students, young adults, and teachers. Each session lasted approximately two hours. Instructions on computer informatics were given in English, and translated to Creole with the help from a local translator. The training objective was primarily to help young Haitians understand what technology could do to advance access to information and skills that create opportunities for a better future. Topics covered in the training included basic elements of computer usage such as creating, saving and retrieving files; finding, opening and annotating eBooks; searching Wikipedia; browsing maps to find locations; and using appropriate computer vocabulary to describe essential components of hardware and software. To assist the primary school students with developing keyboard and mouse dexterity, the training utilized instructional software with graphical games and text in local language. For secondary school students and young adults, specific learning topics included using Open Office suite products to create multimedia presentations, write letters, and construct slideshows with images. The training material for "teaching the teacher" included detailed instructions on interacting with computers and searching for information.

Handouts with instructions on basic computer use (e.g., opening and closing applications, searching for files and applications, saving files, etc.) were provided to teachers in English and French. The handouts and training material could then be passed down to students to help them become independent computer learners. In addition to focusing on basic computer knowledge, the instruction also aimed at increasing interests in the use of computers, while overcoming the anxiety and discomfort of using technology.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

362

5.8. Evaluation and Interpretation

Phase 1 of the research focused on ICTE capacity development. Hence, the evaluation was limited to the short-term assessment of whether the ICTE artifacts met the identified user requirements. In early stages of the study, there were numerous interactions with key informants and teachers. They consistently expressed eagerness and enthusiasm in ICTE solutions that would improve technological access in schools, and facilitate information and technology literacy. Although the time spent at the sites for capacity building (Figure 1) was short (six days), there were many opportunities to speak with students, teachers, key informants, and school administrators during artifact implementation and training. The target audience greatly welcomed the opportunity to gain access to computing technology and digital information. Primary school students demonstrated attentiveness and excitement during training sessions. Secondary school students were particularly keen to have their own COS solutions. Teachers greatly welcomed COS and the IIAB. At all locations, the teachers provided positive evaluation of handouts and training material, and indicated that the information was essential to achieve the continuity of technology education. Secondary school students, young adults, and teachers raised various questions on the use of laptops, COS and IIAB. In addition to the keen interests in ICTE solutions, a sense of empowerment felt by users to overcome information barriers was also witnessed. The interpreter provided feedback from trainees indicating that access to information and technology was a transformative experience to a majority of them.

Long-term evaluation goals will target assessing the diffusion of ICTE in the Haitian context (Phase 2 of the research). Future research will quantitatively assess factors that influence the community's intention to adopt and routinize ICTE. In addition, educational outcomes achieved from the routinization of ICTE will be empirically examined.

6. DISCUSSION

Haiti reels under the burden of many critical challenges that most developing countries have overcome through public policies and governance. Political instability, natural disasters and economic crises have contributed to the increasing poverty, deteriorating health, and deprecating infrastructures in Haiti (Koenig, Leandre, & Farmer, 2004). Although Haiti's proximity to developed countries (e.g., the United States and other resource rich Caribbean islands) has enabled an influx of monetary funds and altruistic support, much remains to be done to overcome the educational challenges and paucity of scientific research initiatives in Haiti. In the follow sections, we discuss the role of ICTE in overcoming educational challenges, the importance of ICT research and innovation, and additional considerations when using the citizen-centric framework for capacity development.

6.1. ICTE Educational Challenges

Studies in developing countries suggest that improving access to technology and use of technology in pedagogy can be highly effective in improving student learning (Kremer, Brannen, & Glennerster, 2013). In Haiti, same grade students in the same school have a dramatic range of learning levels due to high repetition rates and high number of over-aged students. Instruction using educational technology has not been tailored to individual knowledge levels. Under these circumstances, the ICTE training proceeds according to the availability of informatics instructor and computer lab resources instead of the instructional needs of different student groups.

Furthermore, schools did not have capacities to deliver quality education due to inadequately trained teachers (only 15% of teachers are qualified), lack of coordination and regulation to establish an officially approved curricula, and infrastructural barriers (e.g., poor physical conditions of the buildings). As a result, differences in learning levels were observed at different sites. For example, one site was committed to having a computer lab in the school and actively working to develop computer proficiency standards for students. Another site used a computer

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

363

lab to offer training across all age groups simultaneously. However, a third site was in need of extensive assistance in any available capacity to develop the basic computer lab infrastructure and teacher training program prior to targeting computer literacy skills among students. In the light of such drastic locational differences, without policy changes that would regulate pedagogy and school governance, providing additional ICTE aids may have limited impact on facilitating information and technology literacy.

6.2. ICT Research and Innovation

The paucity of research and innovation for the ICTE development in Haiti is ill fated. Due to the lack of resources, equipment, and government initiatives, there is no systematic research program established in the Haiti university system (Suzata, 2011). Consequently, most research efforts are conducted as international initiatives or as part of NGO research networks.

ICT is an enabler with the potential to transform the natural curiosity of young children and school students into effective and well-grounded discovery. In addition to the efforts of teachers, social workers, and volunteers who devote their lives and livelihoods to improve education in Haiti, a concerted effort from social scientists will be beneficial for ICT research and innovation that target educational goals. The effort shall include assessing problems faced by the Haitian educational system, developing ICT artifacts that support educational objectives, evaluating outcomes against strategic goals, and disseminating findings to the public and scientific community. Therefore, in addition to developing innovative ICTE solutions, a comprehensive understanding of the factors influencing the adoption and continued use (routinization) of ICTE artifacts, attitude towards them, as well as barriers and challenges that constrain access to the technology is essential. Having established relationships with the schools in Central Haiti, the second phase of this study will focus on developing such understanding by investigating the underlying cultural, psychological, and environmental factors that influence the adoption and routinization of ICTE at these locations.

The citizen-centric framework presented in this research assumes an outcome-based approach to meet the community level needs in rural parts of Haiti where the reach and use of technology in education is scarce. The homogeneity of the outcome-based approach may raise concerns of the suitability of ICTE solutions across the variety of stakeholders and school locations. For example, the open source based ICTE solutions designed to facilitate technological familiarity may not be adequate for young Haitian adults considering relocation to a bigger city such as Port au Prince in search of IT jobs. However, such requirements have to be treated as special cases that require attention outside outcome-based objectives of the citizen-centric framework for ICTE capacity development. Since we are interested in examining the benefits that an individual may realize from having access to ICTE, the impact of these solutions in inducing computer literacy and information familiarity will be measured during the second phase of this research.

6.3. Other Considerations for the Citizen-centric Framework

The importance of prioritizing education to enhance capabilities and opportunities for human development is well recognized (Saito, 2003). In marginalized communities where access to educational resources is limited, innovative low cost ICT solutions have been used to overcome education barriers (Bonnah Nkansah & Unwin, 2010). Haiti remains at the distant periphery of ICT penetration. ICTE efforts that have been successful in other resource poor countries may not necessarily be effective in Haiti. Nevertheless, lessons from this initiative may ensure that expensive mistakes would not be repeated while planning and developing ICTE solutions in other deserving countries.

The citizen-centric approach for developing ICTE capacity in Haiti raised several challenges, such as difficulties of coordinating interviews, prototype testing, and funding for capacity building. Relentless advocacy promoting the needs of the Haitian youth and negotiating on their behalf were crucial elements in the initial success of the project. However, merely introducing

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

364

technology is not sufficient to address the educational shortcomings in Haiti. Additional considerations should include the need for more instructional material and interactive training sessions to achieve continuity of technology education. For international researchers and volunteers planning ICTE training activities in Haiti, language differences may necessitate extensive reliance on a Creole interpreter. Using short sentences and simple terminology during training sessions can help facilitate effective interaction with the audience and provide them opportunities to raise questions and clarifications. Pausing frequently to allow the translator to best express what is said, and observing nonverbal cues (Gibson et al., 2013) can be particularly important during the training of young school children.

7. CONCLUSION

Access to technology and digital information remains a muted desire for the vast majority of Haitian youth. Although ICT may serve as an enhancer of capabilities and producer of opportunities, the country will remain stagnant unless the doors are opened for the Haitian youth to access technology and information. This research addresses the challenges of capacity building to facilitate the diffusion of technological competency among school children, young adults and teachers in Centre province, an impoverished central plateau in Haiti. To achieve this objective, a two-phase research plan was developed. A citizen-centric framework for ICTE capacity development that integrates stakeholder needs, prototype development, capacity building, training, and evaluation was used in the first phase of the study. Three ICTE artifacts to facilitate technological access, information literacy and computer familiarity was developed using design science approach. More than a hundred USB thumb drives, fifty laptops, and eight teacher workstations were configured and tested in the United States. The ICTE solutions were then installed at six different locations in the Centre province. Students, teachers, young adults, and other members of the community were trained to become active learners through computer familiarity and information literacy. Future research will determine how this approach can be scaled to other deserving areas in Haiti.

Informed by phase 1, the second phase of the study will adopt a quantitative approach to determine whether increasing the availability of ICTE would influence educational outcomes in Haiti. By empirically validating the community's intention to adopt and routinize ICTE, this phase will help determine the impact of ICTE artifacts in the challenging Haitian setting. The citizen-centric approach presented in this paper may be utilized in countries that face similar barriers of technology and infrastructure resources. Gender disparity was not addressed in this study as Haiti has accomplished gender equality in classroom participation (The World Bank, 2012). Nevertheless, additional considerations may be required in settings where gender disparities may not favor ICTE use by females.

8. REFERENCES

Ale, K., & Chib, A. (2011). Community factors in technology adoption in primary education: Perspectives from rural India. *Information Technologies & International Development, 7*(4), pp. 53-68.

Baki, A. (2000). Preparing student teachers to use computers in mathematics classrooms through a long-term pre-service course in Turkey. *Journal of Information Technology for Teacher Education, 9*(3), 343-362.

Bonnah Nkansah, G., & Unwin, T. (2010). The contribution of ICTs to the delivery of special educational needs in Ghana: practices and potential. *Information Technology for Development, 16*(3), 191-211.

Brown, C., Ripp, J., & Kazura, J. (2012). Perspectives on Haiti Two Years after the Earthquake. *The American Journal of Tropical Medicine and Hygiene, 86*(1), 5-6.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

365

Buckingham, D. (2006). Is there a digital generation. *Digital generations: Children, young people, and new media*, 1-13.

Casal, C. R. (2007). ICT for education and development. *info, 9*(4), 3-9.

CIA. (2013). United States Central Intelligence Agency. The World Factbook 2003. Washington DC: United States Central Intelligence Agency. .

Fitzgerald, B. (2006). The transformation of open source software. *MIS Quarterly*, 587-598.

Gaskill, B. (2014). Internet-in-a-Box: Resources for the unconnected world. *The Twelfth Annual Southern California Linux Expo*.

Gibson, M., Bowles, B. C., Jansen, L., & Leach, J. (2013). Childbirth Education in Rural Haiti: Reviving Low-Tech Teaching Strategies. *The Journal of perinatal education, 22*(2), 93.

Greene, A. (1993). *The Catholic Church in Haiti: Political and Social Change*: Michigan State University Press.

GTEF. (2010). Groupe de Travail sur l'Education et la Formation. *Govt. of Haiti Education Commission*.

Gudmundsdottir, G. B. (2010). When does ICT support education in South Africa? The importance of teachers' capabilities and the relevance of language. *Information Technology for Development, 16*(3), 174-190.

Gutenberg. (2014). Project Gutenberg Archves. 2014

Hefferan, T. (2007). *Twinning faith and development: Catholic parish partnering in the US and Haiti*: Kumarian Press Bloomfield, CT.

Johri, A., & Pal, J. (2012). Capable and convivial design (CCD): a framework for designing information and communication technologies for human development. *Information Technology for Development, 18*(1), 61-75.

Keengwe, J., Onchwari, G., & Wachira, P. (2008). Computer technology integration and student learning: Barriers and promise. *Journal of Science Education and Technology, 17*(6), 560-565.

Khan, M., Hossain, S., Hasan, M., & Clement, C. K. (2012). Barriers to the Introduction of ICT into Education in Developing Countries: The Example of Bangladesh. *Online Submission, 5*(2), 61-80.

Koenig, S. P., Leandre, F., & Farmer, P. E. (2004). Scaling-up HIV treatment programmes in resource-limited settings: the rural Haiti experience. *Aids, 18*, S21-S25.

Kremer, M., Brannen, C., & Glennerster, R. (2013). The challenge of education and learning in the developing world. *Science, 340*(6130), 297-300.

Mansell, R., & Wehn, U. (1998). *Knowledge societies: information technology for sustainable development*: United Nations Publications.

Mao, J.-Y., Vredenburg, K., Smith, P. W., & Carey, T. (2005). The state of user-centered design practice. *Communications of the ACM, 48*(3), 105-109.

Mingers, J. (2001). Combining IS research methods: towards a pluralist methodology. *Information Systems Research, 12*(3), 240-259.

Patton, M. Q. (1990). *Qualitative evaluation and research methods*: SAGE Publications, inc.

Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers & Education, 37*(2), 163-178.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

366

Picoto, W. N., Bélanger, F., & Palma-dos-Reis, A. (2014). An organizational perspective on m-business: usage factors and value determination†. *European Journal of Information Systems, 23*(5), 571-592.

Pulkkinen, J. (2007). Cultural globalization and integration of ICT in education. *Educational technology: Opportunities and challenges*, 13-23.

Rodríguez, P., Nussbaum, M., & Dombrovskaia, L. (2012). Evolutionary development: a model for the design, implementation, and evaluation of ICT for education programmes. *Journal of Computer Assisted Learning, 28*(2), 81-98.

Romeo, G., & Walker, I. (2002). Activity theory to investigate the implementation of ICTE. *Education and Information Technologies, 7*(4), 323-332.

Rusten, E., & Ramirez, S. (2003). Future direction in agriculture and information and communication technologies (ICTs) at USAID. *The academy for education development and winrock international*.

Saito, M. (2003). Amartya Sen's capability approach to education: a critical exploration. *Journal of philosophy of education, 37*(1), 17-33.

Selinger, M. (2009). *ICT in education: Catalyst for development*: Cambridge University Press, Cambridge.

Sharma, R. (2003). *Barriers in using technology for education in developing countries*. Paper presented at the Information Technology: Research and Education, 2003. Proceedings. ITRE2003. International Conference on.

Suzata, E. (2011). *Education in Haiti: An Overview of Trends, Issues, and Plans*. Paper presented at the World Innovative Summit for Education, Port-au Prince.

The World Bank. (2012). Haiti Overview. Washington DC: The World Bank.

Tongia, R., & Subrahmanian, E. (2006). *Information and Communications Technology for Development (ICT4D)-A design challenge?* Paper presented at the Information and Communication Technologies and Development, 2006. ICTD'06. International Conference on.

UNHDR. (2013). Human Development Report.

UNICEF. (2013). At a glance: Haiti.

van Velsen, L., van der Geest, T., ter Hedde, M., & Derks, W. (2009). Requirements engineering for e-Government services: A citizen-centric approach and case study. *Government Information Quarterly, 26*(3), 477-486.

Voogt, J. (2003). Consequences of ICT for aims, contents, processes, and environments of learning *Curriculum landscapes and trends* (pp. 217-236): Springer.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

367

USER PARTICIPATION AND M-MONEY SUCCESS: AN EXPLORATORY CONTINGENCY MODEL

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Abstract: This study is about understanding how innovations for developing country users can not only enhance the end-users' capacity to build or modify future designs but also ensure scalable and sustainable innovations. Although user participation has been identified as the 'magic bullet' or the solution to designing context-specific innovations that actually meet the developing country users' needs there is little insight into how effective the user participation process is. Past research in user participation in system design in developing countries shows that there is an acute lack of theoretical frameworks and empirical evidence to understand how user participation can effectively be applied to system design to achieve system success amidst developing countries contextual constraints. The study uses User Centred Design (UCD) Theory and the Delone & McLean Model to address this gap. UCD provides the best practice approach to ground system design process on observations of the users' practices in the real world process. The study uses this theory to investigate how three mobile money innovations in Kenya incorporated users into the design process and how this process shape and are shaped by the contextual constraints of developing countries.

Keywords: User Centred Design, Participatory design, User participation, System success, Mobile Money

1. INTRODUCTION

Despite the potential for mobile technologies to provide access to finance there are still numerous narratives of technologies that fail to live up to their promised potential (Heeks, 2002). Challenges arise because of the unfamiliarity with the local context and the distinct infrastructure in developing countries that lead to high technology design-reality gaps and low user acceptance rates, which inhibit their sustainability. While at 70 percent Kenya records one of the highest rates in mobile market penetrations in Africa (GSMA Intelligence, 2014), mobile innovations for development have been slow to scale. Although most of the developing country users use the mobile money innovations to send money or pay bills(Demombynes & Thegeya, 2012) few use them for the more targeted solutions they provide, for example, micro-credit, micro-insurance, health, agriculture or education and therefore the innovations are slow to scale and not living up to their promised potential. Some of the challenges highlighted that could be a hindrance to scalability include low user awareness and poor understanding of applications and how to use them among others. In a study conducted by iHub research users indicated that they did not use M-Kesho because…. "it is too much of a process (signing up as well as the process to actually use)" (iHub Research & Research Solutions Africa, 2012, p. 48). The report further emphasizes the importance of developers understanding user needs as they design for developing country users. Therefore for the innovations to be inclusive, it is imperative that designers of products and services to the developing country users understand the context for which they design (Byrne & Sahay, 2007). This can be done by ensuring that the innovations are inclusively designed and developed, that is, working with and co-opting input from the intended

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

368

marginalised beneficiaries into the design process (Hussain, Sanders, & Steinart, 2012; Sanders, 2002). World over, studies have identified user participation in innovation design as a prerequisite to good design (Carroll & Rosson, 2007; Puri, Byrne, Nhampossa, & Quraishi, 2004) and it is said that "incorporating user skills, experiences and interest into the system design increase the likelihood of the system being useful and well integrated" (Kensing & Blomberg, 1998, p. 172). Moreover, interaction design practitioners share the view that every participant is an expert in how they live and that technology designs would benefit from input from participants with diverse backgrounds (Sanoff, 2007). But, despite the emphasis on the intrinsic value of user participation, it remains that many system development processes still maintain traditional structures that makes little use of, and even inhibits, the adoption of user centred approaches to innovation (Buur & Matthews, 2008).

To a great extent user centred design projects have evolved in the developed countries but initiatives in the developing countries continue to fail despite the incorporation of participatory approaches (Winschiers, 2006). A significant body of research has investigated these participatory approaches more so how the construct user participation relates to system success (Barki & Hartwick, 1994; Lee & Carroll, 2010; McKeen, Guimaraes, & Wetherbe, 1994) but few actually explore how the user participation process addresses or circumvents the constraints of their context.

As system designers embark on designing for developing countries, their aim should be more than designing systems that fix the current problem but also enhancing the end-users' capacity to build or modify future designs by identifying the roles key users of the innovations e.g. micro-entrepreneurs, farmers and women in lending groups, can play in their design is important. Incorporating them into the design process ensures that their entrepreneurial skills, creativity, drive and insight into local needs and assets can be employed for effective system design.(Hussain et al., 2012).

Therefore, though more and more system designers are adopting user centred design approaches as they design for users in developing countries, there is a lack of theoretical frameworks and empirical evidence to understand and identify how to effectively incorporate user participation given the contextual constraints. This study therefore addresses this gap by drawing on user centred design principles to evaluate the user participation process against participatory design best practice and the Delone & McLean model to investigate how this then relates to system success in a developing country context.

2. RESEARCH OBJECTIVE & QUESTIONS

The purpose of this study is to develop and empirically test a conceptual framework which explains why and how user participation is incorporated in the design of information systems in developing countries. The study seeks to not only examine the existing practices of user participation and how they are facilitated, but additionally, to provide an understanding of how these practices shape and are shaped by the context of developing countries and to further examine their relationship to system success. User participation (UP) is defined as the behaviours, assignments, and activities that users or their representatives perform during the system development process.

The research seeks to achieve its objectives by asking the following questions:

Research Question

The underpinning question of this research is "*how can user participation effectively be applied in the system development process to contribute to a successful system given the contextual assumptions in developing countries*".

Sub-research questions

Process (best practice for participatory process)

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

369

1. What is the level of user participation in system design in Kenya?
2. How is user participation applied in system design in Kenya?

Effect (Association between user participation process and system success)

3. Why is user participation applied in system design in Kenya?

Context (local perspective)

4. How is the user participation process shaped by the local contextual conditions in Kenya?
5. How are the local contextual factors in turn affected by the user participation process?

3. RESEARCH FOUNDATION

As earlier identified, the gaps in literature emphasize the need to develop a theoretically grounded and practically oriented understanding of how system design can effectively incorporate users while addressing the contextual constraints and challenges found in a developing country context. The use of the six UCD principles (early focus on users and tasks, active user participation, early prototyping, continuous iteration, address user experience and multidisciplinary skills and perspectives) form a basis to evaluate how the system designers incorporate user participation into the system development process against best practice. To understand the value and efficacy of this user participation process it is then modelled against the system success variables (system quality, information quality, system use, user satisfaction, individual impacts, and organizational impacts) identified in the Delone & McLean model.

3.1. Data Analysis

From the literature, although positive relationships between end-user participation and system success have been hypothesised it has been identified that these relationship can be influenced by the context in which the relationship occurs. Several studies (Doll & Torkzadeh, 1989; King & Lee, 1991; McKeen et al., 1994; Tait & Vessey, 1988) have taken into account contingency and situational factors impact on the system and their main findings have been that these factors have a moderating effect on end-user participation and system success. The findings of these studies are from a developed country context and very little is known about the different contingency and situational factors in developing countries context.

The argument in this study is therefore captured in a framework of understanding that the positive contribution of user participation to the success of system is moderated by the contextual factors surrounding the system development. The conceptual framework Figure 1 below outlines three interlinked constructs namely; process – effect – context that captures the local context that shapes and influences the processes of user participation and the success of the system.
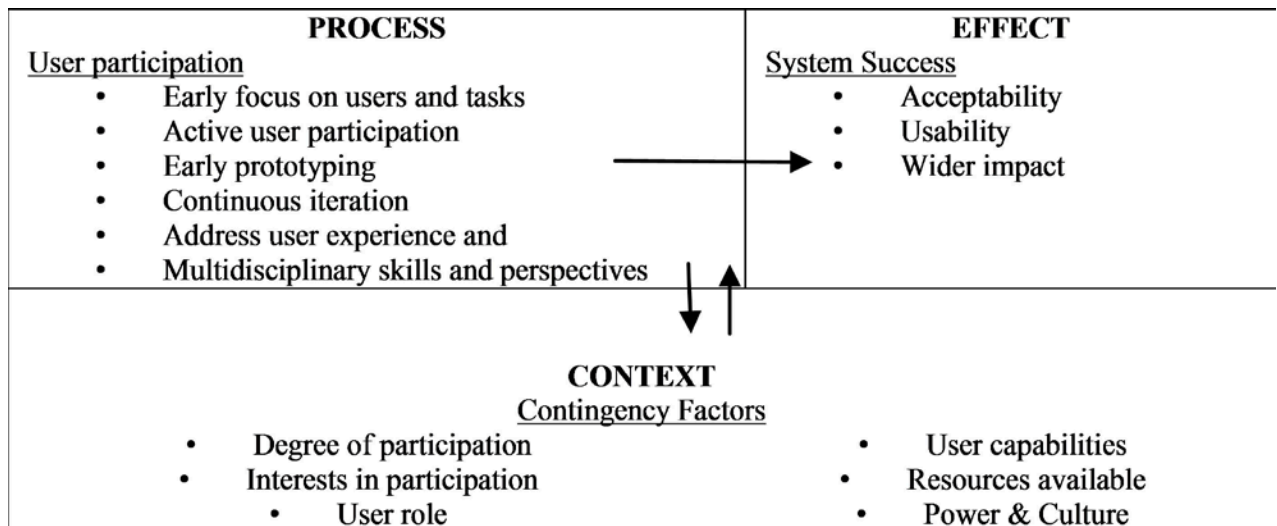

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

370

Figure 1: Contingency Model

3.1.1. User Participation

The construct user participation in system design has been ambiguous and there has been little consensus in its definition. There has been debate on whether just taking part defines user participation or does the user have to contribute something meaningful to the design. There has also been confusion between user participation and user involvement as they are used interchangeably in information system research. Barki and Hartwick (1994, p. 441) makes a distinction between the two and defines user participation as the "activities performed by users" during system design while user involvement as the "subjective psychological state reflecting the importance and personal relevance that a user attaches" to a given system.

The study will benchmark the user participation process against UCD principles mentioned above which provide best practice for participatory process. The study will not only need to identify activities performed by the user but also to understand the interests to participate. Henceforth for purposes of this research and for the proposed model, user participation is used to conceptualise both user activities and user attitude and behaviour in the design of systems.

3.1.2. System Success

System success is conceptualised using the DeLone and McLean's (2002; 1992) (D&M) model of IS success, which is commonly accepted and frequently used in research into the success of systems. Three variables namely system acceptability, system use and impact are defined to model system success.

a) In trying to establish the quality of the mobile money innovations (Collins, Morduch, Rutherford, & Ruthven, 2009) - Design Principles for the poor – will be used. These principles assess system quality using four variables namely;

- *Reliable* - deliverable at the promised time, in the promised amount, and at the promised price;

- *Convenient* - enabling nearby, quick access, privately and unobtrusively;

- *Flexible* - easy with which one can reconcile transactions with cash flows and

- *Structure* - regularize the transactions to promote self-discipline.

b) System use defined as the interaction of the information product with its recipients, the users and/or decision makers(Barki & Hartwick, 1994; Franz & Robey, 1986; Igbaria, Parasuraman, & Baroudi, 1996; Torkzadeh & Doll, 1999) will look at the number of times the users interact with the mobile money application and use the application for the intended purpose.

c) Finally, impact is defined as the effect of information product on the behaviour of user and on organizational performance. (Hwang & Thorn, 1999; Petter, DeLone, & McLean, 2008) looks at the users' loyalty to the mobile money application, enhanced economic activity with increased access to micro-credit, increased savings, increased bargaining power, usable mobile money application, reduced design costs and increased levels of mobile money application acceptance.

3.1.3. Context

The contingency factors that have been studied before mainly look at system complexity, resource constraints, stage of development, communication etc (Doll & Torkzadeh, 1989; King & Lee, 1991; McKeen et al., 1994; Tait & Vessey, 1988) and it is imperative that when answering the fourth question to identify the factors that are relevant to a developing country context. When designing with users in the developing countries a key component for

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

371

consideration is the users' skill and knowledge levels and a basic concern that is usually overlooked is 'What is the user good at?' Typically these users lack the necessary skills required and need training to not only increase their ability to effectively participate but to also empower them (Byrne & Sahay, 2007; Hussain et al., 2012) as users who lack the necessary skills are ineffective in participation and ultimately have less influence in the design of the system (Kimaro & Titlestad, 2008). The design should therefore ensure that it focuses on the users abilities and needs and not just system effectiveness (Lee & Carroll, 2010).

According to Puri et al (2004, p. 42) the politics of design and the dimensions of user participation are determined by the socio-economic, cultural and political factors faced in each setting. This is underpinned by Avgerou (2008) who stresses that the importance of the potential value and fit of innovations to the local context cannot be taken for granted. Invariably the effectiveness of user participation will be affected by the local dynamics of at play. Social and political structures influence the group dynamics in participatory approaches (Hussain et al., 2012) and this in turn affects how marginalised individuals participate in the system design activities.

Understanding the culture is important so as to know how to identify and approach potential participants. As it stands, a majority of the information systems are designed and developed in the global North where the culture could be described as abstractive yet they are for developing countries users whose cultures could be described as associative where perception and behaviour may not follow a clearly predictive pattern (Brown, 2002). In designing innovations for users in these cultures, context is key and the effectiveness of the innovation is dependent on the character of the context it is used in (Hussain et al., 2012; Maunder et al., 2007; Puri et al., 2004) and therefore the value of interacting with the end-users is apparent for the solution to have value for the user.

Three types of user participants have been identified as: micro-entrepreneurs, farmers and women in ROSCAs who form a majority of unbanked population that use mobile money in Kenya(FinAccess, 2009). The role of a user in a product development process has changed from being an informer into a co-creator (reference this idea). It is therefore important to look beyond just effective design of these innovations and address the changing roles of these users/participants.

3.2 Propositions

From the conceptual model, twelve research propositions are proposed in relation to user centred design theory in the context of a developing country. These proposals inform the collection, structuring, presentation and analysis of data for this study. They are summarised below:

Process (best practice for participatory process)

P1 – Given the constraints in a developing country context, system designers that follow the principles of user centred design are more likely to achieve an effective user participation process

Effect (Association between user participation process and system success)

P2 – System designers who apply participatory approach in the design of their systems are more likely to achieve a greater extent of system acceptability

P3 – System designers who apply participatory approach in the design of their systems are more likely to achieve a greater extent of system usability

P4 – Users who participate in the system design process are more likely to have an increased sense of system ownership

Context (local perspective)

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

372

P5 – The higher the degree of user participation, the greater the influence the users have on the design process

P6 – Interests in participation contribute largely to the distribution of decision-making powers

P8 – User IT skills and knowledge are more likely to improve with increased participation

P9 – Users with high IT skills and knowledge are more likely to play a greater role in the system design process

P10 – Resources have an influence on the interests in participation

P11 – The more decision-making powers the users have the higher the degree of participation

P12 – Power relations shape the constitution of interests in participation

4. RESEARCH METHODOLOGY

The research employed a multiple case study approach to allow for comparison of the case studies to confirm or disconfirm the relationships proposed. The research defines a case study as a mobile money innovation in a developing country. The case study selection criteria included a developing country with a population that was sufficiently innovative and exceptional in terms of mobile money systems, the researcher's experience of the specific focus of the research and knowledge of the case study boundary, accessible to the researcher among others. Kenya was an ideal location for field study not only because M-Pesa has been a transformative innovation but it also provided an adequate number of mobile money innovations to choose from with different levels of user engagement and thus providing a better understanding of user participation in the design of these innovations.

Three case studies and a preliminary study were identified. The purpose of the preliminary study was two-fold; assessment of instruments - to identify problems with the research instruments and feasibility - to acquire a background of the mobile money landscape in Kenya and assess the feasibility of the study. The three case studies chosen provided mobile money services (micro-credit, micro-savings or micro-insurance) and were in different stages of the development process. They had all engaged in different levels of user participation during the development process. The entry point was the innovation owner or senior management who then provided information on who to talk to. Data was collected from two major sources; the innovation designer(s) and the end-user participants of each innovation. Additional data was sometimes collected to either acquire or verify the data.

4.1 Data Collection and Analysis

To answer the research questions data was collected by use of qualitative methods (semi-structured interviews, focus groups and participant observation) to explore the user participation practices and investigate its association with system success. Although user participation-system success relationship studies have mostly undertaken a quantitative approach as they set out to test association between user participation and system success this was not appropriate for exploring the underlying motives and mechanism that are shaped by the context in which the design occurs. This is because they mostly measure the frequency of participation activities performed, and not how or why they were performed. Use of qualitative data and instruments therefore will result in a greater understanding of how user participation was brought into practice and the consequences of this practice given the context in which it occurs.

The researcher collected a rich set of data from a variety of complementary sources. They first interviewed the system designers at regular intervals and gathered copies of all documents and artefacts used or produced during the design. These included background information about the innovation and the services it offered, interview notes, requirements, and any paper and software

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

373

prototypes. They then interviewed and discussed with the users either during the design meetings or during their meetings where they were using the innovation.

A detailed analysis of the interviews and discussions with designers and users is ongoing in order to identify the levels of user participation, to explore the process and context of user participation and to investigate the benefits associated with user participation. The results and conclusions presented in this paper are largely based on this analysis, with information from the semi-structured interview and focus group transcripts and design artefacts and participation field notes used as supplementary evidence and background information to support my observations as a participant observer. In the analysis, the transcripts were coded for; how the concept was generated, design cycle stage, user type, user selection process, UCD process, iteration cycles, UP techniques used, UP benefits identified, UP challenges, reasons for participation, roles played. Detailed coding tables were then produced.

5. KEY RESEARCH FINDINGS AND ISSUES

Analysis of findings is still ongoing and the results are summarised below in terms of certain recurring themes identified during the analysis. Some of the emerging themes include;

a) Understanding user & their situation – this is concerned with the user type, how the users were identified and recruited, the user skills and knowledge, user experience, location where UP occurred,

b) Participatory practices – this is concerned with the design cycle stage, the UP techniques used, the iteration cycles, the time allocated for UP, the funding allocated for UP, the challenges faced during UP

c) Justification for UP – this is concerned with the purpose for UP, the different motivations for participation, the benefits of UP

d) Collaborative working practice – this is concerned with the designer – user working environment, the different user roles, power relation issues, user training

For each theme, a number of issues are developed. The issues are by no means exhaustive; they represent some of the major findings, but it is not possible to report all the results in this paper.

5.1. Theme 1: Understanding user & their situation

Designers reported difficulties in identifying the right users to participate in the design. Most of the designers selected users from already established groups like chamas (savings groups), church groups or community support/development groups. Users also wondered about the criteria used to select users.

Designers reported difficulties in anticipating the level of training or experience possessed by the user. In as much as the users having context-specific knowledge which was invaluable to the design it was difficult for the designers to identify. They reported spending a lot of time explaining the innovation and its intended use. One designer is quoted as saying that they had to spend time convincing the users that they were equipped to participate. This was underpinned by several users who expressed concerns over their capacity to participate.

5.2. Theme 2 - Participatory practices

Some of the common participatory techniques used during the design process included focus groups, brainstorming sessions and paper prototypes which were used during different stages in the design cycle.

Designers reported that funding was a major constraint on the participation process. Funding was a major deciding factor on the techniques that they could use and also on how they could motivate the users to participate. Designers mentioned that they would have liked to pay the

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

374

users a small stipend to motivate them to attend the design meetings as they were aware that the users had other obligations.

Designers also mentioned their concerns about the time consuming UP practice. Some were under strict deadlines to deliver and in one case the designer was concerned about the risks of their innovation being 'hijacked' due to the long design process.

5.3. Theme 3 - Justification for UP

There was a designer-user mismatch in the aims for UP. The users' reasons for participating fell in two groups; from just being a part/member of a group (inclusion) – this could be brought on from the community settings of developing countries context – and hardly contributed anything constructive to others wanting to be part of something that would help them in the future (empowerment). On the other hand, the designers' main reason for user participation was efficiency – getting the right user requirements.

The users did mention that participation gave them a sense of ownership. Some even went on to 'market' the innovation to others in their community.

5.4. Theme 4 - Collaborative working practice

It was noted that most of the user feedback came from a select few. Given that the users were selected from already established groups, there were already established power structures within those groups that spilled over to the design groups. Even in the case where the users did not know each other, power structures were formed along social structures that already exist within the community. Therefore, for example, the researcher noticed that the older man in the group had more say in decision making and the rest of the group would generally agree to whatever he said.

6. DISCUSSION

a) Given the low literacy levels in developing countries and a lack a basic understanding of the context, the terminology, or the system interface, there needs to be a concept of the representative user from the outset. Well-defined and complete user requirements are therefore beneficial, although challenges remain relating these to functional requirement. It is also worth noting that in the developing country context decisions made collectively so before embarking on the design project there should be a common sense of understanding of the reasons for coming together and the different roles they would be playing.

b) Capacity to participate is an important consideration as the unequal nature of social relationships and positions between different stakeholders was recognised from the outset. Therefore, the needs of the various groups need to be accommodated, such as discussions in the home language and having the meetings near home or place of work.

c) Complex socio-cultural issues must be identified early in the design process to ensure that the participation is active and constructive. Given the existing power structures it would be beneficial to identify change/mediating agents who can act as a bridge between the designers and the users therefore steering the group in the right direction and minimizing hierarchical structures.

d) Though the system is developed in a specific context it in turn impacts the context itself, by modifying or strengthening it. This changed scenario then needs to be fed back to the system in the form of modifications. Therefore, the design process in needs to be empowering, so that users are able to introduce changes as may become necessary.

e) Collaborative working practice allows designers-users to elicit and explore the tacit knowledge and invisible practices that might otherwise have been lost, and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

375

simultaneously encourages users to participate in their own empowerment therefore it is imperative that the environment is conducive by providing mechanisms for participation that produce verifiable changes based on them.

7. CONCLUSION

This research is of particular interest because it is becoming clear that involving users in an effective way in design is a complex problem. While some of the results might appear obvious at first sight, they point to the fact that the problem is not just a matter of developing the appropriate design techniques, but rather, it involves working on a wider change in design practice, where the design process and the way design is impacted by the social-cultural differences have to be studied as a whole.

This paper has provided a detailed analysis of three case studies on the complexities of designing with users in a developing country context. It gives a summary of emerging themes or issues arising from this study; understanding the users and their situation, effective participatory practice, understanding the justification for UP and providing a collaborative working environment, so as to illustrate these complexities.

To ensure that innovations for developing countries users not only enhance the end-users' capacity to build or modify future designs but also ensure scalable and sustainable innovations it is imperative for the designers to recognise and understand these complexities so as to work towards enhancing the user participation process.

REFERENCES

Asghar, S., Malik, A. M., Safeer, M., Umm-E-Habiba, & Fong, S. (2010). Analytical framework for studying the effects of user participation in DSS development. In *2010 4th International Conference on New Trends in Information Science and Service Science (NISS)* (pp. 254–259).

Avgerou, C. (2008). The significance of context in information systems and organizational change. *Information Systems Journal*, *11*(1), 43–63.

Barki, H., & Hartwick, J. (1994). Measuring User Participation, User Involvement, and User Attitude. *MIS Quarterly*, *18*(1), 59–82. doi:10.2307/249610

Baroudi, J. J., Olson, M. H., & Ives, B. (1986). An Empirical Study of the Impact of User Involvement on System Usage and Information Satisfaction. *Commun. ACM*, *29*(3), 232–238. doi:10.1145/5666.5669

Brown, I. T. (2002). Individual and technological factors affecting perceived ease of use of web-based learning technologies in a developing country. *The Electronic Journal of Information Systems in Developing Countries*, *9*. Retrieved from http://144.214.55.140/ojs2/index.php/ejisdc/article/view/50

Buur, J., & Matthews, B. (2008). Participatory innovation: a research agenda. In *Proceedings of the Tenth Anniversary Conference on Participatory Design 2008* (pp. 186–189). Indianapolis, IN, USA: Indiana University. Retrieved from http://dl.acm.org/citation.cfm?id=1795234.1795269

Bygstad, B., Nielsen, P. A., & Munkvold, B. E. (2010). Four integration patterns: a socio-technical approach to integration in IS development projects. *Information Systems Journal*, *20*(1), 53–80.

Byrne, E., & Sahay, S. (2007). Participatory design for social development: A South African case study on community-based health information systems. *Information Technology for Development*, *13*(1), 71–94. doi:10.1002/itdj.20052

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

376

Carroll, J. M., & Rosson, M. B. (2007). Participatory design in community informatics. *Design Studies*, *28*(3), 243–261.

Cavaye, A. L. M. (1995). User participation in system development revisited. *Information & Management*, *28*(5), 311–323. doi:10.1016/0378-7206(94)00053-L

Collins, D., Morduch, J., Rutherford, S., & Ruthven, O. (2009). *Portfolios of the Poor: How the World's Poor Live on $2 a Day*. Princeton University Press.

Coombs, C. R., Doherty, N. F., & Loan-Clarke, J. (2001). The Importance of User Ownership and Positive User Attitudes in the Successful Adoption of Community Information Systems: *Journal of Organizational and End User Computing*, *13*(4), 5–16. doi:10.4018/joeuc.2001100101

DeLone, W. H., & McLean, E. R. (1992). Information Systems Success: The Quest for the Dependent Variable. *Information Systems Research*, *3*(1), 60–95.

DeLone, W. H., & McLean, E. R. (2002). Information systems success revisited. In *Proceedings of the 35th Annual Hawaii International Conference on System Sciences, 2002. HICSS* (pp. 2966–2976). doi:10.1109/HICSS.2002.994345

Demombynes, G., & Thegeya, A. (2012). Kenya's mobile revolution and the promise of mobile savings. *World Bank Policy Research Working Paper*, (5988). Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2017401

Doll, W. J., & Torkzadeh, G. (1989). A Discrepancy Model of End-User Computing Involvement. *Management Science*, *35*(10), 1151–1171.

FinAccess. (2009). *Financial access in Kenya: results of the 2009 national survey*. FSD Kenya.

Franz, C. R., & Robey, D. (1986). Organizational Context, User Involvement, and the Usefulness of Information Systems*. *Decision Sciences*, *17*(3), 329–356. doi:10.1111/j.1540-5915.1986.tb00230.x

GSMA Intelligence. (2014). GSMA Intelligence 2014. Retrieved September 17, 2014, from https://gsmaintelligence.com/markets/1887/dashboard/

Harris, M. A., & Weistroffer, H. R. (2008). Does User Participation Lead to System Success? Retrieved from http://sais.aisnet.org/2008/1BHarrisWeistroffer.pdf

Hartwick, J., & Barki, H. (1994). Explaining the Role of User Participation in Information System Use. *Management Science*, *40*(4), 440–465. doi:10.2307/2632752

Heeks, R. (2002). Information Systems and Developing Countries: Failure, Success, and Local Improvisations. *The Information Society*, *18*(2), 101–112. doi:10.1080/01972240290075039

Hussain, S., Sanders, E., & Steinart, M. (2012). Participatory Design with Marginalized People in Developing Countries: Challenges and Opportunities Experienced in a Field Study in Cambodia. *International Journal of Dsign*. Retrieved from http://www.ijdesign.org/ojs/index.php/IJDesign/article/view/1054/455

Hwang, M. I., & Thorn, R. G. (1999). The effect of user engagement on system success: A meta-analytical integration of research findings. *Information & Management*, *35*(4), 229–236. doi:10.1016/S0378-7206(98)00092-5

Igbaria, M., Parasuraman, S., & Baroudi, J. J. (1996). A Motivational Model of Microcomputer Usage. *Journal of Management Information Systems*, *13*(1), 127–143.

iHub Research, & Research Solutions Africa. (2012, December). Mobile Usage at the Base of the Pyramid in Kenya. infoDev | The World Bank.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

377

Ives, B., & Olson, M. H. (1984). User Involvement and Mis Success: A Review of Research. *Management Science*, *30*(5), 586–603.

Kautz, K. (2011). Investigating the design process: participatory design in agile software development. *Information Technology & People*, *24*(3), 217–235.

Kensing, F., & Blomberg, J. (1998). Participatory design: Issues and concerns. *Computer Supported Cooperative Work (CSCW)*, *7*(3), 167–185.

Kimaro, H. C., & Titlestad, O. H. (2008). Challenges of user participation in the design of a computer based system: The possibility of participatory customisation in low income countries. *Journal of Health Informatics in Developing Countries*, *2*(1), 1–9.

King, W. R., & Lee, T.-H. (1991). The effects of user participation on system success: toward a contingency theory of user satisfaction. In *Proceedings of the twelfth international conference on Information systems* (pp. 327–338). Minneapolis, MN, USA: University of Minnesota. Retrieved from http://dl.acm.org/citation.cfm?id=126686.150745

Kujala, S., Kauppinen, M., Lehtola, L., & Kojo, T. (2005). The role of user involvement in requirements quality and project success. In *13th IEEE International Conference on Requirements Engineering, 2005. Proceedings* (pp. 75–84). doi:10.1109/RE.2005.72

Lee, R. L., & Carroll, J. M. (2010). Towards A Framework for Effective User Participation in Nonprofit Community Contexts: Beyond User Involvement. *Southern Association for Information Systems*, 13–18.

Maunder, A., Marsden, G., Gruijters, D., & Blake, E. (2007). Designing interactive systems for the developing world - reflections on user-centred design. In *International Conference on Information and Communication Technologies and Development, 2007. ICTD 2007* (pp. 1–8). doi:10.1109/ICTD.2007.4937419

McKeen, J. D., Guimaraes, T., & Wetherbe, J. C. (1994). The Relationship between User Participation and User Satisfaction: An Investigation of Four Contingency Factors. *MIS Quarterly*, *18*(4), 427–451. doi:10.2307/249523

Mumford, E., & Henshall, D. (1983). Designing participatively: A participative approach to computer systems design. *Manchester: Manchester Business School*.

Petter, S., DeLone, W., & McLean, E. (2008). Measuring information systems success: models, dimensions, measures, and interrelationships. *European Journal of Information Systems*, *17*(3), 236–263. doi:10.1057/ejis.2008.15

Puri, S. K., Byrne, E., Nhampossa, J. L., & Quraishi, Z. B. (2004). Contextuality of participation in IS design: a developing country perspective. In *Proceedings of the eighth conference on Participatory design: Artful integration: interweaving media, materials and practices - Volume 1* (pp. 42–52). New York, NY, USA: ACM. doi:10.1145/1011870.1011876

Sanders, E. B. . (2002). From user-centered to participatory design approaches. *Design and the Social Sciences: Making Connections*, 1–8.

Sanoff, H. (2007). Special issue on participatory design. *Design Studies*, *28*(3), 213–215. doi:10.1016/j.destud.2007.02.001

Seddon, P. B., Staples, S., Patnayakuni, R., & Bowtell, M. (1999). Dimensions of information systems success. *Commun. AIS*, *2*(3es). Retrieved from http://dl.acm.org/citation.cfm?id=374468.374477

Tait, P., & Vessey, I. (1988). The Effect of User Involvement on System Success: A Contingency Approach. *MIS Quarterly*, *12*(1), 91–108. doi:10.2307/248809

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

378

Torkzadeh, G., & Doll, W. . (1999). The development of a tool for measuring the perceived impact of information technology on work. *Omega*, *27*(3), 327–339. doi:10.1016/S0305-0483(98)00049-8

Vaughan, P. J. (2001). System implementation success factors; it's not just the technology. *University of Colorado at Boulder.< Available at: Http://spot. Colorado. Edu/~ vaughan/SystemImplementationSuccessFactors_files/frame. Htm*. Retrieved from http://net.educause.edu/ir/library/pdf/cmr0122.pdf

Winschiers, H. (2006). The Challenges of Participatory Design in a Intercultural Context: Designing for Usability in Namibia. In *PDC* (pp. 73–76). Retrieved from http://ojs.ruc.dk/index.php/pdc/article/view/375

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

379

SCALING AS A PROCESS OF MANAGING SOCIOMATERIAL ASSEMBLAGE: CASES ABOUT HEALTH INFORMATION SYSTEMS FOR DEVELOPING COUNTRIES

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Abstract: This paper presents a sociomateriality inspired analysis of Health Information System (HIS) scaling in the context of developing countries. This approach extends the primarily technical and output based approach to scaling to a sociomaterial perspective that allows examining processes where multiple time-space contexts are bridged. Our analysis identifies four key mechanisms that contribute to a successful scaling outcome: embedding which refers to a strategy to make a HIS work in a particular time-space context; disembedding to transport the working HIS from a particular to multiple new time-space contexts through material restructuring; and reembedding. Empirically, the paper draws upon HIS design and implementation activities carried out in India and Ethiopia within the context of the Health Information Systems Programme (HISP) initiative ongoing in multiple developing countries.

Keywords: scaling, sociomateriality, health information systems, developing countries.

1. INTRODUCTION

Scaling of Information Systems (IS) is a key area urged for further research and investigation (Walsham & Sahay, 2006; Walsham et al., 2007). Unlike most IS research topics that focus on temporal and isolated organizational contexts, scaling touches upon design, development, implementation and use issues across multiple time-space contexts. Conceptualizing this process of HIS circulation across multiple time-space contexts is the focus of this paper.

Considered by many as a key enabler for socioeconomic development in developing countries, numerous interventions have applied HIS as part of health sector reform activities (WHO, 2000; AbouZahr & Boerma, 2005; Chetley, 2006). However, many of them have ended with problems of design-reality gaps (Heeks et al., 1999), inability to live beyond pilot stages (Heeks et al., 1999; Heeks, 2006), and poor sustainability (Braa et al., 2004; Kimaro, 2006). For HIS to work in a context, it is crucial to establish a match between the materiality of technology with the work practices, organizational structures and other socio-technical realities of where it is being implemented, and furthermore, this match should evolve with time as organizations evolve (Leonardi and Barley, 2008; Orlikowski, 2007; Zammuto et al, 2007). In the words of Braa et al. (2004) scaling "is a prerequisite, not a luxury, for sustainab[ility]" (p. 337).

Studies on HIS scaling have traditionally focused on quantitative aspects such as patterns of use and number of users served (Monteiro 1998, Sahay & Walsham, 2007) and volume of data maintained (Shaw et al., 2007). In this paper, we build on the time-space perspective (Sahay, 1997) which emphasized the interplay between social and material elements across multiple time-space contexts. Specifically, our aim is to understand the challenges of design, implementation and use of HIS in a particular context and then its spread to others. We draw on notions of sociomateriality (Orlikowski, 2007; Orlikowski & Scott, 2008) to develop such a

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

380

theoretical perspective on scaling as a process of managing sociomaterial assemblage in time-space. Our empirical basis is provided by the study of a HIS (called DHIS2) being implemented through the HISP (Health Information Systems Programme) initiative in multiple countries. Two countries – Ethiopia and India – represent the research sites for the analysis presented in this paper.

The rest of the paper is organized as follows. In section 2, we discuss relevant literature on scaling and sociomateriality, followed by an overview of the research approach in section 3. Section 4 presents the two empirical cases of DHIS2 scaling. Analysis and discussion follow in section 5 and then conclusions.

2. THEORETICAL PERSPECTIVE: INFORMED BY SOCIOMATERIALITY

Scaling is "an important issue in IS, especially in the contemporary context of globalization, as attempts are ongoing to expand IS in the same context as well as take it into other contexts" (Sahay & Walsham, 2006, p. 185). Scaling is detailed along two dimensions – across time, when expanding in scope and size in a particular setting (Walsham & Sahay, 2006); and across space, when spreading a working solution to multiple settings (Braa et al., 2004). This involves engaging with multiple social and material realities.

From the social perspective, Shaw et al (2007) discuss the embedding of HIS artifact in people and their work practices, and success being dependent on the degree of embeddedness achieved. A central concern is how well the materiality of the artifact is aligned and fitted with the sociotechnical reality of the setting (Monteiro and Hanseth, 1995). What brings success is a combination of the materiality of the artifact with work practices, organizational structures, social processes and other contextual factors (Leonardi and Barley, 2008; Zammuto et al, 2007).

A sociomateriality perspective on scaling allows for an analytical focus on the relation between the social and the material, and how these enable or constrain scaling. Braa & Sahay (2012) also argue against looking at scaling just in terms of boxes of technology being taken from one site to another, but as the adoption of certain design principles of scaling along both qualitative (e.g. learning) and quantitative (e.g. material) dimensions. The HIS is not seen as a black-box waiting to be transported to the new context, but intimately entangled with the existing infrastructure, and social realities, requiring disentanglement (Berg & Goorman, 1999) or disembedding to be scaled to another context. Once disentangled, the technology may not be directly applicable to the new context as its materiality may need restructuring and reembedding, hence the creation of a new sociomaterial assemblage. This process of disembedding and restructuring requires "generification work" (Gizaw, 2014; Pollock et al., 2007, Sæbo 2013) to enable the technology to work in multiple settings. A generification based design facilitates for easier disembedding and (re)embedding across time-space contexts in the course of scaling.

In summary, our analysis seeks to understand the process of moving HIS from a particular time-space context to others, and the associated design challenges. We conceptualize this process as involving embedding, disembedding, material restructuring and (re)embedding.

3. RESEARCH METHODS

We conducted a comparative case analysis of two instances involving the scaling of DHIS2, within the framework of HISP, a global research and development network coordinated by the University of Oslo, Norway. The network has created the DHIS2 product in 2006, which has since evolved across multiple countries and use areas. Our study concerns two cases where the authors have been intimately involved. The first case involves scaling of DHIS2 functionality to support multidimensional reporting in Ethiopia, and the second concerns a dashboard module developed in India as a local module which failed to spread to other countries.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

381

Empirical data was collected through a variety of means, including actual development activities; analysis of requirement and design documents; interview of designers; participant observation of design activities; and various email exchanges with HISP team members. Data analysis was conducted iteratively, commencing with examination of empirical data, followed by identification of key themes, and the development of theoretical interpretations of scaling as a process of managing sociomaterial assemblage.

4. CASE DESCRIPTION: SCALING OF DHIS2

4.1. Multidimensional Reporting: Born in Ethiopia and Spread to Multiple Countries

4.1.1. The Need for Scaling

DHIS2 is generic software used for collection, validation, analysis and reporting of aggregate statistical health data. It was based on a data model for collecting and processing single value per data element – for example what is the total number of malaria cases in a district which can then be aggregated across a state or country. However, when introduced to Ethiopia late 2006, the existing socio-technical reality demanded support for "multidimensional reporting".

4.1.2. Embedding Specific needs of Ethiopia inside DHIS2

Ethiopia is a poor country plagued with high morbidity and mortality rates, requiring the Ministry of Health to identify specific vulnerable groups based on age and gender breakups of morbidity and mortality. This involves collecting multiple data values per data element. For example, for data element "malaria", value represents total number of malaria cases in a district, state or country; of the total how many were male, female, and sub groups of age - under 4, between 5 and 14; and above 15. This reporting had to be done under the framework of the Integrated Disease Surveillance Reporting (IDSR) programme, which has active donor support.

The global DHIS2 development delegated this development task to the local HISP Ethiopia team based at Addis Ababa University, where one of the authors was the lead designer. Once a sound understanding of the requirements was developed, the programming work turned out to be difficult. DHIS2 is a free and open source system designed using Java plug-ins and frameworks available for download from the Internet. Programmers were required to synchronize their DHIS2 code using version control systems over the Internet. However, internet connectivity in Addis Ababa University was very poor, restricting downloading of required tools. In addition, the connection was configured for email and basic browsing denying the use of online version control and synchronization tools. This made it difficult to directly work with the global team, who then sent the source code and required tools through email to enable asynchronous development.

With tools in place, the local developers made changes to the core, business and presentation layers of DHIS2 and saved them in a local copy called "MM" (for Morbidity and Mortality). In the core layer, the team embedded the specific age and gender breakups required. The business layer was also changed to aggregate breakups. The presentation layer provided an interface that mimicked paper forms. See figure 1.

| | Morbidity in IPD | | | | | | Mortality in IPD | | | | | |
| | Male | | | Female | | | Male | | | Female | | |
Dataelement	0-4 years	5-14 years	>=15 years	0-4 years	5-14 years	>=15 years	0-4 years	5-14 years	>=15 years	0-4 years	5-14 years	>=15 years
Diarrhoea												
Malaria												
Meningitis												
Typhoid												
Typhus												

Figure 1: Morbidity and Mortality report of Ethiopia displayed in DHIS2

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

382

The first release came in 2008, receiving positive feedback from the Ethiopian Ministry of Health, who also requested reports similarly modelled.

4.1.3. Disembedding the Specific Needs of Ethiopia from DHIS2

Following this, one HISP Ethiopia member brought on her laptop the MM system and showed it to the global team in Oslo. A coordinator said:

> "looks like you've done a great job… really heartening to know that we can now handle morbidity and mortality" *(February 2007, Coordinator from the global team).*

However, all were not happy. Another member said:

> "This works fine, but not for countries which don't need the MM. At a workshop in Cape Town we concluded the MM should take care of its data by reusing core objects of DHIS2. By doing it this way the core... wouldn't have to be changed at all … countries not needing MM would not be affected … The implications of this, compared to your code, is you extract all your code from the DHIS2 core modules and make a separate project" *(February 2007, Lead global designer).*

Following the feedback, the team stopped working further and started discussions with the global team towards a generic approach with no "hard-coding" which required restructuring core DHIS2.

4.1.4. Restructuring the Internals of DHIS2

One of the authors of this paper joined the global team and started discussing the technical approach. A first step was to rename the system from MM to multidimensional which represented both single and multivalued reports in a generic fashion including the Ethiopian needs. From the core layer the specific additions of Ethiopia were removed and replaced with more generic Category and Option objects. Categories represented different dimensions such as age, gender, in-patient, out-patient and others identified by users. The Option object represented age and gender break-ups under morbidity, mortality and in-patients. The presentation layer was changed to provide an interface that allowed users to define as many dimensions and break-ups as possible. The business layer was also changed, including the indicator, validation rule and aggregation engines to enable processing of extended data elements and their multiple dimensions.

4.1.5. Reembedding the Generic DHIS2 in Sociotechnical Realities of Countries

The new design went to implementation in Tajikistan where they were collecting about 30,000 data elements involving multiple dis-aggregations of gender and age. The Tajik Ministry ordered to replicate paper forms in totality, including the total columns which could ideally be computer generated. Given the political reality where permissions for change were not forthcoming, the newly designed module was very apt to replicate the paper forms.

During implementation in Tajikistan, in February 2008, a team of developers and researchers established a local Tajikistan team and provided them with trainings to design the complex multidimensional reports, validation rules and indicators, in Tajik and Russian languages. Since then, the multidimensional reporting module has been put to use in more than 40 countries including Sierra Leone, India, Vietnam, Sri Lanka, Kenya, Tanzania, Zanzibar, each involving country-specific customizations.

4.2. Dashboard Module: Born in India, Stayed in India

In the early days of DHIS2, key functionalities included data reporting with validation checks and indicator processing. As usage increased, various states wanted to strengthen data analysis and visualization features. In the end of 2006, a Health Commissioner from one state insisted for a "dashboard" to support graphical analysis by pulling important data, converting them into indicators and displaying them in various formats for easier access. This was the origins of the "dashboard module."

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

383

4.2.1. Embedding Specific Needs of an Indian State

While the dashboard was being developed in India, the global team was busy focused on getting the data entry right, forcing the Indian team to work locally. The Commissioner, a senior, visionary, IT savvy and a strong personality initiated a process where he would call the Indian developers to his room and give them requirements at a very detailed level which they obliged. Their design approach, as explained by the Indian lead developer, was to start the solution "as an independent module without using existing DHIS2 code but using its database". The justification given was, they only needed to pull, process and display existing data.

However, later the developers found it difficult to maintain two separate links, each for the dashboard and the DHIS2, and started to integrate the two by creating a local branch from the global trunk as their working base which gave them local flexibility. This flexibility, helped to develop many interesting features that included integration with Excel and analysis of null and top-10 indicator reports. These improvements bolstered greatly the demand for the dashboard in India, pushing the local team to make more improvements and provide trainings for different users spreading across nearly 20 states in the country.

4.2.2. Failure to Dissembled the Dashboard from Settings of India

Looking the usefulness and success of the dashboard in India, the global team initiated discussions on how the module could become part of the core, and be taken to other countries. A global designer forwarded a mail asking:

> "what is the status of this module now? Is it ready to become an integrated DHIS 2 module?" (October 2007, Global designer)

The global and Indian developers agreed on the importance of integrating the local branch with the global trunk. The Indians started the integration, but they faced incompatibility errors. A global designer traced the error to the dashboard module and recommended to remove it from the trunk until problems were rectified. However, this was a huge challenge, leading to friction between the two teams. The global team accused the Indians that their solution was "a hack and poor workaround", while the Indians felt that the global team did not understand the pressure and situated needs they had to deal with. With the two branches kept apart, both teams went their own ways: the global team improving DHIS2 with latest technology for performance, and the Indians improving their module for local use based on demands from the rising user base.

This separation proved a problem all around. The global DHIS2 could not access the graphical analysis and visualization features provided by the dashboard, and the Indians not having the new updates and functionalities introduced through new DHIS2 releases. Technical attempts to integrate the two solutions failed repeatedly, prompting the global team to decide to redevelop a similar module in the core. The entire HISP team wanted to reach a pragmatic solution by reusing the existing Indian solution with minimal duplication and started to evaluate the source code. The evaluation found this code to be unnecessarily complex, unstructured and spread all over the layers of DHIS2. Since the objective of the Indian team was to fetch, process and display existing data, they did not follow the systemic layers already in place in DHIS2. Code snippets referring to MySQL database and specific Excel report templates were also found embedded in presentation and business layers. This was against DHIS2 design practice which aimed to provide flexibility by not making any specific assumptions of a particular database and reporting templates. Removing the specific code snippets left no dashboard functionality but with thousands of lines of codes with little coherence or modularity for reuse. This convinced the global team to abandon the refactoring process in favor of building a new generic dashboard. To this, an Indian team member replied:

> "[we would] like to stay with the Excel reporting module and dashboard as they are...it has been rolled out and training has been given to hundreds of people on that" *(January 2009, Head of HISP India)*

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

384

In the end, the local dashboard module remained in India and the global team developed a generic solution which currently has been adapted to many countries, and is under constant improvement. The Indians explored its advantages and adapted their approach in 2011. The head of HISP India admitted the generic dashboard solution from the global team will soon completely replace the local solution as it has latest technology and improved functionalities, such as Google Maps. Also, hanging on to the local module would exclude the Indians from getting technical support from the global team which exclusively focused on the global module. However, this would involve a huge challenge of disembedding local users from the existing module which they are used to, for another module. Making this transition for tens of thousands of active users in India is indeed a mammoth task.

5. ANALYSIS AND DISCUSSION: SCALING AS A PROCESS OF MANAGING SOCIOMATERIAL ASSEMBLAGE

In the previous section, we presented two contrasting cases of DHIS2 scaling. In Ethiopia, the expansion was in terms of taking DHIS2 from a level where it supported only single value reporting to a level of multidimensional reporting supporting multiple disaggregation units, representing an expansion in scope and size (Sahay & Walsham, 2006). Originating from Ethiopia, responding to specific needs to support Morbidity and Mortality reporting, the module was then adopted and reworked by the global team, to first be tested and adapted in Tajikistan, and subsequently across various countries, including India. This represented an expansion across time-space dimensions.

The Indian example also illustrates scaling across the material dimension as the dashboard provided new features for analysis and graphical visualization, covering various uses and users in the different states. However, it was found technically inadequate to be moved to other countries as it was not compatible with the generic DHIS2. Ultimately, the module "died" and was replaced by the global module, representing a failure to scale across time and in space. Next, we analyze the dynamics underlying both these scaling processes.

5.1.1. The Embedding Process

In the Ethiopia case, there were interconnected challenges related to the social and the material. From the material side, it was important to engage with restructuring of existing code base, but within an environment of limited internet infrastructure. As a result, they needed to access the code base through email, and then carry out development on local laptops, which excluded inputs from the global team based in Oslo. From the social side, they were faced with challenges in understanding work practices targeted for reducing morbidity and mortality. The team managed to find its way in reaching a working assemblage of the social and the material by embedding local reporting needs in the core, business and presentation layers of DHIS2.

It was a similar process in the dashboard case of India. There again, the expansion was a result of local needs from a state in India, developed using the available technology of MySQL and Excel, based on local urgent exigencies with limited inputs from the global team. The Indian team started the development, but technically did not appreciate the layered architecture of DHIS2, which was not part of their experience. They resorted to a rather "hard-coding" approach. Socially, the team had to engage with responding to the needs of a very demanding Health Commissioner, large user base and, high volumes of data consumption. This gave them little time to brainstorm ideas and reflect on approaches. The apparent disconnect between the Indian and global teams for reasons of both geography and culture, excluded possibilities of external review and comments on the code.

When looking at both cases, we see two levels of the sociomaterial assemblage corresponding to different realities before and after the expansion. From the social side we see organizational demands and practices, leadership environment and funding. From the material side we have

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

385

reporting paper forms, available Internet infrastructure and programming styles. In both cases, the designers managed to achieve the first level of functional scaling which helped embed the DHIS2 within their respective contexts. For example in Ethiopia, the local team had to deal with limited internet infrastructure with use restrictions, and policies of international donors. In India, the assemblage included the vision of the Health Commissioner and various needs from states within short time cycles. Lack of prior experience of the team to work in layered architecture meant that they tried to deal with the social pressures by hard coding reports through direct access to the database. Both the Ethiopian and Indian teams managed to establish a working sociomaterial assemblage, but with limited scaling potential.

5.1.2. The Disembedding Process

Once DHIS2 was embedded in specific contexts, what we had was no more a box of DHIS2 that could be lifted out from one country and shipped to another; rather a sociomaterial assemblage that only made sense in its entirety in the context it was established. Moving the entire ensemble "as is" and planting it somewhere else was impossible as no two countries had identical settings. For example, the comment: "this works only for Ethiopia but not for other countries."

However, this does not mean it is totally impossible to spread a technology from one context to another. This rather demonstrates the challenges and "(im)possibilities" (Berg & Goorman, 1999, p.51) of spreading across contexts. We even experienced this – managed to spread the MM out of Ethiopia but faile with the Indian dashboard. In Ethiopia, the disembedding was enabled by the local developer joining the global team and contributing to the new solution. The urgent demand from Tajikistan for multidimensional module further facilitated the process. This mobility could not be achieved with the Indians who were engrossed in fire-fighting demands of local users which denied them the possibility of collaboration with the global team.

5.1.3. The Restructuring Process

It was important to follow the disembedding with a process of material restructuring. Because what remained after the separation, was some form of materiality devoid of its meaning and a context that lacked required features for users to use. For example, when the team removed all the specific additions of the Indian team from the DHIS2, they were left with thousands of lines of codes that made no sense and a context that had no dashboard functionality. The same had happened with the MM module from Ethiopia but the team managed to bring sense to it through a complex process of restructuring and redesign that introduced new Category and Option objects and associated changes on the core, business and presentation layers of DHIS2.`

The restructuring process in both cases was affected by outcomes of negotiations between designers and also by the affordance and constraints of the materiality itself. For example with the India case, the two groups of designers were not on the same perspective when approaching design. It has also been argued by others that Indian developers are good at carrying out coding tasks rather than creating an overall design and product architecture (Sahay et al 2003). These characteristics surely affected the restructuring process. In Ethiopia, this restructuring was enabled through the local-global collaboration.

5.1.4. The Reembedding Process

In sociomateriality, separating the social and the material is only temporal and analytical; things need to be seen as an ensemble in time-space. For the multidimensional solution to make sense in Tajikistan, the team had to reembed it into a new local setting. The process was a similar one with that of embedding requiring involvement of the locals to understand their needs, build capacity to allow them to adapt the generic solution into their local context, including language.

Such a reembedding process enabled a successful scaling of the multidimensional reporting module. The dashboard module faced a different fate because of the challenges in disembedding and restructuring, making it impossible to do reembedding into multiple other contexts.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

386

Geographical and cultural distance between the Indian and global teams also did not help matters, leading to the decision to create a generic alternative solution, based on modern technologies. As a result, the dashboard module couldn't scale outside the settings of India, but was a success in Indian settings, living a life of its own.

In summary, the case analysis emphasizes two key aspects relating to scaling. Firstly, scaling is better understood as a process of managing sociomaterial assemblage across time-space rather than just as a technical process of expansion or spreading. Such a perspective highlights the inter-connected roles of the social and the material in the success (or not) of scaling processes. Secondly, the scaling process is not a one large step of moving from point A to B, but involves smaller steps, identified as embedding, disembedding, material restructuring and reembedding. This small step approach provides a perspective to better understand the social and material constraints that may arise at different stages of the process, and how they could be addressed.

6. CONCLUSIONS

This study, with its analysis of scaling as a process of managing sociomaterial assemblage brings important practical and theoretical contributions to IS research.

Theoretically, the study extends our understanding of the concept of scaling with due attention to the interplay of the social and the material in time-space. By doing so, the paper addresses some limitations from existing conceptualizations of scaling including its primarily technical focus. Scaling is not only about increasing size, numbers, and volumes, but also about a process of establishing a fit with new work practices, organizational structures, and social processes. There may also be the need to "de-scale" in terms of reducing technology materiality (or functionality) or reducing hardware capacities. Thus, a focus on the constitutive entanglement of the social and the material in time-space brings attention to the process of establishing a working assemblage than on the output of achieving an increase in size or scope.

As a practical contribution, the study offers practitioners a strategy to design scalable systems by targeting practices to address immediate organizational requirements. With scaling seen as a process of tracing multiple heterogeneous sociomaterial assemblages across time-space, chances are that we will encounter multiple organizations and practices requiring different forms of materiality. Thus, processes of embedding, disembedding, material restructuring and reembedding, discussed above, offer practitioners mechanisms to design for more scalable systems.

7. REFERENCES AND CITATIONS

Abouzahr, C. and Boerma, T. (2005) Health Information Systems: the Foundations of Public Health. Bulletin of the World Health Organization 83(8), 578-583.

Baskerville, R. (1999) Investigating Information Systems Research with Action Research. Communication of the AIS 2(19), 1-32.

Berg, M. and Goorman E. (1999) The contextual nature of medical information. International Journal of Medical Informatics 56(1-3), 51–60.

Braa J., Hanseth O., Heywood A., Mohammed, W. and Shaw, V. (2007) Developing Health Information Systems in Developing Countries: The Flexible Standards Strategy. MIS Quarterly 31(2), 381-402.

Braa J., Monteiro, E. and Sahay, S. (2004) Networks of Action: Sustainable Health Information Systems Across Developing Countries. MIS Quarterly 28(3), 337-362.

Braa, J. and Sahay, S. (2012) Integrated Health Information Architecture – power to the users. Matrix publishers, New Delhi, India.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

387

Chetley, A. (2006). Improving health, Connecting People: The role of ICTs in the Health Sector of Developing Countries. A framework paper, Working paper 7, Infodev.

Fowler, M. (1999) Refactoring: Improving The Design Of Existing Code. Addison-Wesley, Reading, MA.

Gizaw, A. (2014) OPEN GENERIFICATION: The case of District Health Information Software. Unpublished doctoral thesis, University of Oslo, Norway.

Heeks, R., Mundy, D., And Salazar, A. (1999) Why healthcare information systems succeed or fail. Working Paper Series Number 9, University of Manchester, Institute for Development Policy and Management, Manchester, United Kingdom.

Heeks, R. (2006) Health information systems: failure, success and improvisation. International Journal of Medical Informatics 75(2), 125–137.

Kimaro, H. (2006) Strategies for Developing Human Resource Capacity to Support Sustainability of ICT Based Health Information Systems: A Case Study from Tanzania. The Electronic Journal of Information Systems in Developing Countries 26(2), 1-23.

Leonardi, P. and Barley, S. (2008) Materiality and change: Five challenges to building better theory about technology and organizing. Information and Organization 18(3), 159–176.

Monteiro, E. (1998) Scaling Information Infrastructure: The Case of the Next-Generation IP in the Internet. The Information Society 14(3), 229-245.

Monteiro, E. and Hanseth, O. (1995) Social shaping of information infrastructure: on being specific about the technology. In Information Technology and Changes in Organizational Work (Orlikowski, W., Walsham G., Jones, M. and Degross, J. Eds), pp 325–343, Chapman & Hall, London.

Orlikowski, W. (2007) Sociomaterial practices: Exploring technology at work. Organization Studies 28(9), 1435–1448.

Orlikowski, W. and Scott, S. (2008) Sociomateriality: Challenging the Separation of Technology, Work and Organization. Annals of the Academy of Management 2(1), 433-474.

Pollock, N., Williams, R. and D'adderio, L. (2007) Global Software and its Provenance: Generification Work in the Production of Organizational Software Packages. Social Studies of Science 37(2), 254-280.

Sahay, S. (1997) Implementation of information technology: A time-space perspective. Organization Studies 18(2), 229-260.

Sahay, S. and Walsham, G. (2006) Scaling of Health Information Systems in India: Challenges and approaches. Information Technology for Development 12(3), 185–200.

Sæbø, J. (2013) Global Scaling of Health Information Infrastructures: Circulating Translations. Doctoral thesis, University of Oslo, Norway.

Shaw, V., Mengiste, S. and Braa, J. (2007) Scaling of Health Information Systems in Nigeria and Ethiopia – Considering the Options. In Proceedings of IFIP WG 9.4, Sao Paulo, Brazil.

Susman, G. and Evered, R. (1978) An assessment of the scientific merits of action research. Administrative Science Quarterly 23(4), 582-603.

Walsham, G. and Sahay, S. (2006) Research on Information Systems in Developing Countries: Current landscape and future prospects. Information Technology for Development 12(1), 7–24.

Walsham, G., Robey, D. and Sahay, S. (2007). Forward: Special Issue on Information Systems in Developing Countries. MIS Quarterly 31(2), 317-326.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

388

WHO (2000). Design and Implementation of Health Information Systems. World Health Organisation, Geneva.

Zamutto, R., Griffith, T., Majchrzak, A., Dougherty, D., and Faraj, S. (2007) Information technology and the changing fabric of organization. Organization Science 18(5), 749–762.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

389

DEVELOPMENT AND ICT-ENABLED WELL-BEING

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Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

390

IMPACTING ON GENDER EQUALITY THROUGH A WOMEN'S ICT PROGRAM IN SOUTH ASIA - AN EXPLORATORY STUDY

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Abstract: Educating women for ICT-based change can be seen as an ICT4D intervention. This paper fills the gap in the literature of capabilities and ICT education for gender equality. This is done by a study of the creation of an undergraduate ICT program for women by a higher education institution in South Asia. It is focused on the qualitative, subjective self-assessment of the students. The case is investigated through the capabilities approach as formulated by Sen, and then applied to the higher education sector by Walker. Based on our data, we conclude that through ICT undergraduate programs, it is possible to develop South Asian women with capabilities in programming *and* interdisciplinary liberal arts. The study shows that students remain loyal to their families and acquire more advanced strategies for personal empowerment, not least emotionally. The four years of intervention reorient their imagination in many ways, outlined in the paper. Furthermore, the data points toward the direction that a women's ICT program has positive impact in several ways, but in particular seems efficient in symbolizing progressive women positively on the regional level, and in particular at the local level of communities.

Keywords: Women's Colleges, Gender, Higher Education, ICT4D

1. INTRODUCTION

There is a rich literature on Computer Science (CS) and Information and Communication Technology (ICT) in higher education, and on how the use of ICT affects education and gender. There is also a voluminous literature on capabilities and education (Sen, 2001; Walker, 2006). But in these research fields there is not much being written on how ICT-educational programs can affect women.

Universities can be regarded as drivers of ICT for Development (ICT4D) through developing ICT capacity (Harsh & Zachary, 2013). We want to study this further through focusing on students with ICT-related capabilities. Our particular study is on Asian University for Women (AUW), taking as its mission "to cultivate successive generations of women leaders who possess the skills and resources to address the challenges of social and economic advancement of their communities." (AUW, n.d.a) , including women leaders with in-depth knowledge of ICT.

The majority of CS programs in the Global South concentrate on providing the students primarily with subject matter knowledge. There are also some that have a more focused strategy on acting as societal change agents. AUW has since its inception aimed at providing gifted, but educationally and (in most of the time) socially disadvantaged women with a high-quality education. This is not just for correcting the persisting asymmetric access to education. AUW believes that its alumni will go out in society and act as change-makers, undermining the patriarchal structures in South and South-East Asia. While women's universities is an old phenomenon (Renn, 2014), and the outcomes of such institutions have been debated (Nishio, 2008; Renn, 2014), we do not know enough about the outcomes of such programs in the specific

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

391

context of CS and ICT. Such knowledge is valuable for institutions that are starting up, and for the donors funding higher education. We believe, this research work will be an important contribution in providing assistance to evaluate the effect of CS/ICT programs in other universities. Such a comparative basis can furthermore helps the potential funders of women education, ICT4D leaders, and policy makers.

This paper moreover aims for providing some inspiration for ICT4D education. In our view, this question cannot be reduced to the level of courses with ICT4D literature in the form of a primer or research papers from good ICT4D journals. It is also a question of sustainability, and sustainability is interconnected to structures of education.

The objective of this paper is *thus to report the outcomes of the Computer Science (CS)-Information and Communication Technology (ICT), hereafter CS-ICT, program at AUW at the individual level*. This is a case from one institution, which brings many of the advantages and limitations for a case study (Flyvbjerg, 2006); in this case it allowed the researchers to trace the complex relations in the group and reach a deep understanding, rather than an understanding of the variance of the impact on female Computer Science graduates across the Global South. However, even if it is a single-institution study there are lessons to learn for those that are teaching and involving female students with similar characteristics in normal computer science or MIS programs. As the graduates are still only in their very first steps in their career, it is still impossible to determine whether this program would impact on the way ICT is built, and thus the study is delimited to the impact on the students. AUW and its CS-ICT program has a unique approach to drive sustainable development through a gender-aware intervention, something we think warrant attention and analysis, and will outline in Section 2.

2. THE SETTING – ASIAN UNIVERSITY FOR WOMEN

Established in 2008 and based in Bangladesh, AUW is a start-up liberal arts university with nearly 550 students from 16 different countries. The primary uptake is from South Asia. The core objective of this institution is to develop women's leadership through interdisciplinary curriculum and community based service learning. AUW select their students based on their merit and also commitment and contribution towards socio-economic development (AUW, n.d.a). The official cost of education is US$ 12,000 per year for each admitted student. However, the majority of the AUW students till now received financial scholarships and tuition waivers from the university. The university is focused on attracting internationally trained and highly qualified teaching and administrative staff for planning and implementing its programs. All these have made the AUW project significantly costlier than its peer private and public universities in the region.

CS-ICT at AUW aims to educate students who aspire to work in the ICT Industry and Development Sectors. This 4-year program leverages technical ingenuity together with social insights across the disciplines in order to address challenges in ICT4D-relevant areas such as health, microfinance, entrepreneurship, governance, education, and civic activism. CS-ICT envisions the students to work in multi-disciplinary and intercultural teams, delivering global solutions. The vision behind CS-ICT is that it would enable AUW to develop future leaders in the ever growing field of Communication and Computing Technology, empowered with holistic knowledge about global as well as local socio-economic issues, and equipped to solve the related real world problems from the front (AUW, n.d.b).

3. RELATED WORK

3.1. Related work on capabilities, Gender and ICT

There is a rich literature on ICT in higher education from a developmental perspective (Georgsen & Zander, 2013; Marshall, Kinuthia, & Taylor, 2009). The use of ICT in higher education and how it brings gender empowerment in a developing context has also been studied

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

392

(Purushotaman, 2013). There is furthermore a voluminous literature on capabilities and education, but they only discuss peripherally the subject (Walker, 2006). However there is very little being written on how ICT programs can affect development (interesting exceptions being Negash, Watson, & Straub, 2008; Gregory, 2009). Especially this is the case from a capability perspective. Since the capability approach is appreciated as useful to the field of ICT4D, this work will be a valuable contribution to the further mapping of development by ICT in education.

AUW is not alone in including "gender positive initiatives" in their operations. There are no figures of the number of women's colleges in South Asia as a whole, but in India alone there is estimated to be over 2,500 colleges (Radha, 2011). Almost all of them, however, operates under much more humble financial conditions. The ones who also have an attitude-changing (or reinforcing) agenda influence students' values about marriage, career and feminism (Indiresan, 2002, 2011). We are not aware of any research literature that empirically cover the impact of women's universities institutions in the field of ICT. What we have seen in other developing country contexts is that dual-sex universities in current practice can have unequal access to facilities for women, women are underrepresented in their democratic organs, and women become expected to complete their social and family duties, resulting in less time in computer classrooms or libraries(Mhambo-tata, Mlambo, & Mwatsiya, 2009). We have observed widespread inequality in using ICT by women, beyond the education sector as well (Hilbart, 2011; Hossain & Berresford, 2012; Khan & Ghadially, 2010).

Of great relevance to a study such as this one is what will face the students on the employment market. There is limited research in this area in the region of South and South-East Asia. Work from East Africa (Abagi, Sifuna, & Omamo, 2009) indicate that skills is only one factor out of many aspects here, and if university is to be the single most important tool to succeed in the later career, it should hence not focus only on skills development.

3.2. Theoretical Framework

This paper follows the capability approach as created by Sen (2001) and then elaborated by Walker (2006) for the context of higher education. The core concept is capabilities, a concept referring to the level of individuals, as skills. More specifically, it refers to skills as a way to reach attainable options thanks to those skills and aptitudes. To this Walker adds capability as opportunity (Walker, 2006), and thus transcend the skills perspective (see also Barnett, p. 440). The proper creation in a society of opportunities cannot be understood from the perspective of a single individual, but rather by relationships between individuals. Walker (ibid) describes this as that the capability approach is "ethically individualistic", but not ontologically so.

The ultimate goal of increased capabilities is the increase of well-being, for self and others. Sen takes well-being to be "the primary feature of well-being can be seen in terms of how a person can function, taking that term in a very broad sense" (Sen, 1985, p. 197). Functions/functioning can be both activities and states of being, such as eating, reading, seeing, or not being ashamed of poverty or clothing. The sum of accomplishments is the "functioning vector", the total well-being. Well-being should not be reduced to pure utility, pure happiness (as a mental state) or desires. It is important that a learner not only gets increased skills and opportunities, but also values them - in that way the capabilities will also be exercised. The focus is on developing capabilities up to a certain threshold level, where well-being starts to manifest (Nussbaum, 2006).

Walker has operationalized the capability approach to a list of capabilities that higher education can and should address at the individual level. (Walker, 2006, p. 121):

1. Practical reason.

2. Educational resilience

3. Knowledge and imagination.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

393

4. Learning disposition.

5. Social relations and social networks.

6. Respect, dignity and recognition.

7. Emotional integrity, emotions.

8. Bodily integrity.

It is useful to apply this framework in order to see whether participation in learning activity orchestrated by AUW is related to development of these capabilities. This framework has been used in our method (see below).

Finally, it can be noted that the capability approach forces us to think what we mean by development through education, and how we should pay attention to the quality of the higher education experiences between students by considering their own perceived achievements, rather than achievement as measured by policy-making institutions or input-output measures, instead of only quantitative studies (Unterhalter, 2003).

4. METHOD

The AUW is interesting as an example of extreme case (Flyvbjerg, 2006) study of what kind of impact that can be achieved under very favorable conditions. AUW has good resources at its disposal. Furthermore, the students are exactly the change agents that a gender-aware ICT4D community would like:

- Intellectually capable

- Educated for leadership

- Women (i.e. addressing the gender skewing)

- Interested in grassroots questions

- Many come from socially disadvantaged backgrounds (class skewing)

Whether evaluation should be made by students, by comparison between institutions, or by experts is a long-standing discussion. Each approach has its merits. We have put emphasis on students' subjective change of motivation in life, and their relationships with their community, where **self-assessment** at this stage tells things that will only be shown after years of performance in subjects' careers. We duly recognize the limitations due to risk of misperception of capabilities. For instance, the students have undergone extensive training in academic English and every student is totally fluent, have competences in understanding western guest faculty, but as we shall see in the next section, they take it for granted and do not see that development. Still, their perceptions will highlight what they value, and many other aspects of capabilities.

We took the first graduate class (16 students) and interviewed 6 students individually, with a duration of circa 1.5 hours each in 2012. Based on the analysis of these semi-structured interviews, we made one additional 2-hour focus group interview with 5 more students (voluntary, and consenting to research participation). The sample was purposeful in both cases, aiming to cover many nationalities, castes, class and academic performance. We aimed to further illuminate specific capability issues that were only superficially covered in the first round. Moreover, the focus group spawned some reactions to individual students' statements. The interviewer was also one of their past teachers and knew the students well. The interview guide was constructed with departure in Sen's and Walker's writings. The data were coded with a coding scheme with key concepts from the same literature (e.g. #skills, or #change of preferences). In accordance with the dense format of this paper, we have applied a thematic analysis inspired by Braun & Clarke (2006) for the process and presentation of the analysis. We have focused on the results that we found to be most significant, but also repeated patterns

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

394

across interviews. We have deliberately been quite exploratory (ibid), in order to allow for promising themes in the data, whereas the limitation of such a strategy is that its findings may be relatively tentative and benefit from further inquiry. The themes appeared after our initial rounds of coding, where we saw where the most "dense" material was. Our search for interpretations was guided by a critical realist epistemology. Although the interviewer was an AUW CS-ICT faculty during the interview process, he was not in a position to influence any of the interviewees' academic results.

5. RESULTS

The results were organized in identified themes, and we report the most salient and significant themes below.

5.1 The Capability of Knowledge and Imagination

This theme concerns at its core the subject knowledge, the discipline of computer science, but also contextual knowledge of the liberal arts, which AUW is committed to. The students all identify their main knowledge as Computer Science and ICT, despite the liberal arts 'touch'.

The student respondents feel that their main capability being programming and applied areas, such as mobile development. They feel that they have tried working as programmers, so they know what that professional everyday life will be like. Students got inspired in various directions outside core CS, such as e.g. animation drawing. They acknowledge that they are still learning in these areas, and imagine themselves to build further skills in the supporting areas. Interestingly many of them have felt inclination to teach ICT, and apparently have sufficient subject skills to do so. They also perceive themselves to possess much broader and different skills as compared to other CS graduates. A common opinion is that their education cannot be reduced to skills in an area, put best by this student (R5):

"...education not only means having the certificate in any area, it also shapes your life in this way. You have to be capable of identify what's good, what's bad, what's right and what's wrong. And...computer science is a tool. It's like through computer science, you can integrate with any other subjects in any other areas."

The program has made the respondents open to interdisciplinary education, and they are conscious about changes in ethical stances. But ideas related to such multiplicity have some variations. One of respondents (R6) states e.g. *"By studying CS, we think more technically, not the practical way. Practical in the sense that ... other people's points of view. I always like, 'Oh, this is not my topic.' So I avoid that. I don't know how the CS education can change my point of view"*. Hence, this is a matter of personal inclination.

In spite of being from an all-women university, AUW students got rich opportunity of working with male peers between semesters, outside the university. Respondents feel that they have strategies (skills) for talking to people (men and other women) outside their comfort zones, for instance, they learned that it is more effective to prove that they have factual knowledge first, before offering their point on a certain question. They are not uncertain (even they have been in the earlier stages of their education) of their opportunity to exercise their knowledge in debate and discussion in male-dominated workplaces. At the same time, they are well aware the omnipresence of discrimination. But we saw very insignificant levels of resignation.

The respondents say that they do not "know enough" about many curriculum subjects, but they are not able to explicate the threshold level for their skill where they "know enough" to be capable - especially when they have not attained it yet. Their threshold levels become uncertain due to the lack of practice. In it our judgment, it is only sound with some doubt, which arises in every critically minded student from time to time.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

395

Generally, the students feel that education *is* opportunity. They perceive their education as a great resource when getting an internship and their basic training provides them a platform[1]. Conversely, beliefs in autodidact alternatives to their path of life are almost absent.

5.2 Influence of Family

Overall, the respondents identified "family" to be a critical factor in their lives. They found family to be a source of positive support as well as negativity. Some of our respondents experienced tension within the household and the larger community for speaking their mind on social issues. The majority of the respondents shared their concerns about marriage and how in-laws family can have negative impact over one's career. To ensure better decision making for the future, many of our interviewees expressed interest to share their own knowledge and experience with the family members, especially the young ones.

In most cases, families were found to be supportive of the respondents' education and future career, even when the surrounding social elements were not that enthusiastic about women's higher education. In general, we found fathers to be the champions of women education and career development. One of our respondents mentioned about her father's perception about an ideal job for her (R5): *"He is very proud of me... My dad is now thinking someday I will work in NASA..."* Another student said: *"With the study and education, he [father] always supports...he also supported my sister."*

The participants highlighted some negativities too from the family front. Some parents were not much enthusiastic about AUW education. According to them, university degrees can jeopardize the girls' prospect of getting good partners with equal or higher profile. In addition, the extended family members, primarily the male members, across the societies our respondents represent, showed negative attitudes towards women education, specifically in CS/ICT/Engineering (R3):

"...once when I was coming from home on a vacation...my uncle made a comment, that it's a good idea for my younger brother to study engineering, but it's not useful for me to study computer science, what I will do and why, as a women, I should go for this one."

The idea of marriage and the prospect of dealing with future in-laws turned out to be major sources of anxieties. Almost all of them believed that marriage can adversely affect their utilization of their education and professional aspirations. They mentioned the traditional social expectations, where the girls live with their in-laws after marriage and the primary responsibility of the decision making on education, work, and other issues lies with the husband and other male members of the in-laws family. One participant of the focus group reflected on her possible helplessness (FG-1):

"...maybe you have some plans, but from your in-laws' side, they are not supportive. You want to study outside, maybe they won't allow you to go outside to study. Or maybe if you want to work, they may not support."

Our respondents also mentioned families, where female education is seen as an opportunity for better jobs - not for greater women empowerment but for meeting the ever-growing demand of dowry. A respondent (R1) shared:

"So my father usually says you have to find your own money to pay your dowry. So before coming here (AUW) that was what I was thinking. If I want to be successful, I should be able to finance myself and get married"

During this research, we found the majority of respondents to be eventually open on working out possible solutions to this "marriage" problem. Some of them stressed on the importance of achieving independence and getting empowered before getting married, some focused on the

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[1]There is a tradition in South Asia to train for general skills rather than immediate employability: See e.g. the situation for Indian engineers (Aspiring Minds, 2014)

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

396

value of balancing between professional and private life, and some talked about future "friendly partners", who can support the women in fulfilling their aspirations.

5.3. Change of Preferences

A significant portion of the conversations was about what in Walker's (2006, p. 40) terminology would call adjusting expectations of life. The respondents talked about their own and their surroundings' change of preferences about education, family, empowerment and career. AUW's CS-ICT program helped the interviewees to conceptualize education beyond diplomas and GPAs. They identified the need of being proactive in community works and highlighted that the benchmark of a thriving career not only depends on salary or profit, but also on the level of positive contribution one can have on her society. They acknowledged the importance of inclusiveness, equity, individuality, and critical decision-making.

The respondents now consider an ideal education as an enabler for independent decision-making. Among the regions from where the respondents came from, there are considerable similarities between the expected monotonous goals and singular objectives of education (e.g. getting good grades, finding jobs, etc.). However, the cross and multi-disciplinary nature of liberal arts education introduced to the AUW students' immense possibilities, as evident from the research interviews. One respondent (R1) said:

"my community usually sees education not as understanding each other and looking at life in a different way...AUW education is that it gave me a chance to look into others' lives in a different way, look things in different points of views...it can be from social dimension or economic point of view, those sorts of things....

The basic aim of education should not be just to get a job, but should also for someone to be able to understand that "OK, these things are happening, what we should do, what sort of difference we can make in our community."

Similarly, the respondents thought that CS-ICT education in AUW has provided something extra, due to its liberal arts nature. It was beyond their expectation and they believe that such experience would provide them a competitive edge over their peers from other CS programs. According to one student (R1):

"When I first started I thought being a computer science major, I will be good at programming when I finish,... but back in Kerala no one teaches what ethics is, what the problems in ICT field are, and how technology can be use for community development...that is the difference AUW brings up."

The idea of a 'successful woman' was also changed for all the interviewees. For them, to become an accomplished woman, one now needs to do more other than just taking care of families and earning money:

"Before coming to AUW, I imagined a successful woman should be married to a good husband, he would have a job, she also needs to have a job. It doesn't need to need to be like a very good job...but after AUW, a successful woman needs to have a career that she loves to do, and she doesn't need to be married." (R4)

In the narratives, we found many of their parents to be at first skeptical about the usefulness of CS or any other technical education for girls. Different social opinion makers even questioned the quality of AUW's CS-ICT education. However, after seeing the gradual positive changes among the students their perceptions altered too. Our respondents' effective approaches on ICT related issues and problem solving exercises were critical in building such positivity. In addition of the formal university education, AUW offered internships for all its students including the Computer Science ones on many leading local, regional, and international ICT organizations. Such exposures assisted our AUW students in mustering more experience, and for expanding their horizons (R1):

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

397

"Before AUW education it would have been someone who is working at an outsourcing firm...now it can be in a cyber crime field or in the policy-making field or who can do programming. So I realize that there are much more opportunities for the CS graduates, not just programming."

Beyond career ambition, social calling, or effective learning process, the respondents stressed on their evolved conceptualization of empowerment. Many, in their pre-AUW lives, thought of empowerment as directly equitable with a high paid job, or a state of a society where women feel safe – or were completely unaware. The impact of liberal arts education in CS studies was evident in the interviewees' latest thoughts on empowerment. Some of them think that empowerment should not be confined to traditional success. It needs to ensure the construction of a society where the women are not required to be saved, but will be freely choosing to do something that truly makes them happy. For many, empowerment now means a socio-economic stage that provides the strength to fight against internal as well as external discriminations:

"I think empowerment for women should make her feel that she doesn't need to prove that women can work. She only needs to prove that she can work, as a person..." (R4)

"Empowerment is being independent emotionally, not just financially. Financial independence is a basic form of empowering women, but being emotionally independent is very essential." (R2)

The emergence of all these changes of ideas and multiplicity of thoughts has confused the respondents as well about their future course of action. According to them, their new personal thought-models are at times found to be in conflict with their families' and societies' expectations. Some of the respondents highlighted the challenges they are facing with career choices. They mentioned their fears about confronting the traditional norms to attain their ideal empowerment and career goals. They are now skeptic about settling back in their own societies. These thoughts additionally confirm the changes of preference that took place within themselves.

6. DISCUSSION & CONCLUSION

In sum, we have highlighted how the AUW has developed students with perceived capabilities in programming, yet with an interdisciplinarity through its basis in liberal arts, and have created changed valuations of skills in many dimensions. Unsurprisingly, the family remains salient in our respondents' minds and 5 years on an intercultural campus with countercultural undercurrents has not broken that social bond. Many of the respondents are social "pattern-breakers", but none of them denounce their family; they rather develop strategies "from within" the social system, such as using the career to raise sufficient money for dowry, or moving back to the home region, but sufficiently far away from family in order not to be constantly monitored. Even a progressive intervention such as the CS-ICT program, will cause not only social transformation but also social reproduction (e.g. of the dowry practice) (Renn, 2014, p. 113 ff.). As illustrated, their relationships are mainly positive of ICT education, but also include conflicts.

To Walker's list of capabilities in Section 3.2, we might add a capability in this case – symbolic value. What AUW seems uniquely positioned to do in terms of developmental *gender equity impact*, is to create *symbolic value* - by highlighting capable females. Renn (2014) describes the importance of symbolic function of female higher education generally. It draws attention to the status of women, existing but also potential, and the changing status. Our empirical material elaborates this function, specifically in the ICT context. The respondents are both oriented towards social change, constructively opposed to family structures and their home regions, and have skills that will actually make them professionally capable to make a difference, perhaps also rising in the ranks. While we do not want to fetischize "the career", it is a fact that graduates with prestigious titles and high salaries will function as a symbol. Some people with orthodox

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

398

mindset in the students' home regions may adjust their interpretations on the limits of what women are able to accomplish.

AUW can never reach massive impact, as the number of women is so large in the region. Due to AUW's high costs per student, the model does not scale, but this a limitation, not a weakness. We think that symbolic value may one of AUW's most important developmental functions; showing the local communities and families that their women, if they get the chance, can grow into irradiant, strong, non-stereotypical, spirited computer professionals. There is a crying need for non-stereotypical women in the ICT industry (Abagi et al., 2009). The full impact will only be measurable when the graduates peak in their careers many years ahead from now, and their perceived well-being and effect on local community can be fully felt. We can only assess the relation to their community back home, and their potential to succeed in their career and life. The symbolic value effects will discharge throughout the social system after graduation. Younger girls from their local community will have a concrete remainder that they should have high expectations for themselves, that they can go into workforce, highly educated. The classes are also adding to the symbolic value, proving that the woman in question is not a single exception, but a regularly occurring phenomenon. Even if the graduate will not succeed on the labor market, even the bachelor degree itself will have effect (Renn, 2014, p. 123). Furthermore, the CS-ICT program intervention affect areas in the periphery, where gender inequity in South Asia often persist. It had in many cases not been acceptable to offer a girl from such areas a scholarship to a co-educational institution. Our work here at least showed the potential and some success of women only CS-ICT program in a developing country's setting, which can be used as a benchmark for further development in STEM and related technical education for women. A logical step for further research is a tracer study in a few years, in order to analyze the life paths of the alumni and their networks, when reactionary elements of marriage, childbirths and other institutions have exerted their full pressure on the graduates.

7. ACKNOWLEDGMENTS

8. REFERENCES

Abagi, O., Sifuna, O., & Omamo, S. (2009). Professional women empowered to succeed in Kenya's ICT sector. In I. Buskens & A. Webb (Eds.), *African women and ICTs* (pp. 169–182). London: Zed Books.

Aspiring Minds. (2014). http://www.aspiringminds.in/researchcell/whitepapers/national_employabilityReport_engineers_annual_report_2014.html (Retrieved 2014-10-02)

AUW. (n.d.a). AUW mission. Retrieved from http://www.asian-university.org/About_AUW.htm

AUW. (n.d.b). ICT program description. Retrieved from http://www.auw.edu.bd/computer-scienceinformation-and-communication-technology-csict/].

Barnett, R. (2009). Knowing and becoming in the higher education curriculum. *Studies in Higher Education* 34, 4. p. 429–440.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. doi:10.1191/1478088706qp063oa

Flyvbjerg, B. (2006). Five Misunderstandings About Case-Study Research. *Qualitative Inquiry*, *12*(2), 219–245. doi:10.1177/1077800405284363

Georgsen, M., & Zander, P.-O. (Eds.). (2013). *Changing education through ICT in Developing Countries*. Aalborg: Aalborg University Press.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

399

Gregory, J. (2009). A complex model of international and intercultural collaboration in health information systems. In S. Poggenpohl & K. Sato (Eds.), *Design integrations - research and collaboration* (pp. 247–273). Intellect Ltd.

Harsh, M., & Zachary, G. P. (2013). Computer science research capacity as a driver of ICTD innovation: institutional factors in Kenya and Uganda (pp. 53–56). ACM Press. doi:10.1145/2517899.2517943

Hilbart, M. (2011). Digital gender divide or technologically empowered women in developing

countries? A typical case of lies, damned lies, and statistics. Women's Studies International Forum 34, 479–489

Hossain, S., & Beresford, M. (2012). Paving the pathway for women's empowerment? A review of information and communication technology development in Bangladesh.

Contemporary South Asia, Vol. 20, No. 4, December 2012, 455–469

Indiresan, J. (2002). *Education for women's empowerment: Gender-positive initiatives in pace-setting women's colleges.* Delhi: Konark.

Indiresan, J. (2011). Moving beyond academics: Gender positive initiatives in pace setting women's institutions in India. In *Universities for women: Challenges and perspectives* (pp. 31–53). Delhi: Women Press.

Khan, F., & Ghadially, R. (2010). Empowerment through ICT education, access and use: A gender Analysis of Muslim youth in India. Journal of International Development,22, 659–673, Wiley InterScience,

Marshall, S., Kinuthia, W., & Taylor, W. (Eds.). (2009). *Bridging the knowledge divide: educational technology for development*. Charlotte, NC: Information Age Pub.

Mhambo-tata, B., Mlambo, E., & Mwatsiya, P. (2009). when gender-blind access results in discrimination: realities and perceptions of university students in Zimbabwe. In I. Buskens & A. Webb (Eds.), *African women and ICTs* (pp. 67–76). London: Zed Books.

Negash, S., Watson, R., & Straub, D. (2008). An african PhD program in Information systems: The case of Addis Ababa University, Ethiopia. *African Journal on Information Systems*, *1*(1), 67–76.

Nishio, A. (2008). The Significance of the Existence of Women's Colleges and Their Entry into Science-Related Fields. In *Information technology and economic development* (pp. 278–290). London: IGI Global.

Nussbaum, M. C. (2006). *Frontiers of justice: disability, nationality, species membership*. Cambridge, Mass.: The Belknap Press : Harvard University Press.

Purushotaman, A. (2013). *Empowering women through learning to use the internet* (PhD Thesis). Aalborg University.

Radha, N. N. (2011). A review on women's education in India. *Pragati Quarterly Research Journal*, *5*(118), 32–50.

Renn, K. (2014). *Women's colleges and universities in a global context*. Baltimore: John Hopkins university press.

Sen, A. (2001). *Development as freedom*. Oxford: Oxford University Press.

Unterhalter, E. (2003). Crossing Disciplinary Boundaries: the potential of Sen's capability approach for sociologists of education. *British Journal of Sociology of Education*, *24*(5), 665–669. doi:10.1080/0142569032000148708

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

400

Walker, M. (2006). *Higher education pedagogies - A capabilities approach*. Maidenhead; New York: Society for Research into Higher Education & Open University Press. Retrieved from http://site.ebrary.com/id/10175267

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

401

WOMEN AND ICT-ENABLED WELL-BEING: INCLUSIVE INNOVATION BY MICRO FINANCIAL INSTITUTIONS IN INDIA

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Abstract: Increased interest in lower income consumer groups in developing markets has led to the conceptualization of inclusive innovation (the means by which new goods and services are developed for marginalized groups such as those living on lowest incomes). But so far researchers have not addressed fully the development impact (issues such as well-being, empowerment, equality and poverty reduction). Research needs to address its impact both on the demand side (consumers) and on the supply side (for example banks and technology providers). This study seeks to enhance our understanding around issues of impact evaluation in the context of inclusive innovation. The research was undertaken with a micro financial institution and its partners in India where firms have progressively focused on poor women in rural areas and provided them with mobile-enabled savings facilities. On the demand side our study demonstrates that such innovation has a positive impact on the livelihoods and well-being of women in both absolute and relative terms. Supply side issues such as process improvement and effective use of existing resources are also considered.

Keywords: Well-being, Women, Inclusive innovation, ICT4D, Mobile-enabled savings, India

1. ICT FOR DEVELOPMENT AND WELL-BEING

Information and communication technology for development (ICT4D) began to gain attention of both researchers and practitioners in the 1980s. ICT4D is an interplay of three aspects: information, technology and development (Heeks, 2007). The development aspect refers to issues such as well-being, better quality of life, empowerment, equality and poverty reduction.

Every year huge investments are made in ICT4D projects by public and private sector organizations, especially in emerging economies. However, the development impact remains questionable. For example, it is unclear whether or not the use of mobile phones in rural communities has led to social and economic development (Abraham, 2007; Tarafdar et al., 2013). Some research has documented ICT4D projects that failed to achieve anticipated benefits (Corea, 2007; Thirumavalavan & Garforth, 2009), such as the geographical information systems introduced by the Indian Ministry of Environment and Forests for forestry management (Heeks, 2002) and telecenters for agricultural development in rural India (Thirumavalavan & Garforth, 2009). Poor management, resistance to change, and complex power structures are some of the factors responsible for these failures (Silva & Hirschheim, 2007). In addition, impact assessment of ICT4D projects has tended to focus on the measurement of technical and financial aspects, with less emphasis on development issues (Thapa & Sæbø, 2011). Thus there is a need to address the development impact of such projects.

Impact evaluation is crucial for ICT4D projects. First, ICT initiatives in developing countries as a whole are driven more by supply than demand (Chaudhuri, 2012). Thus, in addition to these supply factors it is important to understand demand and usage patterns in order to evaluate their impact. Second, ICT4D projects involve multiple actors such as public and private firms, social

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

402

enterprises and governments (Heeks, 2012). Accordingly, it is also important to explore the views of the different actors on development impact and assess to what extent they share the same objectives and visions. Third, although the development impact of ICT investment in terms of technological infrastructure, diffusion and usage is well established, there exist inequalities of location, age, gender, education and income (Heeks, 2010). Development relates to human well-being and includes factors such as better quality of life and material conditions (income and employment) (OECD, 2013). Therefore, research in ICT4D requires a more holistic understanding of how projects have resulted in development impact, for example, on people in rural communities and neglected groups. In addition, a recent surge in mobile technologies has paved the way for innovations in products and processes (Duncombe & Heeks, 2002). The majority of studies have reported primarily on descriptions of these initiatives without exploring why and how they could lead to developmental outcomes (Tarafdar et al., 2013). Thus it is essential to assess the development impact of ICT4D projects.

As ICT use and digitization continue to spread throughout the world, the need to understand the nature and extent of the relationship between ICTs and marginalized citizens assumes greater significance. In addition, while considering whether or not the development reaches out to those marginalized (e.g., women and people at the bottom of the pyramid), it is important to understand if ICTs enable well-being and open opportunities for employment and income. In developing countries, factors such as low literacy rates, caste, culture, gender, and religious issues can pose hurdles in accruing benefits to the vast majority of the population (Thapa & Sæbø, 2011). For example, Tarafdar et al., (2013) argue that ICT-based innovation can increase marginalization of already marginalized members of society such as women, rather than the contrary due to technological barriers. For instance, women may not know how to operate Internet-based kiosks and thus get excluded from ICT4D projects requiring such access.

The topic of ICT usage and women has caught the attention of many researchers. Hafkin & Huyer (2007) argue that ICTs impact men and women differentially and women have many disadvantages that result in less access to ICT and less usage. In addition, it is uncertain whether ICT represents an opportunity for women (for example, used by women for the purposes of community building and political organization) or a threat, putting women at a significant disadvantage (Hilbert, 2011). Potnis (2014) contends that due to male-dominated cultural practices, the living conditions of women at the lowest social stratum are worst in India. Men typically control almost all aspects of their lives and women are sometimes not allowed to make major decisions related to their life. For instance, in rural India, women who use mobile phones are sometimes ridiculed or threatened by men (Potnis, 2014).

Thus, there is some debate about whether ICTs enable well-being or marginalize disadvantaged groups such as women. There is a need to comprehend specific courses of action through which ICT can lead to development in these marginalized communities (Avgerou, 2008). Consequently our research question is: *How do ICTs impact the well-being of women?* In this paper, we address the research question by investigating the impact of a mobile technology on the social development and well-being of women in a rural area. Specifically, we explore how micro financial institutions in India are leveraging mobile technologies for the development of poor women in rural communities. To address our research question, we employ the theoretical lens of inclusive innovation as it argues for an active involvement of the marginalized in the design, development and implementation of ICTs. In addition, it also entails active participation of innofusion intermediaries who support the diffusion and adoption of ICTs in local communities (Foster & Heeks, 2013b). In the next section, we introduce and discuss the framework of inclusive innovation.

2. INCLUSIVE INNOVATION

Inclusive innovation is an emerging form of innovation in developing countries and is the means by which new goods and services are developed for and by the billions living on lowest incomes,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

403

marginalized groups such as women, youths, handicapped people and ethnic minorities. Inclusive innovation involves the participation of the marginalized in identifying their development priorities and in providing incentives for various actors to address their needs.

Unlike the Systems of Innovation (SoI) framework (Edquist, 2005) which has been used to analyze innovation policy in developing countries, inclusive innovation explicitly conceives development in terms of the active inclusion of those who are excluded from mainstream development. Inclusive innovation tends to focus on the micro level and local needs. In particular it includes informal relations, incremental learning and intermediaries into the core structure of innovation, actors, learning, relations and institutions (Foster & Heeks, 2013b). Foster & Heeks (2013a) examine the role of policy in such inclusive innovation systems by analyzing the Kenyan mobile technology market. Their analysis suggests that inclusive innovation in ICTs is based on four key domains: the product, its retailing and support, the micro-enterprises that provide the services, and the wider institutional context. In addition, inclusive innovation in ICTs is built upon interactions among certain key factors such as adaptive innovation, competition, the role of intermediaries and regulatory interventions.

The role of intermediaries is crucial in an inclusive innovation system (Foster & Heeks, 2013c; Foster & Heeks, 2013b). The key actors in an inclusive innovation system are the demand-side micro-enterprises embedded in marginalized communities. These intermediaries play a crucial role in all the four domains (the product, its retailing and support, the micro-enterprises that provide the services and the wider institutional context). The producers, suppliers and consumers also play significant roles. Exploring their roles can generate useful insights into the strategies adopted by them to support inclusive innovation systems (Foster & Heeks, 2013b). Furthermore, recent research on inclusive innovation in low income markets has shown that interactions between local innovation intermediaries and company-led institutional structures are also important in supporting inclusive innovation (Foster & Heeks, 2014).

Inclusive innovation proves an appropriate framework to investigate the impact of ICTs on the social development and well-being of those who are marginalized because it involves their greater participation, especially with regard to the five key issues seen in table 1 (Cozzens & Sutz, 2012; Foster & Heeks, 2013b). Through the lens of inclusive innovation we investigate how different participants such as intermediaries and producers interact with end users to enable well-being of the marginalized. In the next section, we present the research methodology and setting adopted for this research.

Key inclusivity issue	Description
Inclusivity of precursors	Problems addressed by innovation are of relevance to the marginalized
Inclusivity of processes	Members from marginalized communities play a part in design and development
Inclusivity of adoption	Consumers have the capabilities to absorb innovations
Inclusivity of impact	Goods and services have a beneficial effect on the lives of the marginalized
Inclusivity of output	Production, implementation and delivery of goods and services are appropriate for the development of marginalized communities

Table 1. Key inclusivity issues

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

404

3. RESEARCH METHODOLOGY AND CONTEXT

India is an appropriate research setting to address the development impact of ICT, and that on women in particular, for a number of reasons. First, though India has progressed technologically, it fares poorly on factors such as human development index, gender equality and caste divide (India RealTime, 2013). Secondly, the status of women in terms of employment and education is not encouraging. Lastly, though considerable efforts have gone into poverty reduction, social and economic development for women has been slow (Mathur, 2014). Thus, we explore how inclusive innovation through ICT is facilitating the well-being and social development of poor women based in rural areas of India.

To explore the various impacts of ICT-based services to be assessed, our empirical analysis is based on the mobile money sector. We draw, in particular, on our research focusing on the delivery of mobile banking services to poor women in the villages around Varanasi, India. In this micro-finance sector there are an increasing number of innovations aimed at marginalized income groups. This sector was chosen in particular because it includes a number of innovations that were introduced through a partnership among three companies targeting women in rural areas. But new and unexpected uses and behaviors emerged that were embedded in local contexts. Here we particularly focus on two two-way interactions. We explore the interactions between the end users and intermediaries and that between these intermediaries and suppliers of mobile money services.

Our case study research (Yin, 2008; Walsham, 1995) draws on 65 semi-structured interviews undertaken in 2013 and 2015 as part of research into the mobile money sector. Interviewees included 40 key participants from the three firms, 15 women clients and 10 independent consultants. Data gathering also included extensive document analysis, particularly that relating to the strategies of lead firms in the mobile money services.

The main firms include ICP Bank, a large private sector bank, Alpha India Financial Services, the main technology partner, and Cashpor, a micro financial institution. Cashpor works as a business correspondent (BC) for the ICP Bank. In 2006, the government of India launched its program to promote branchless banking and financial inclusion through the BC model. BCs provide banking services such as opening bank accounts, accepting deposits, and offering withdrawal facilities. Cashpor leverages its existing human resources, mobile technologies and branch infrastructure to offer *Apna* savings accounts (Apna means 'our' in English).

Cashpor is a not-for-profit organization established in 2002 as a group lending institution, lending small amounts of money to poor women in the states of Uttar Pradesh and Bihar. The sums ranged from 2000 Indian National Rupee (INR) to 8000 INR (about US$33 and US$133 respectively). In 2011, under a partnership with Alpha and ICP Bank, it started to offer mobile-based banking services. Cashpor has helped over 1,57,968 disadvantaged women (47% of whom belong to the 'scheduled' castes and 34% to other 'backward' classes), between the ages of 20 and 60, to open a savings account through their mobile phones (Majumdar, 2014). We now present our key findings from the interviews.

4. KEY FINDINGS

4.1. Demand Driven Innovation

Cashpor mainly serves as an intermediary between the provider of the product (ICP bank) and technology (Alpha). Cashpor has a long-standing relationship with its consumers that are poor women. Contrary to the notion that ICT initiatives in developing countries are driven by supply rather than demand, our case demonstrates that ICT-led initiatives for existing customers are more likely to be demand driven. This is illustrated by the comment from one of our respondents:

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

405

One primary problem the women in these areas face is that they are not able to save money. Previously the money which we lend to them was frequently snatched away by their husbands or it got spent on other household expenses. Thus, our primary goal to help empower women to start their small business or some activity was not fully attained. So we thought we should provide them with some means to save via a mobile enabled channel. This is how we thought of introducing Apna savings accounts (Vijay, Business Correspondent Channel Officer, Cashpor).

4.2. Intermediary and User Interactions

The role of intermediaries in inclusive innovation is considered very important. Cashpor as a BC serves as an intermediary between customers and the ICP bank. The key role in enabling mobile-based savings is played by the loan officers at Cashpor who interact with the women each week. The women clients attend weekly meetings in which the loan officers collect the loan repayments, deposits, make withdrawals and open accounts. Inclusive innovation systems need to recognize informal institutions i.e., the behavioral norms embedded within local social relations (Shirley, 2008). In many cases the loan officers perform 'assisted banking'. As one of the loan officers explained:

Many women do not own mobile phones so they borrow mobile phones from other women to do transactions. Some are not comfortable doing the transactions so we perform the transactions on their behalf on our mobile phones. But we teach them and after a few meetings they start doing it themselves (Vivek, loan officer, Cashpor).

An independent consultant elaborates:

Cashpor introduced a new way of delivering financial services, i.e., they offered the savings services through the existing credit channel. Therefore, it was initially difficult for women to comprehend that the same people who provide credit are now providing branchless banking. So, the loan officers had to change their way of interacting with the women. They would talk about the advantages of bank accounts. (Nitin, consultant in mobile money, employed at MicroSave, a consulting firm).

Another agent describes the situation thus:

Some women do not feel comfortable using mobile phones so they send their children and husbands to the weekly meetings to transact on their behalf. For others who do not have mobile phones we just ask them to buy the phone card and they use it in our phone when they make transactions.

4.3. Viable Business Case for Stakeholders

By using the BC model, Cashpor extends its product portfolio from pure credit to mobile-enabled saving which earns additional revenue. It also expects additional credit assistance from ICP bank as it sources accounts for the bank. In addition, as ICP bank is a private sector bank it frequently changes the product design. Our respondent elaborates:

Partnering with private sector banks gives flexibility as they are more aggressive in their approach and want to explore the unbanked areas. Public banks tend to consider rural areas only as a way to fulfill their social responsibility. Further, with private banks, changing some features of the product or introducing new designs does not take much time ... the delivery of products is fast.

The third actor, Alpha India Financial Services, works as the provider for mobile technologies and processes the transactions. Alpha is also a BC for one of the largest banks in India acting as a competitor to Cashpor in the macro BC space. However, it chose to collaborate in this micro setting with Cashpor as it helps it to expand to rural areas with no additional investment. Manavsi, VP, International Business of Alpha India Financial Services, based in South Africa, explains:

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

406

We wanted to expand our reach to other areas. We are well established and successful as a BC in urban areas such as Delhi. However, importing the same model into rural areas did not seem prudent to us as that would require investing in additional infrastructure and building channels from scratch. Partnering with Cashpor provides us with exposure to rural markets with no investment. We mainly train Cashpor staff on how to use our mobile banking portal.

4.4. Infrequent Transactions

Women previously used the accounts as a means to save money and make infrequent transactions. The account opening charge of INR 100 and the cost of transactions act as deterrents for women to use their account frequently (Grameen Foundation, 2013b). Now customers have the option of either paying INR 50 (US$ 0.9) per year for unlimited transactions or INR 2 (US$ 0.03) per transaction. Cashpor earns commissions paid by ICP Bank which pays INR 20 (US$ 0.33) to Cashpor for every new account and INR 1 (US$ 0.02) for every transaction. However, this is only the case in their partnership with ICP Bank.

More recently, Cashpor has enrolled as a BC for Inde Bank as well and provides saving accounts on behalf of the bank. Cashpor has opened 69,458 savings accounts with a total transaction volume of 12 crore INR (about US$2 million) (Reserve Bank of India, 2014). In addition, Cashpor also brought out two new products in this financial year to add to the BC savings account offering: recurring deposit accounts and fixed deposit accounts to provide long term savings facilities to its consumers. Table 2 shows these savings details.

Particulars	Financial year 2013-14	Financial year 2012-13
Average savings balance	346 rupees (US$5.5)	386 rupees (US$6.1)
Deposits mobilized	196 million rupees (US$3,149,104)	89 million rupees (US$1,430,260)
Withdrawals	141 million rupees (US$2,265,917)	56 million rupees (US$899,939)
Number of Savers	196,080	123,487
Percentage of active savers	76	83

Table 2. Savings details (Source Cashpor annual report 2013-2014)

4.5. Increased Livelihood, Earnings, Social bonding and Empowerment

Through its BC operations, Cashpor has helped many poor women come out of poverty and start a small activity. Rajesh, an employee handling BC relations explains:

Earlier, sometimes the women were not able to repay their loan on time as they did not have money. But now as they save money they make timely repayments of their loans. It also helps them save for future purposes such as the education of their children and give them a better life. Others need to protect their money from their husbands who use the money to buy alcohol.

Evidence from our case study also suggests that women become more independent and influential in their homes. For example, Abhi, a manager who handles BC relations with ICP Bank argues:

Earlier some women would have to ask permission from their husband if they wanted to buy something. As they are able to save now, they feel more determined and empowered to make their own decisions and influence family decision-making.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

407

In addition, Cashpor provides a cost effective manner for saving money. Another respondent elaborates:

The cost of saving 2 dollars in a conventional bank is more than 2 dollars. It is inconvenient…they need to go out of their village…queue up in long lines… think if the money is at home it will get spent on something but if it is in an Apna account it is saved conveniently (Pradeep, Manager Operations, Cashpor).

All the fifteen women clients interviewed mention the usefulness of mobile-enabled savings and how it made them feel financially independent. The average amount deposited was thirty rupees. The savings, though of small monetary values, helped them in difficult times, for example, when it came to repay their loan instalment or to invest in a small business activity such as a tea stall.

The average savings deposit is 351 rupees (around US$6) although small in absolute terms it means a lot to the clients who for the first time had a cushion to fall back on in difficult days (from Cashpor annual report, 2013-14).

I deposit 20 rupees every week at the center meeting. Sometimes I deposit more. I saved 500 rupees. Me and my friend opened a small tea stall. We earn a small amount and my savings helped. (Kamladevi, Cashpor client).

Another woman mentioned how mobile-based savings resulted in better bonding with other women.

If I am unable to pay the installment for my loan, other women in the group withdraw small amounts from their accounts and pay my installment due. We take the responsibility for the whole group (of 25 women). (Savitri, Cashpor client).

The women in the group feel more responsible towards each other. For example, those who are comfortable using the technology help and teach the older women in the group who do not know how to use mobile phones to check their balance and teach them how to sign their names.

4.6. Policy Implications

Foster & Heeks (2013a) contend that regulatory policy relating to inclusive innovation is built on three reinforcing factors. These are adaptive innovation, dynamic competition and intermediaries. They argue that the regulatory policy should facilitate these factors for such innovation to be successful. In our case such regulations were preset by the regulatory authority, the Reserve Bank of India (RBI) which is the central bank in India.

Competition is a crucial aspect in our case as well. It demonstrates that although inclusive innovation was mainly demand driven, it did have some supply side factors. Nitin, a mobile money consultant, employed at MicroSave elaborates:

The micro finance sector in India is getting extremely competitive…so they also need to retain clients and keep them with the company and so…providing them with additional financial services such as accounts and fixed deposits could lead to increased customer retention.

In addition we find that the change in regulation around the institutional structure of micro financial institutions could lead to further significant alterations in the Cashpor mobile money network that comprises of two banks and a technology provider. Nitin provides further details:

MFIs think that banks might be competitors for their credit business. The banks might acquire their clients and start extending credit directly to them …but with RBI granting banking licenses to MFIs such as Bandhan…we do not know whether such regulatory policies could lead to banks and MFIs parting ways.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

408

5. DISCUSSION

There has been a growing interest among researchers, practitioners and policy makers in inclusive innovation. From a policy perspective, countries such as India have placed inclusive innovation as a key policy element for the decade of the 2010s (OAPM, 2011), including a US$80m India inclusive innovation fund.

Our study demonstrates that inclusive innovation in our case was mainly demand driven but it also shows the presence of some supply-side motives such as that to retain customers in the presence of growing competition in the MFI sector. Our findings also suggest that ICTs need to share a common vision – inclusivity – to enable well-being and development. For example, ICP bank, by participating in this form of innovation, extended its presence and thus its customer base in rural areas without incurring the costs of setting up teller machines and branches. The role of Cashpor and its loan officers as intermediaries was important to support the delivery of the product and its support during weekly meetings. Informal relations and institutions represent a core element of inclusive innovation systems. The informal practices of assisted banking and using borrowed mobile phones to conduct transactions proved necessary to support inclusive innovation. Policy implications in terms of fostering competitive dynamics in the MFI sector and the BC sector also supported Cashpor as it partnered with two banks and expanded its range of products, particularly those for women.

In addition, our study emphasizes the role of innofusion intermediaries such as the loan officers in enabling the social development of the women. These intermediaries develop local innovations in practices and processes and enable the diffusion of ICTs. For example, the loan officers at Cashpor actively interact with the women to ensure that they use the mobile based accounts regularly. This has significantly reduced the dormancy rate. In addition, these intermediaries assist the women in conducting the transactions over mobile. For example after doing the transaction the loan officer informs the women of their account balance and updates their booklets.

Our study demonstrates mobile based savings accounts had a positive impact on the well-being and progress of the excluded group i.e., the poor women in rural areas who are excluded from core banking arrangements. Furthermore, positive impact could be evaluated based on quantitative economic perspectives such as greater welfare and productivity. Considering this perspective, the Apna savings account enabled many women to save for their long-term future needs such as education of their children and for emergencies such as unforeseen medical expenditure. In addition, better savings opportunities enabled the women to expand their existing activities by investing the saved money in their small scale activities. For example, as of March 2013, more than 120,000 customers have opened accounts with an average savings balance per customer of INR 248 (US$4.16) (Grameen Foundation, 2013b).

More specifically, our study addresses the development impact of inclusive innovation. This is viewed as consisting of six different levels with each succeeding level representing a greater notion of inclusivity with impact evaluation at the third level (Heeks et al., 2013). To address the development impact of inclusive innovation, the value of inclusivity of intention (level one of inclusive innovation) and consumption (level two) needs to be acknowledged. Thus, before discussing the impact of inclusive innovation at the third level we discuss these aspects.

An innovation is inclusive if the abstract motivation of that innovation is to address the needs or problems of the excluded group (level 1: Intention) and if it is adopted and used by the excluded group (level 2: Consumption). These conditions exist in our study as well. Amongst various reasons for Cashpor to provide such innovation, one key factor was to provide mobile-enabled savings accounts to poor women. In addition, the pricing of these products was kept low in order to make them affordable. Furthermore, training sessions on financial literacy and technology usage were organized to impart the capabilities to absorb the innovation.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

409

Another perspective on the positive impact of inclusive innovations can be seen in terms of equality of the benefits. This implies a condition that the benefits were restricted to the excluded group, or were greater than those gained by 'included' groups using the innovation (Heeks et al., 2013). In our case, the ability to have a safe place to save money is a benefit that is valued most by poor women in rural areas. Normally, these women either are unable to save money (as they were unable to access existing banking services or the money was spent elsewhere) or rely on informal and unsafe ways to save money (such as in rice bags that were torn by rats and the money lost). Sometimes family members took away that money. Thus, the benefits of accessing bank account and savings services were greater for these women in our case as compared to their counterparts in urban areas who are more independent and already have access to a formal banking infrastructure. Thus, the impact evaluation for inclusive innovation is both absolute and relative. The benefits of inclusive innovation should accrue at an absolute level such as improvements in livelihood and well-being of the excluded and in addition, at a relative level where the impact evaluation implies that the benefits should be greater for the excluded group. Thus, the impact evaluation is a crucial element of inclusive innovation especially at the demand side, the users of such innovation.

Although the impact evaluation for inclusive innovation mainly focuses on the end users, for inclusive innovation to be successful impact evaluation activity should be performed at the supply side as well. Evaluating supply-side impact would provide stronger reasons for the actors at the supply side to invest more in inclusive innovation and to continue improving it. For example, Cashpor is making good use of the existing infrastructure and loan officers to provide credit services and savings products simultaneously. In addition, this innovation has enabled Cashpor to develop processes to deal with problems related to rejection of account opening forms and dormant accounts. For example, an account opening form tracker was developed to track the movement of account opening forms and eliminate redundancy to reduce the time taken to open accounts from a few months to 20 days (Grameen Foundation, 2013a). Furthermore, Cashpor has been able to use the processes developed as a part of this innovation to offer other financial products as well, for instance the use of the account opening form tracker to support a pension product (Grameen Foundation, 2013c).

6. CONCLUSION

ICTs have the potential to enable well-being and development in marginalized communities. To achieve these objectives ICTs need to incorporate both supply side and demand side incentives and put a viable business model in place. Our study explores a business model (business correspondent) that incorporates the interests of all the stakeholders and provides a good value proposition to all the actors involved. In addition, our study highlights that establishing a network of innofusion intermediaries is crucial in enabling the social development and well-being of marginalized communities.

In addition, ICT4D projects involve multiple actors from public and private domains. Therefore establishing effective multiple partnerships with various stakeholders and providing a strong value proposition combined with low margins is desirable. Our case represents an example where all the mentioned barriers have been overcome by a MFI (Cashpor).

Our study also emphasizes impact evaluation in the realm of inclusive innovation as it sheds light on the development aspect. We show that impact evaluation is a two-step process consisting of absolute impact and relative impact. We have also demonstrated that though impact assessment has been carried out from a demand-side perspective, a careful consideration of impact on the actions of supply-side actors is also important.

Our case also sheds some light on open innovations in ICTs. Open innovation for ICT4D is typically achieved through open collaboration and participation. Cashpor uses an open platform for providing mobile based accounts. Cashpor users can access and participate in the system

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

410

irrespective of the design of the mobile phone and the network operator. Thus, this open platform is device and operator agnostic as it works on all kinds of devices and with all kinds of network operators. Moreover, in our case the participation of external actors is not exclusively based on external funding but on the alignment of goals, division of responsibilities, product portfolio, geographical choice and revenue sharing.

7. REFERENCES

Abraham, R. (2007). Mobile Phones and Economic Development: Evidence From the Fishing Industry in India. *Information Technologies and International Development*, *4*(1), 5–17.

Avgerou, C. (2008). Information systems in developing countries: A critical research review. *Journal of Information Technology*, *23*(3), 133–146.

Chaudhuri, A. (2012). ICT for Development: Solutions seeking problems. *Journal of Information Technology*, *27*(4), 326–338.

Corea, S. (2007). Promoting development through information technology innovation: The IT artifact, artfulness, and articulation. *Information Technology for Development*, *13*(1), 49–69.

Cozzens, S., & Sutz, J. (2012). Innovation in informal settings: A research agenda. *IDRC, Ottawa, Canada*.

Duncombe, R., & Heeks, R. (2002). Enterprise across the digital divide: information systems and rural microenterprise in Botswana. *Journal of International Development*, *14*(1), 61–74.

Edquist, C. (2005). Systems of innovation: Perspectives and challenges. In Fagerberg, J., Mowery, D., and Nelson, R. (Eds.) *Oxford Handbook of Innovation*. Oxford: OUP, 181-208.

Foster, C., & Heeks, R. (2013a). Analyzing policy for inclusive innovation: the mobile sector and base-of-the-pyramid markets in Kenya. *Innovation and Development*, *3*(1), 103–119.

Foster, C., & Heeks, R. (2013b). Conceptualising Inclusive Innovation: Modifying systems of innovation frameworks to understand diffusion of new technology to low-income consumers. *European Journal of Development Research*, *25*(3), 333–355.

Foster, C., & Heeks, R. (2013c). Innovation and scaling of ICT for the bottom-of-the-pyramid. *Journal of Information Technology*, *28*(4), 296–315.

Foster, C., & Heeks, R. (2014). Nurturing user-producer interaction: Inclusive innovation flows in a low-income mobile phone market. *Innovation and Development*, *4*(2), 221–237.

George, G., McGahan, A. M., & Prabhu, J. (2012). Innovation for inclusive growth: towards a theoretical framework and a research agenda. *Journal of Management Studies*, *49*(4), 661–683.

Grameen Foundation. (2013a). *Addressing dormancy in savings accounts: Insights from the Cashpor BC project* (1–14). http://www.grameenfoundation.in/wp-content/uploads/2013/07/Addressing-Dormancy-Insights-from-the-GFI-Cashpor-BC-Project.pdf .

Grameen Foundation. (2013b). *Building Sustainable Business Models for Providing Financial Services to the Poor: A study to understand the business case of Cashpor as a Business Correspondent*. http://www.grameenfoundation.in/wp-content/uploads/2013/11/The-MFI-BC-Business-Model-Case-Study.pdf.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

411

Grameen Foundation. (2013c). *Channel Innovation for Financial Inclusion*. http://www.grameenfoundation.in/wp-content/uploads/2013/11/A-Case-Study-on-Channel-Innovation.pdf.

Hafkin, N. J., & Huyer, S. (2007). Women and gender in ICT statistics and indicators for development. *Information Technologies & International Development*, *4*(2), pp–25.

Heeks, R. (2002). Information systems and developing countries: Failure, success, and local improvisations. *The Information Society*, *18*(2), 101–112.

Heeks, R. (2007). Theorizing ICT4D Research. *Information Technologies & International Development*, *3*(3), 1–4.

Heeks, R. (2010). Do information and communication technologies (ICTs) contribute to development? *Journal of International Development*, *22*(5), 625–640.

Heeks, R. (2012). Deriving an ICT4D research agenda: a commentary on "Information and communication technologies for development (ICT4D): Solutions seeking problems?." *Journal of Information Technology*, *27*(4), 339–341.

Heeks, R., Amalia, M., Kintu, R., & Shah, N. (2013). Inclusive Innovation: Definition, Conceptualisation and Future Research Priorities Annual Conference of the Academy of Innovation and Entrepreneurship. Oxford, United Kingdom.

Hilbert, M. (2011). Digital gender divide or technologically empowered women in developing countries? A typical case of lies, damned lies, and statistics. In *Women's Studies International Forum 34(6),* 479–489.

India RealTime. (2013). India Ranks Lower Than Pakistan on Gender Equality. *Wall Street Journal*. Retrieved from http://blogs.wsj.com/indiarealtime/2013/03/15/india-ranks-lower-than-pakistan-on-gender-equality/

Khan, F., & Ghadially, R. (2010). Empowerment through ICT education, access and use: A gender analysis of Muslim youth in India. *Journal of International Development*, *22*(5), 659–673.

Majumdar, S. (2014). *Empowering Women*. http://www.powerpolitics.in/Issues/March2014/page64.php.

Mathur, A. (2014). Women at Work. *Swarajya*. Retrieved from http://swarajyamag.com/economy/women-at-work/

OAPM. (2011). *Towards a More Inclusive and Innovative India*. New Delhi. http://www.kooperation-international.de/uploads/media/India_Innovation_Strategy_2011.pdf.

OECD. (2013). *Measuring well-being and progress* (pp. 1–15). http://www.oecd.org/statistics/measuringwell-beingandprogressunderstandingtheissue.htm

Potnis, D. D. (2014). Managing Gender-Related Challenges in ICT4D Field Research. *The Electronic Journal of Information Systems in Developing Countries*, *65*(2), 1–26.

Reserve Bank of India. (2014). *Universal Access to Investment and Risk Management Products*. http://www.rbi.org.in/Scripts/PublicationReportDetails.aspx?UrlPage=&ID=736.

Shirley, M. M. (2008). Institutions and Development. In *Handbook of New Institutional Economics* (pp. 611–638). Springer.

Silva, L., & Hirschheim, R. (2007). Fighting against windmills: Strategic information systems and organizational deep structures. *MIS Quarterly*, 327–354.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

412

Tarafdar, M., Singh, R., & Anekal, P. (2013). Impact of ICT-enabled product and process innovations at the Bottom of the Pyramid: A market separations perspective. *Journal of Information Technology*, *28*(4), 279–295.

Thapa, D., & Sæbø, Ø. (2011). Exploring the link between ICT and Development: A Literature Review. In *Proceedings of the 11th International Conference on Social Implications of Computers in Developing Countries* (pp. 689–704).

Thirumavalavan, R., & Garforth, C. (2009). ICT4D and farming communities: Success and failure of telecentres in rural Tamil Nadu. In *Proceedings of the 10th International Conference on Social Implications of Computers in Developing Countires: Assessing the Contribution of ICT to Development. Dubai, UAE: Dubai School of Government. UAE.*

Yin, R. K. (2008). *Case study research: Design and methods* (Vol. 5). Thousand Oaks: Sage.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

413

ICTS AND HOPE FOR DEVELOPMENT: A THEORITICAL FRAMEWORK

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Abstract: Hope is a core part of what it means to be human, and has long been recognised as foundational in driving people to make changes in their lives and contexts. Yet this importance of hope is not reflected in academic research, with little work being undertaken on hope and development, and none on hope and the application of ICTs-for-development (ICT4D). This paper makes a start on closing this knowledge gap by exploring the different meanings of hope within existing literature. It synthesises these meanings into a new multi-dimension content model of hope that looks at the subject, object and enaction of hope. This model is then linked to ICT4D initiatives by taking into account the hopes of different stakeholders, which are seen – via a modified ICT4D value chain framework – to be both an input to and an output from ICT4D adoption and use. The paper then undertakes a preliminary application of this framework to a case study using multiple sources of secondary data from the One-Laptop-per-Child initiative. This provides preliminary validation for the models of hope, and offers a foundation for future research seeking to understand the connection between ICT4D and this key human belief.

Keywords: ICT4D, Hope, Stakeholders, One-Laptop-per-Child

1. INTRODUCTION

Traditional conceptualisations of international development during the 20th century were macro-level "grand theories" derived from economics or sociology (Sumner and Tribe, 2008). In the later part of the century, a wider range of ideas began to be applied to development, including more micro-level, individualised theorisations such as those of Amartya Sen around human capabilities (e.g. Sen, 1999) and related work on wellbeing. The latter particularly has led to a recent intersection between psychology and development studies: drawing ideas about psychological wellbeing and applying them in developing country contexts (e.g. Camfield et al., 2008).

Despite this incursion of psychology into one of ICT4D's cognate disciplines, there appears – to date – to have been relatively limited explicit use of psychological concepts in researching ICT4D (Heeks, 2010a). There has been recognition of the importance of psychological factors in ICT4D such as the "cognitive, emotional, and political capacities" of individuals (Avgerou, 2010). And there has been demonstration of the utility of psychology-based concepts in understanding ICT4D such as the technology acceptance model (Kifle et al., 2010) and social cognitive theory (Thatcher and Ndabeni, 2010).

It is therefore unusual that one of the core concepts of positive/wellbeing psychology (e.g. Magaletta and Oliver, 1999; Ciarrochi et al., 2007) – hope – has yet found little or no application within development studies and, to our knowledge, no application to ICT4D (Dinerstein and Deneulin, 2012). This despite the acknowledged importance of hope in – for instance – everything from mass social movements in developing countries (Castells, 2012; Dinerstein and

Deneulin, 2012) to the lives of excluded individuals (Nalkur, 2009); including its importance in ICT4D initiatives (Diaz Andrade, 2007).

With hope being important but under-researched in both international development generally and ICT4D specifically, the aim of this paper is to introduce hope to the ICT4D field as a psycho-social construct. The paper examines the meanings of hope and, on the basis of a review of existing literature, builds a new model of hope that can be operationalised in developing countries. It explains specifically how hope relates to development interventions such as ICT4D projects, and then shows how the new model can be applied to ICT4D, based on secondary analysis of evidence about the One-Laptop-per-Child initiative. The paper ends with some brief thoughts about future practice and research directions for the intersection between hope and ICT4D.

2. THE MEANINGS OF HOPE

Before conceptualising hope, and modelling its relation to ICT4D, we must first examine the meanings of hope within extant literature. Multiple explanations and meanings of hope can be found from various accounts. Among the prominent ideas on hope, one of the strongest comes from the philosopher Ernst Bloch (1986), who draws from Marxist sociology to define hope as the current imagining of a possible but uncertain future. Bloch's hope is a broad mix of cognitive faculty and emotion which can be shared across groups and communities, serving to mobilise mass movements such as the ICT-enabled Arab Spring (Weeks, 2011; Benski and Langman, 2013).

A different understanding of hope comes from the positive psychology movement, epitomised by Rick Snyder's "hope theory" (see: Snyder, 2002; Snyder et al., 2002). This theory defines hope to be the goal-directed capacity to both find routes to these goals (pathway) and the motivation to pursue goals (agency). This has a strong congruence with Sen's (1993) notion of agency achievement, and agency freedom. Where Bloch defines hope in rather general terms of imagining structural transformation of society, Snyder presents an emotional model focused on attainment of more immediate personal goals.

Bloch and Snyder present their own specific ideas on hope but some have undertaken synthesis of the ideas of other about hope. Probably best-known is the work of Darren Webb (2007, 2008) in categorising previous ideas about hope. For example, Webb (2007) examines the goals of hope and differentiates between open-ended hope and goal-directed hope. And Webb (2008) explores the relation between hope and notions of utopia; then classifying hope into anti-utopian, non-utopian and utopian hope. Alongside other categorisations offered by Webb, this provides a taxonomical structure that we can – as shown next – develop as a framework for analysis of ICT4D and other development interventions.

3. CONCEPTUALISING HOPE

Building on Webb's foundations, the ideas of Bloch and Snyder, and other literature cited below, we sought to develop a workable new hope framework that would encompass the various different notions of hope within the literature, but which could also be operationalised to study ICT4D projects. What emerged inductively from our literature review was a set of three key categories: the Subject of hope (who hopes); the Object of hope (what they hope about); and the Enaction of hope (what is seen to be required to put hope into practice). Each of these will now be discussed in further detail.

3.1. The Subject of Hope

Who is it that hopes? Snyder (1995, 2002) focuses on individual hope as a personal concept, with levels of hope varying between individuals. This individuality of focus exists irrespective of whether what is hoped for relates to the individual or others. But this therefore allows for

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

415

individual hopes to be directed at a common goal (as in Bloch's understanding) and thus shared by a set of related hopers (Webb 2007). McGeer (2004) calls this "collective hope". To understand who hopes, we therefore identify a scale – the "Dominion of Hope" – that ranges from one individual through groups and communities to large-scale hope shared across a society. (Accepting that different dominions of hope can co-exist around different issues within one collective, and that individual and collective hope will also mutually influence each other (Courville and Piper, 2004)).

3.2. The Object of Hope

What do hopers hope about? We call the goal or content of one's hope, the 'Object' of hope, and analyse that into three characteristics of the object: Specificity, Domain and Extent.

Specificity: How specific is what is hoped for? We can draw on Webb's (2007) different modes of hope to identify a continuum of specificity. An 'open-ended' object of hope is one that is broad and indeterminate; perhaps a grand vision of the future or just a vague sense of believing a change in personal circumstances can occur. 'Closed-ended' hope focuses on a concrete goal for improvement, perhaps one that is clearly measurable and time-bound.

Domain: What type of change is hoped for? Looking at the examples of hope outlined in the literature, one can see them relating to various different domains. One possible categorisation would split these domains into four areas:

- Political hope is discussed extensively by Dauenhauer (1984) and by Bloch (1986), and hopes for a change in the power structures and dispensations of a situation.

- Social hope seeks change relating to social development; for example a hope for better personal health (Snyder, 2002) or for better education (Halpin, 2001a, 2001b).

- Economic hope includes hope for a change in financial circumstances or in the basis for economic livelihoods. Some, for example, see the political project of neo-liberalism gaining traction because of the economic hope it offers individuals for a higher-income life (Miyazaki, 2006a).

- Cultural hope includes hope for preservation of local culture and identity in the face of external challenges (Miyazaki 2006b).

Extent: How much change does the hope wish for? The 'Extent' of the object of hope defines the quantum of change in the status quo sought by the hoper. At one end is hope for a total overhaul of the present circumstances to a future that is completely different. Such a hope is presented by Blochean or Rortyian hope (Rorty, 1999; Smith, 2005, Halpin, 2001b) in which hope focuses on transformative social change. The other end of extent of hope aims only for an incremental change in the given circumstance: what Snyder (1995) calls "doable goals" (though this might be part of a longer set of steps towards a more transformative goal). An example might be the hope of recuperation from an injury (Lohne and Severinsson, 2005).

3.3. The Enaction of Hope

How is hope to be realised? Arguably, hope has little meaning unless it is linked to human agency. We term this connection, the 'Enaction' of hope and divide it into two elements: Agent and Timescale.

Agent: Who will deliver the object of hope? In the relationship between hope and the application of human agency in the form of hopeful actions there are different modalities. Most often, the agent is the same person who has the hope. Hence, for example the work of Snyder (2002) and McGeer (2008) in arguing that hope leads to agency, within one individual, through the emotional motivation of will to act and the cognitive identification of pathways through which to act and achieve the hoped-for goal. An alternative perspective speaks of hope that exists with "abeyance" of personal agency (Dauenhauer, 1984; Miyazaki, 2006b) in which the

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

416

hoper depends on agency of the "other" (Webb, 2007). In between these two can be seen the notion of "mutually efficacious social praxis" (Webb, 2008) which emerges as collective hope is supported by the shared agency of many hopers who identify agency within both themselves and others (McGeer, 2004).

Timescale: When will the agent(s) deliver the object of hope? The temporality of hopeful actions has been discussed by Miyazaki (2006a) and Snyder (1995), and allows us to identify a final continuum from action in the short term through to action in the long term.

3.4. The Framework of Hope

From the literature analysis above, we can present our new framework of hope, as shown in Figure 1. Hope is here understood as three main elements and six sub-elements, each of which can be envisaged as a scale; typically some kind of continuum.
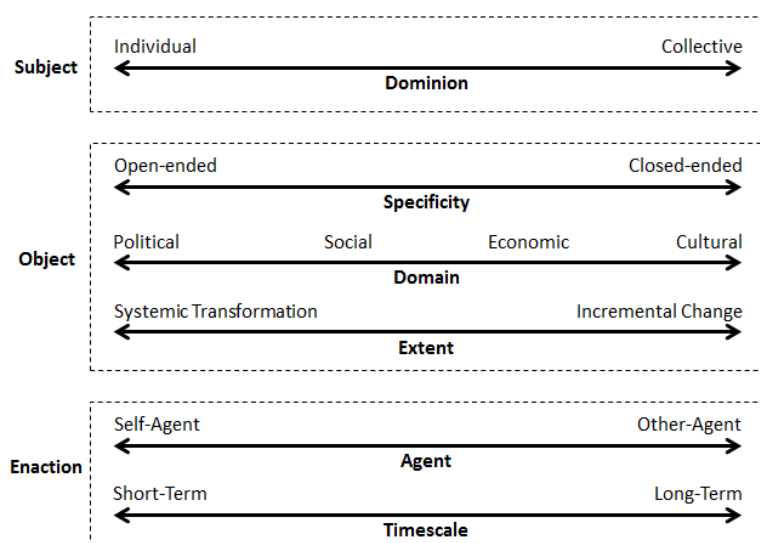
Figure 1. Framework of Hope

4. HOPE WITHIN AN ICT4D CONTEXT

The framework in Figure 1 presents a foundational component in conceptualising the connection between hope and ICT4D. To complete the picture, though, we must add two more things. First we must conceptualise the specific relation between hope and developmental action, such as an ICT4D intervention. Second – and given the inherent subjectivity of hope obvious from the preceding discussion – we must consider the different human actors involved with ICT4D by taking a stakeholder perspective. Each of these will now be explored further.

4.1. Relating Hope and (ICT for) Development

Almost universally, hope is understood as a precursor to human action; that the presence and nature of hope shape human behaviour. However – and in line with recent ideas in psychology about the relation between thought and behaviour (e.g. Bargh and Morsella, 2008) – we also wish to recognise that hope may be an outcome of human behaviour.

In relation to our interests, this means that there is a two-way relationship between hope and all development interventions including ICT4D interventions (Heeks, 2010b). Thus, hope is both an input to, and an output of interventions and we hypothesise:

- Hope for development is a psycho-social input factor influencing adoption and uptake of ICTs by impacting expectations and motivations.
- Hope results as an output factor of ICT adoption and usage: ICT users may become more hopeful about the future as a result of their usage.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

417

- That created hope than acts via a feedback mechanism to influence further ICT adoption and use (or non-use) of technology within the ICT4D initiative.

As noted above, the evidence of this is very patchy because no work has been done focused on the connection between hope and ICT4D. However, we can find some trace of the relations posited above in literature to date. As an input to ICT4D, Rangaswamy and Nair (2012) find that hope for improved socio-economic benefits was a motivating factor behind ICT adoption among slum-based entrepreneurs in India. And as an output from ICT4D, Tafnout and Timjerdine (2009) note the way in which access to mobile phones has given women in Morocco hope of freedom from domestic violence; and Ray and Kuriyan (2010) note the positive impact of ICTs on aspirations for the future of low-income group members. Finally, we can see the feedback loop (though not hope-specific) in the work reported by Smyth et al (2010) in which experiences with a pilot venture influenced the motivation to overcome obstacles facing later adoption of mobile media in India.

Given the direct association of inputs, adoption/use, and outputs with value chains, we can postulate a model of the relation between hope and ICT4D interventions using a modified version of Heeks and Molla's (2009) ICT4D value chain, as shown in Figure 2. In research terms, this would imply studying hope before and during (and, where relevant, after) an ICT4D intervention.
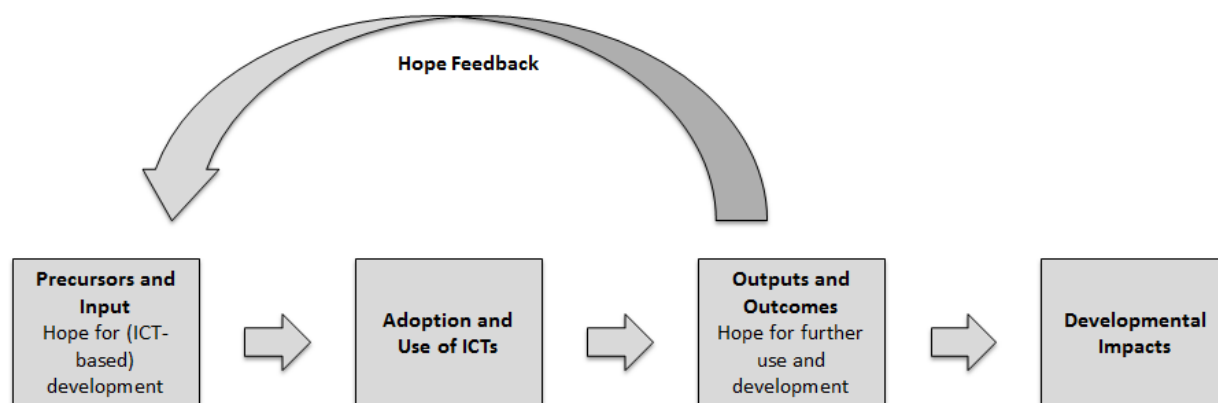
Figure 2. Conceptualising the Relation between Hope and ICT4D Delivery

4.2. Stakeholder Perspectives

It is people who hope, and different people have different hopes. To make this diversity and subjectivity manageable within the context of an ICT4D initiative, we propose using the idea of stakeholder groups. To keep things simple, we could imagine just focusing on two stakeholders: users and intermediaries. Users are an obvious and essential choice – as in the examples given above, it is they whose hopes directly shape their ICT adoption and use, and whose hopes are directly shaped by that experience.

Intermediaries are a bit less obvious but this refers to those who intermediate between users and their adoption and use of ICTs. In some cases these will be "infomediaries", with examples including telecentre operators, cybercafé owners, or lead users within a community (Sein and Furuholt, 2009). Because they directly influence users, they thus directly influence ICT4D adoption and use (Gitau et al., 2010). The hopes of intermediaries will therefore shape the process outlined in Figure 2 and will also (though to a lesser extent than for users) be shaped by that process. Therefore, analysis of hope in ICT4D contexts should look not only at hope in relation to users but also in relation to intermediaries and in the interactions between these two stakeholder groups.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

418

4.3. Overall Conceptual Framework

In summary, the overall conceptual framework is presented in Figure 3: the dimensions of hope can be applied to two different stakeholder groups whose hope influences and is influenced by the ICT4D delivery process.

Figure 3. Hope and ICT4D: Overall Conceptual Framework

5. CASE STUDY: ONE-LAPTOP-PER-CHILD

To test the workability of the developed framework, it was reflexively applied to the context of a case study: the One-Laptop-per-Child (OLPC) projects across different developing countries. OLPC was selected because a significant range of secondary data exists, suitable for exploratory analysis including academic papers, policy and project documentation, and media reports. The selection of sources analysed is presented in Table 1; that selection being made to either provide first-hand observer accounts of OLPC projects, or direct user stories in the form of interview transcripts and quotations. The selection was also made to provide a cross-national perspective on the case. Further triangulation was undertaken with more general media accounts of the case (e.g. OLPCFoundation, 2007).

Source	Content
Apiola et al. (2011)	Field-level experiences of OLPC use from a Tanzanian school
de Macedo Guimarães et al. (2013)	Field-level experiences of OLPC use from Brazilian schools
Duveskog et al. (2010)	Field-level experiences of OLPC use from a Tanzanian school
Gyabak and Godina (2011)	Field-level experiences of OLPC use from a Bhutanese school
Hartel (2008)	OLPC implementation in Ethiopia
Hirji et al. (2010)	Consolidated report of evaluations from different OLPC country sites presenting field-level observations and case studies
Hourcade et al. (2008)	Field-level experiences of OLPC use from a Uruguayan school
Mary and Bassi (2008)	Various regional OLPC case studies
Mozelius et al. (2011)	Field-level observations from schools in Sri Lanka with interview recordings made available
Näslund-Hadley et al. (2009)	Pre-pilot evaluation report from Haiti presenting stakeholder interview data
OLPC (2008a, 2008b, 2008c, 2008d, 2008e)	Field reports on the official wiki of the OLPC Foundation from Pakistan and Thailand
Padmanabhan (2009)	Thesis presenting interview and field level observations from of OLPC use in India
Rahuman et al. (2011)	Field-level observations from schools in Sri Lanka with interview recordings made available

Table 1. OLPC Case Study Data Sources

Following collation of the text, it was filtered in order to perform template analysis (Cassell and Symon, 2004; King, 2007). The first step of the analysis was identification of user and intermediary stakeholder groups, following the argument presented in Section 4.2. This was undertaken inductively from analysis of multiple sources, culminating in identification of the students as a core user group, parents or other family members as key intermediaries, and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

419

teachers as playing a combined user/intermediary role. The initial theme categories were determined by the dimensions of the Hope Framework outlined in Figure 1. With each of the three stakeholders identified as a subject group, an iterative process of coding was used on the subjects' views and experiences. This iterated between the deductive categorisations of the Hope Framework and inductively derived themes arising from the OLPC documentation. The finalised analysis is summarised in Table 2. As discussed below, Figure 2 was also used as the basis for further template analysis to understand the relation between hope and ICT4D.

OLPC – Final Schema		
Subject	**Student (S)**	**Teachers (T)**	**Parents / Family (P)**
Object (O)	***Psycho-social: (SO1)*** - Source to obtain knowledge (SO1.1) - Channel for self-expression (SO1.2) ***Skills: (SO2)*** - Improve language ability (SO2.1) - Develop ICT skills (SO2.2) - Learn subject skills (SO2.3) ***Prospects: (SO3)*** - Continuing education (SO3.1) - Future job and education prospects (SO3.2)	***Child-related: (TO1)*** - Future prospects of children (TO1.1) - Independent knowledge seeking by children (TO1.2) - Improved child subject and language skills (TO1.3) - Access and social mobility (TO1.4) ***Personal Development: (TO2)*** - Improvement in professional skills and pedagogy (TO2.1) - Learn ICT skills (TO2.2)	***Child related: (PO1)*** - Better future for the child (PO1.1) - Educational improvement (PO1.2) ***Family related: (PO2)*** - Improve quality of life (PO2.1)
Enaction (E)	***Shared: (SE1)*** - Seek help from teachers/volunteers (SE1.1) - Share with classmates/ family (SE1.2) ***Self: (SE2)*** - Enthusiasm and interest for and by use of laptops (SE2.1) - Independent exploration (SE2.2) - Seeking to assume ownership (SE2.3) - Knowledge seeking behaviour (SE2.4)	***Shared: (TE1)*** - New ways of student laptop use in class (TE1.1) - Providing laptop exposure to all students (TE1.2) - Encouraging independent use by students (TE1.3) ***Self: (TE2)*** - Using laptops for improving productivity (TE2.1) - Seeking training from schools/government/project (TE2.2)	***Shared: (PE1)*** - Positivity of laptop ownership by the child (PE1.1) - Seek to use and learn about laptop (PE1.2)

Table 2. Final Analysis Schema for OLPC Case Study

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

420

5.1. Subject of Hope

The identity of those who hope was analysed inductively from the data, finding that the most important stakeholders are first the children, forming the core user group; secondly the teachers who enable ICT-related pedagogy and usage; and finally to a lesser extent the parents (Näslund-Hadley et al., 2009; Mozelius et al., 2011) . Both children and teachers express positive hopeful ideas about the presence of the OLPC laptops. There are also instances where parents express the hope that the laptop as a device will have a positive effect on the child and the home. These hopes are presented individually as a personal understanding of the possibilities of ICT. It can be understood that the three main subjects hope for interrelated but different hopes at an individual level. While there may be some collectivity and overlap in this hope, that collectivity was not explicitly expressed in the case study sources analysed.

5.2. Object of Hope

In relation to the specificity of hope, there were a number of instances where the children articulate specific hopes; for example in relation to greater ease of learning of particular academic subjects, or the acquisition of particular skills. But there are also many examples of more open-ended ideas around improved educational and job prospects, pursuit of knowledge, or self-expression – children, for instance, expressed the hope that they would 'become intelligent', 'achieve progress', or creatively 'express' themselves through use of the laptops. These hopes were often quite vague:

> When asked explicitly why they wanted to use the laptop more, the children were unable to articulate in detail why, often smiling and blushing. They were also not able to clearly express how much more or why... (Padmanabhan, 2009: 115)

Teachers' hopes in general tended to be somewhat more specific: that OLPC would bring specific skill improvements in languages or mathematics, that it would enable children to seek knowledge easily and independently, and that it would provide teachers themselves with new ICT skills that would in turn improve their personal or social situation.

There was some sense of an inverse relation between knowledge of, and proximity to, ICTs and the specificity of hope. This was borne out by the parents, who were sometimes reported to be ill-informed and not directly involved in OLPC activities (*ibid.*, Mozelius et al., 2011). They tended to have the most open-ended hopes; hoping from OLPC for the 'chance of a better future' and an 'opportunity' for a change in their child's circumstances.

Where the children had hopes for themselves, and teachers had hopes for the children and themselves, parents generally only had hopes for others: their children. Those hopes, as seen, were mainly within the social domain of education but the more open-ended hopes spread into economic and occasionally other social spheres.

The OLPC mission statement has been considered a "utopian" vision; a vision of a transformative "education project not a laptop project" (Buchele and Owusu-Aning, 2007; Kraemer et al., 2011). But closer to the field and to use of the laptops, that utopian hope transitions into much more instrumental and incremental and practical hopes of the type just described. Another example comes from teachers who hope for minor changes in the mode of classroom interaction, rather than for disruptive and systemic change to the educational paradigm.

5.3. Enaction of Hope

Just as their future hopes relate largely to themselves, children involved with an OLPC project generally see themselves as the agent through whom those hopes will be realised. In Snyderian terms, they have a strong will or motivation to realise their hopes via use of the laptops. This

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

421

will is rather diffuse and unformed prior to familiarity with the laptops but still present, as one teacher in India indicated in describing 'first contact':

> They feel like touching it [*the laptop*] and want to work with it... Sometimes kids would have slowly come in and tried to open the screen with the antenna. You can feel their curiosity and eagerness to learn with the laptop. (Padmanabhan, 2009: 76)

From that first contact, the enactment of hope is generally seen by children to occur through the relatively structured environment of the classroom, in which their agency will be shaped by pathways designed by the teacher: individual work, group work and class work. Over time, though, the enaction of hope may change in the children's mind to be seen to occur both through more independent agency within the classroom setting, but also through less structured activities outside the classroom. Thus children were seen to recognise and enact non-school-based attainment of their hopes, through home use even when in one instance barriers to ICT use arose when a school in Pakistan closed down for financial reasons:

> Despite their frustration [*at closure of the school*], their [*children's*] determination to learn was still persistent. They said that they worked on their OLPC's daily and carried it with them to work on whenever possible. (OLPC, 2008a)

Thus we may see some transition over time from children having a hope to be enacted by what we might call 'assisted agency' to hope being enacted by more independent self-agency (Näslund-Hadley et al., 2009). For the latter, while self-agency might be the heart of enactment, the self was always related to others: seen for example in the desire of children to share their actions and achievements with others.

Teachers' hopes seem to incorporate quite an ecosystem of enactment. They see themselves as agents for achievement of both their own and children's goals: training themselves to create content and to develop classroom activities that will lead to their own professional development but also to better teaching and learning for the children. They also hope that the children will become increasingly independent agents who can use ICTs to attain their own goals. And they recognise there will be shared agency as a means to enact their hopes: between themselves and the children, and between the children themselves.

Finally, many parents do not see themselves as direct actors in the enactment of hopes for their children; a view which presumably derives from their lack of ICT experience but which leads them to some subjective sense of powerlessness. Those that do, take on an active role in helping their children achieve their goals (and these parents may come to develop hopes for their own betterment, not just that of their children).

We might conclude that the dominant model of hopeful action is the independent exploration of the child using the laptop through, and thus developing, his or her self-agency. But that such exploration is often recognised by many of the stakeholders as being enabled by an environment of other agents and of shared agency.

In terms of timescales, the adults in the case – teachers and parents – expressed long-term views about delivery of their hopes via OLPC, but this was less apparent among children.

5.4. Hope, ICT4D Delivery and Feedback

As noted above, alongside analysing OLPC experiences against the Figure 1 content-oriented template, we also analysed against the Figure 2 process-oriented template. We have already seen in the previous section how pre-existing hopes (expressed as will/motivation) had an impact in encouraging adoption and use at first contact. We can also find evidence that use of ICTs changes affective response: here, for example, an observation relating to a teacher from the OLPC project site in Uruguay:

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

422

...a very experienced teacher who at first thought the laptops would not make a positive difference in the classroom. She has changed her mind as she has seen the laptops motivating children to read and write more than they did before the laptops arrived. (Hourcade et al., 2008: 2507-2508)

One can readily see this new perspective feedback to become a catalyst for further adoption and use of the laptops under this teacher's purview. Likewise with the children themselves, hopes arising from prior use can then influence subsequent use. Redolent of this is one teacher's account from India of how children were motivated to get involved with OLPC due to their prior experience with a computer lab:

> Computer lab is also a change. Before the laptops also, we used to take them to the lab. They used to do Paints, Brainstorm (coins are dropped and they must hit the answer with an arrow). They get so excited - you have to see their faces. (Padmanabhan, 2009:123).

Indeed, children's hopes become sufficiently vested in ICTs that they will seek out alternative ICT channels for the realisation of those hopes should OLPC not continue, just as the children in Pakistan continued ICT usage after their school close:

> Unless they are provided [*OLPC laptops*] regularly it will not effect. If you don't continue for next academic year, they will feel bad. Otherwise, they have to go to cyber café to use computers. (Padmanabhan, 2009:77)

Though the explicit evidence base within the surveyed case study material was limited, one can still say there is support for the Figure 2 model. Hope was seen to be both an input to and output from ICT adoption and use and, thus, not surprisingly there is some feedback effect whereby pre-exposure to ICTs shapes the hopes that children bring to OLPC, and whereby use of OLPC creates further hope for use of ICTs as a means to achieve educational and related goals.

5.5. Summary

A brief review of the case study findings on hope and ICT4D is presented in Table 3.

	Nature of ICT4D-Related Hope
Subject	• Individual hopes of children, teachers and parents
Object	• Mix of specificities of hope from all stakeholders, from acquisition of specific skills to vague hopes for a better future • Some sign of greater specificity with greater knowledge of ICTs • Main hope for educational change but some broader economic/social focus for hope • Systemic utopian transformation as the hope at the project level transitioning to a more incremental, pragmatic type of hope at the individual level
Enaction	• Hope vested mainly in the self-agency of students but sometimes enabled by pedagogical actions of teachers and enactment often shared with others • Hopes for long-term developments of the child's future, for which present action is potentially useful even if the actual use is undefined
	Hope and ICT4D Delivery Process
Hope and ICT	• Hope seen as both input to ICT use, and output from ICT use, leading to positive reinforcement as ICT use augments hope for educational development of children and encourages further use of ICT

Table 3. Review of OLPC Case Findings

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

423

6. DISCUSSION AND CONCLUSION

The main objective of this paper was to introduce 'hope' as a construct into ICT4D discourse and research. This has been done by synthesising various meanings of hope into a dimensional framework, and then locating that framework in relation to different ICT4D stakeholders and in relation to the ICT4D value chain. The overall framework was then given a preliminary test through application to existing case study evidence. Alongside the summary of findings already presented, we can also review in more depth what the findings mean for the Figure 2 framework linking hope to ICT4D delivery. That summary is provided in Figure 4.
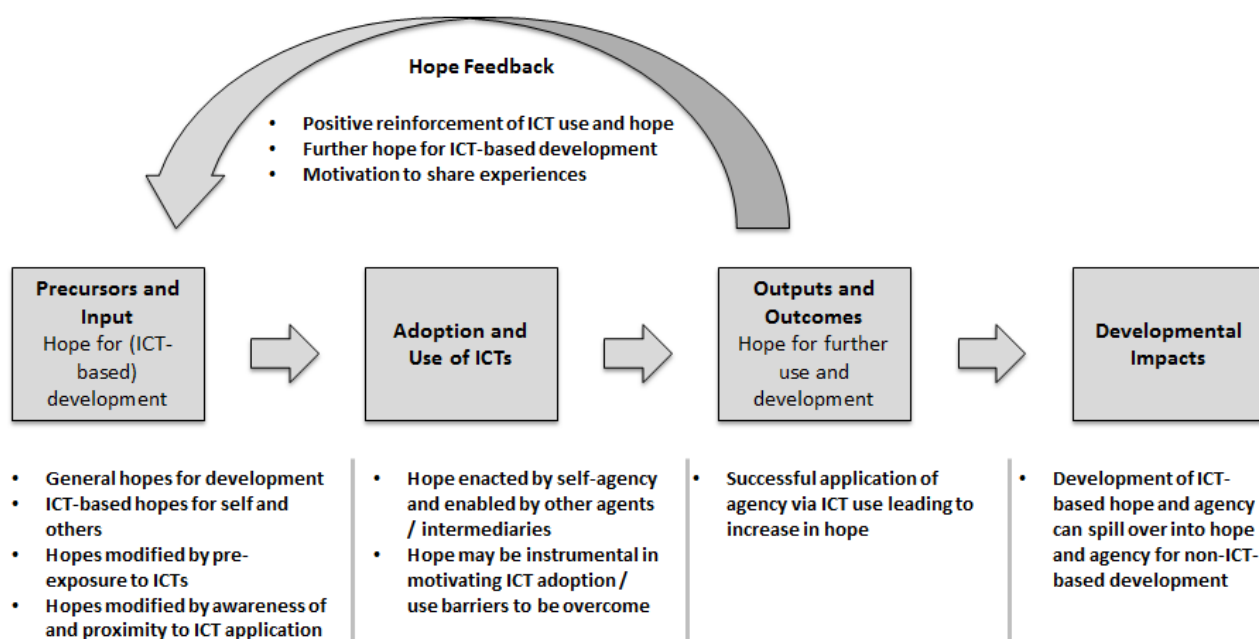
Figure 4. Revisiting the Relation between Hope and ICT4D Delivery

Though only exploratory, the case study analysis was found to mesh with the idea of hope being an input to ICT4D projects, but with some emergent modifiers relating to pre-existing knowledge of ICTs generally and to the ICT4D project specifically. This hope often focuses upon – and should therefore enable – self-agency during ICT adoption and use, though that in turn is enabled by the hopes of other stakeholders who provide the mechanisms – what Snyder would call 'pathways' – for the enactment of hopes. When the results of ICT use are positive in the eyes of those involved, this creates a positive psycho-social experience which can reinforce hope both for further ICT use but also potentially for other development interventions. From the case study, one important facet of hope is as a psycho-social construct through which individuals aim to develop their agency, look for options to apply this agency, and find the will to enact these options in pursuit of development goals.

As noted, these findings are only tentative because they arise from retrospective analysis of secondary data which rarely, if ever, made any explicit reference to the notion of hope. A next step will therefore be application of the framework as the basis for gathering primary data from an ICT4D initiative; ideally longitudinal application both before and during ICT4D use. Nonetheless, we anticipate that the current paper serves to give readers a better understanding of the relation between ICT4D and hope. Hence, ICT4D practitioners may give greater emphasis to the role of hope in their own projects; seeing it for its instrumental role in helping them achieve their application and project objectives.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

424

7. REFERENCES AND CITATIONS

Apiola, M., Pakarinen, S., & Tedre, M. (2011). Pedagogical outlines for OLPC initiatives: A case of Ukombozi school in Tanzania. Paper presented at *AFRICON 2011*, Victoria Falls, Zambia, 13-15 Sep.

Avgerou, C. (2010). Discourses on ICT and development. *Information Technologies and International Development*, *6*(3), 1-18.

Bargh, J. A. & Morsella, E. (2008). The unconscious mind. *Perspectives in Psychological Science*, *3*(1), 73-79.

Benski, T., & Langman, L. (2013). The effects of affects: The place of emotions in the mobilizations of 2011. *Current Sociology*, *61*(4), 525-540.

Bloch, E. (1986). *The Principle of Hope* (3 Vols). Cambridge, MA: MIT Press.

Buchele, S. F., & Owusu-Aning, R. (2007). The one laptop per child (OLPC) project and its applicability to Ghana. Paper presented at *2007 International Conference On Adaptive Science and Technology*, Accra, Ghana, 10-12 Dec.

Camfield, L., Crivello, G., & Woodhead, M. (2008). Wellbeing research in developing countries, *Social Indicators Research*, *90*(1), 5-31.

Cassell, C., & Symon, G. (Eds.). (2004). *Essential Guide to Qualitative Methods in Organizational Research*. London: Sage.

Castells, M. (2012). *Networks of Outrage and Hope*. Cambridge, UK: Polity Press.

Ciarrochi, J., Heaven, P. C., & Davies, F. (2007). The impact of hope, self-esteem, and attributional style on adolescents' school grades and emotional well-being. *Journal of Research in Personality*, *41*(6), 1161-1178.

Courville, S., & Piper, N. (2004). Harnessing hope through NGO activism. *The Annals of the American Academy of Political and Social Science*, *592*(1), 39-61.

Dauenhauer, B. P. (1984). Hope and its ramifications for politics. *Man and World*, *17*(3-4), 453-476.

de Macedo Guimarães, L. B., Ribeiro, J. L. D., Echeveste, M. E., & de Jacques, J. J. (2013). A study of the use of the laptop XO in Brazilian pilot schools. *Computers & Education*, *69*, 263-273.

Diaz Andrade, A. (2007). *Interaction Between Existing Social Networks and Information and Communication Technology (ICT) Tools*, PhD thesis. University of Auckland, New Zealand

Dinerstein, A. C, & Deneulin, S. (2012). Hope movements: naming mobilization in a post-development world. *Development and Change*, *43*(2), 585-602.

Duveskog, M., Sedano, C. I., & Sutinen, E. (2010). Working for my dreams: A Tanzanian OLPC experience. Paper presented at *IST-Africa 2010*, Durban, South Africa, 19-21 May.

Gitau, S., Diga, K., Bidwell, N. J., & Marsden, G. (2010). Beyond being a proxy user: a look at NGOs' potential role in ICT4D deployment. Paper presented at *ICTD 2010*, Royal Holloway, University of London, UK, 13-16 Dec.

Gyabak, K., & Godina, H. (2011). Digital storytelling in Bhutan: A qualitative examination of new media tools used to bridge the digital divide in a rural community school. *Computers & Education*, *57*(4), 2236-2243.

Halpin, D. (2001a). Hope, utopianism and educational management. *Cambridge Journal of Education*, *31*(1), 103-118.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

425

Halpin, D. (2001b). The nature of hope and its significance for education. *British Journal of Educational Studies*, *49*(4), 392-410.

Hartel, H. (2008). *Low-Cost Devices in Educational Systems: The Use of the 'XO-Laptop' in the Ethiopian Educational System*. Eschborn, Germany: GTZ.

Heeks, R. (2010a). Do information and communication technologies (ICTs) contribute to development?. *Journal of International Development*, *22*(5), 625-640.

Heeks, R. (2010b). *Development 2.0*, Development Informatics Short Paper no.11. Centre for Development Informatics, University of Manchester, UK.

Heeks, R., and Molla, A. (2009). *Impact Assessment of ICT-for-Development Projects: A Compendium of Approaches*, Development Informatics working paper no.36. Centre for Development Informatics, University of Manchester, UK.

Hirji, Z., Barry, B., Fadel, R., & Gavin, S. (2010). *Assessment Overview of One Laptop per Child Projects*. Cambridge, MA: One Laptop per Child Foundation. [online], Available at: http://wiki.laptop.org/images/2/24/OLPCF_M%26E_Publication.pdf.

Hourcade, J. P., Beitler, D., Cormenzana, F., & Flores, P. (2008). Early OLPC experiences in a rural Uruguayan school. Paper presented at *CHI'08*, Florence, Italy, 5-10 Apr.

Kifle, M., Payton, F.C., Mbarika, V., & Meso, P. (2010). Transfer and adoption of advanced information technology solutions in resource-poor environments. *Telemedicine and e-Health*, *16*(3), 327-343.

King, N. (2007). *Template Analysis*. School of Human and Health Sciences, University of Huddersfield, UK. [online] Available at: http://hhs.hud.ac.uk/w2/research/template_analysis/index.htm.

Kraemer, K. L., Dedrick, J., & Sharma, P. (2011). One Laptop per Child (OLPC): A novel computerization movement?. Paper presented at *HICSS 2011*, Hawaii, 4-7 Jan.

Lohne, V., & Severinsson, E. (2005). Patients' experiences of hope and suffering during the first year following acute spinal cord injury. *Journal of Clinical Nursing*, *14*(3), 285-293.

Magaletta, P. R., & Oliver, J. M. (1999). The hope construct, will, and ways: Their relations with self-efficacy, optimism, and general well-being. *Journal of Clinical Psychology*, *55*(5), 539-551.

Mary, B., & Bassi, R. (2008). *OLPC Regional Case Studies: Asia, Africa, Europe and Latin America*. Nairobi, Kenya: GeSCI. [online] Available at: http://www.gesci.org/old/files/docman/OLPC_Case-Studies.pdf.

McGeer, V. (2004). The art of good hope. *The Annals of the American Academy of Political and Social Science*, *592*(1), 100-127.

McGeer, V. (2008). Trust, hope and empowerment. *Australasian Journal of Philosophy*, *86*(2), 237-254.

Miyazaki, H. (2006a). Economy of dreams: Hope in global capitalism and its critiques. *Cultural Anthropology*, *21*(2), 147-172.

Miyazaki, H. (2006b). *The Method of Hope: Anthropology, Philosophy, and Fijian Knowledge*. Redwood City, CA: Stanford University Press.

Mozelius, P., Wikramanayake, G. & Rahuman, K. (2011). *One Year of One-to-one Computing in Sri Lanka*. Stockholm, Sweden: Stockholm University. [online] Available at: http://su.diva-portal.org/smash/get/diva2:450262/FULLTEXT01.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

426

Nalkur, P. G. (2009). Adolescent hopefulness in Tanzania. *Journal of Adolescent Research*, *24*(6), 668-690

Näslund-Hadley, E., Kipp, S., Cruz, J., Ibarrarán, P., & Steiner-Khamsi, G. (2009). *OLPC Pre-Pilot Evaluation Report (Haiti)*, Education Division Working Paper no. 2. Washington, DC: Inter-American Development Bank.

OLPC. (2008a). *OLPC Pakistan XO Club*. Cambridge, MA: One Laptop per Child Foundation. [online], Available at: http://wiki.laptop.org/go/OLPC_Pakistan_XO_Club.

OLPC. (2008b). *OLPC Pakistan, Report 1*. Cambridge, MA: One Laptop per Child Foundation. [online], Available at: http://wiki.laptop.org/go/OLPC_Pakistan,_Report_1.

OLPC. (2008c). *OLPC Pakistan, Report 2*. Cambridge, MA: One Laptop per Child Foundation. [online], Available at: http://wiki.laptop.org/go/OLPC_Pakistan,_Report_2.

OLPC. (2008d). *OLPC Pakistan, Report 3*. Cambridge, MA: One Laptop per Child Foundation. [online], Available at: http://wiki.laptop.org/go/OLPC_Pakistan,_Report_3.

OLPC. (2008e). *OLPC Thailand*. Cambridge, MA: One Laptop per Child Foundation. [online], Available at: http://wiki.laptop.org/go/OLPC_Thailand/Ban_Samkha/trial-200705.

OLPCFoundation. (2007). *One Laptop per Child*, [video online], Available at: https://www.youtube.com/user/OLPCFoundation/videos.

Padmanabhan, P. (2009). *Exploring One-To-One Computing on the Ground: The "100-Dollar" Laptop as a Learning Tool for Socially-Disadvantaged School Children in India*, Doctoral dissertation, Faculty of Education, Simon Fraser University, Australia.

Rahuman, M. K., Wikramanayake, G. N., & Hewagamage, K. P. (2011). Case study on adaptability to ICT enabled childhood education in Sri Lanka. Paper presented at *2011 International Conference on Advances in ICT for Emerging Regions*, Colombo, Sri Lanka, 1-2 Sep.

Rangaswamy, N., & Nair, S. (2012). The PC in an Indian urban slum: enterprise and entrepreneurship in ICT4D 2.0. *Information Technology for Development*, *18*(2), 163-180.

Ray, I. & Kuriyan, R. (2010). Towards aspiration as a development indicator. Paper presented at *ICTD 2010*, Royal Holloway, University of London, UK, 13-16 Dec.

Rorty, R. (1999). *Philosophy and Social Hope*. London: Penguin.

Sein, M. K., & Furuholt, B. (2009). Intermediaries in ICT4D: The other "I". Paper presented at *Second Annual SIG GlobDev Workshop*, Phoenix, US, 14 Dec.

Sen, A. (1993). Capability and well-being. In: *The Philosophy of Economics: An Anthology*, D.M. Hausman (ed). Cambridge, UK: Cambridge University Press, 30-53.

Sen, A. (1999). *Development as Freedom*. Oxford, UK: Oxford University Press.

Sumner, A., & Tribe, M. (2008). *International Development Studies: Theories and Methods in Research and Practice*. Los Angeles, CA: Sage Publications.

Smith, N. H. (2005). Rorty on religion and hope. *Inquiry*, *48*(1), 76-98.

Smyth, T. N., Kumar, S., Medhi, I., & Toyama, K. (2010). Where there's a will there's a way: mobile media sharing in urban India. In: *Proceedings of the SIGCHI conference on Human Factors in Computing Systems*. New York, NY: ACM, 753-762.

Snyder, C. R. (1995). Conceptualizing, measuring, and nurturing hope. *Journal of Counseling & Development*, *73*(3), 355-360.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

427

Snyder, C. R. (2002). Hope theory: Rainbows in the mind. *Psychological Inquiry*, *13*(4), 249-275.

Snyder, C. R., Rand, K. L., & Sigmon, D. R. (2002). Hope theory. In: *Handbook of Positive Psychology*, C.R. Synder & S.J. Lopez (eds). Oxford, UK: Oxford University Press, 257-276.

Tafnout, A. & Timjerdine, A. (2009) Using ICTs to act on hope and commitment: the fight against gender violence in Morocco. In: *African Women and ICTs*, I. Buskens & A. Webb (eds). London: Zed Books, 88-96.

Thatcher, A., & Ndabeni, M. (2011). A psychological model to understand e-adoption in the context of the digital divide. In: *ICTs and Sustainable Solutions for the Digital Divide*, J. Steyn & G. Johanson (eds). Hershey, PA: IGI Global, 127-149.

Webb, D. (2007). Modes of hoping. *History of the Human Sciences*, *20*(3), 65-83.

Webb, D. (2008). Exploring the relationship between hope and utopia: towards a conceptual framework. *Politics*, *28*(3), 197-206.

Weeks, K. (2011). *The Problem with Work*. Durham, NC: Duke University Press.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

428

EVALUATING IMPACT SOURCING: A CAPABILITIES PERSPECTIVE FROM A CASE STUDY IN PAKISTAN

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Abstract: Impact sourcing is an emerging sub-field of global outsourcing. There is a paucity of research that focuses on evaluating the social development impact of impact sourcing on a key stakeholder – the outsourcing employees. We draw on a longitudinal interpretive case study from Pakistan guided by the research question, how does Impact Sourcing contribute to the capabilities of outsourcing employees? The theoretical basis of analysis is drawn from Amartya Sen's Capability Approach. The analysis reveals a positive impact of impact sourcing on the capabilities of the outsourcing employees; however, some negative impacts were encountered on the socialisation capabilities of the outsourcing employees. The paper concludes that impact sourcing has strong potential to contribute to development. Negative implications require careful cultural management by the impact sourcing organisation in cases of traditional societies such as in rural Pakistan that have strong family and religious traditions.

1. INTRODUCTION

This paper investigates the development impact of an emerging sub-field of global information technology (IT) and business process outsourcing (BPO) called impact sourcing. Impact sourcing is defined as business process outsourcing activities that provide employment opportunities to people living at the base of the pyramid and, more broadly, marginalised people in low employment regions (Accenture, 2012). Marginalised people might be marginalised because of education, race, religion, gender, sexual orientation, disability, location or other criteria (Carmel et al., p.5).

Impact sourcing is increasingly seen as a 'win-win strategy' for both outsourcing service providers and marginalised outsourcing employees (Avasant, 2012; Monitor, 2011). However, these claims are based on the outsourcing service providers' perspective and there is a dearth of empirical research from the perspective of the marginalised outsourcing employees. Additionally, there is a paucity of research related to organisations that implement impact sourcing as part of their Corporate Social Responsibility (CSR). Impact sourcing is an emerging field with limited prior literature. Most of the Information Systems (IS) literature is either focused toward the business benefits of outsourcing (Lacity et al., 2011; Lacity et al., 2010) or on development through the public sector and social outsourcing initiatives (Heeks & Arun, 2010; Madon & Sharanappa, 2013). Carmel et al. (2014) point out the gap in Information Systems and Strategy literature and stress the need to explore the impact of impact sourcing on the outsourcing employees.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

429

This paper responds to this gap in the information systems for development literature, drawing on an exploratory case study of a commercial US-based Healthcare IT and BPO organisation with two subsidiaries, offshore-outsourcing centres in Pakistan.

The research question guiding our inquiry is: how does Impact Sourcing contribute to the capabilities of outsourcing employees?

We draw on Sen's Capability Framework as a conceptual lens to assess the impact of the impact sourcing organisation on the outsourcing employees' capabilities. To define "impact" we refer to the Organisation for Economic Co-operation and Development's (OECD-DAC) definition, which states that impact is "positive and negative long-term effects on identifiable population groups produced by a development intervention, directly or indirectly, intended or unintended" (OECD-DAC, 2002, p.24).

2. LITERATURE REVIEW

The conceptual underpinnings of impact sourcing may be traced to a discourse related to the business advantages of engaging with low income groups demonstrated in Prahalad and Hart's (2002) concept of Fortune at the Bottom of the Pyramid (BoP). Bottom of the pyramid refers to the largest marginalised socio-economic group of 4 billion people who live on less than $2 per day.

Scholars have a significantly optimistic approach to impact sourcing and present it as a win-win strategy for both the outsourcing service providers, in terms of business profitability, and social development of marginalised people (Avasant, 2012). Development is a social welfare approach which offers an effective response to current social issues; social welfare represents the well-being of people and communities (Midgley, 1995). Impact sourcing may contribute towards development by providing employment opportunities to marginalised people (Carmel et al., 2014). For example, marginalised people, with relatively lower market exposure and personal or professional capabilities, may face difficulty when competing for jobs in metropolitan areas (Monitor, 2011). Environmental, physical or social constraints may also restrict marginalised people from gaining access to the job market. Malik et al.'s (2013a) study of a rural impact sourcing initiative in India shows that women were not allowed to move outside the village for work because of conservative cultural norms.

The phenomenon of impact sourcing is in its nascent stage of research but it is possible to discern two broad categories of business models: 1) Impact sourcing practice in the form of outsourcing social enterprise established for development, and 2) Impact sourcing as corporate social responsibility within a commercial outsourcing organisation (Malik et al., 2013b).

Although private sector outsourcing organisations are considered to be the major catalyst of impact sourcing (Monitor, 2011; Rockefeller Foundation, 2011), most existing studies consider non-profit or social IT outsourcing organisations, such as government financed impact sourcing initiatives for rural Indian women (Heeks & Arun, 2010), a non-profit social enterprise impact sourcing initiative for poor rural Indian people (Madon & Sharanappa, 2013), or the prison employment programme of a US Federal Correctional Institution (Lacity et al., 2014). The survival of the social enterprise type of outsourcing initiatives is in the long run a major concern because of various types of dependency challenges, for example, government sector dependency for the outsourcing work (Heeks & Arun, 2010), or financial dependency (Heeks & Arun, 2010; Monitor, 2011).

Moving to prior literature on the "impact" of impact sourcing, the practitioner literature provides evidence of a remarkable increase in marginalised people's income and spending, however, these findings are based on claims reported without any empirical evidence. For example, Monitor (2011) claims that impact sourcing may influence marginalised people's education and health spending because of an increase in their net income of 40 to 200%. It also claims that

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

430

impact sourcing may provide business benefits to outsourcing service providers because of a 40% decrease in total operational expense in rural areas and small cities (Monitor, 2011).

The academic studies report improvements in marginalised outsourcing employees' personal lives, professional skills, social acceptance, networking abilities and economic uplifting (Heeks & Arun, 2010; Lacity et al., 2014; Madon & Sharanappa, 2013), but, as discussed above, these studies examine only the social non-profit outsourcing initiatives. For example, Heeks and Arun (2010) explore a government financed social outsourcing initiative 'Kudumbashree' in the Indian state of Kerala. They apply the Sustainable Livelihood (DFID, 1999) framework to evaluate the government supported outsourcing initiative and present the results quantitatively in percentages to show increases in financial, physical, social, human and political assets. Another example is Madon and Sharanappa (2013), who also draw on the Capability Approach to evaluate the impact of a non-profit outsourcing enterprise on outsourcing employees' capabilities improvement. Personal development, work and lifestyle change, and improved community relations are a few of the capabilities they discuss briefly in the paper (Madon & Sharanappa, 2013). Lacity et al. (2014) investigate a prison employment programme of a US Federal Correctional Institution (Lacity et al., 2014). Under this programme, called prison sourcing, prisoners were hired and trained to perform computer based business processes. The study found a positive influence of the programme on prisoners, resulting in some benefits, such as work habit development, good financial compensation, development of business skills, productively occupying time and evaluation of self-efficacy and status.

The only study available in the literature that explores the social development impact of a for-profit commercial outsourcing organisation highlights the social development contribution in terms of improvement in personal, professional, social and technological capabilities of poor rural women (Malik et al., 2013a). The research highlights the improvement of ICT skills of the marginalised employees as a prominent social development outcome of impact sourcing. However, the sample was very small and data was collected through Skype interviews, without the interviewer's actual presence in the social context

3. THEORETICAL FRAMEWORK

The theoretical foundation to make sense of the impact of impact sourcing on marginalised people draws on the Capability Approach (CA) (Sen, 1992, 1999). The Capability Approach is appropriate for this inquiry because of the understanding of development as a freedom to achieve well-being through improved capabilities. The Capability Approach is widely used in development studies, welfare economics, social sciences and political philosophy, and has received considerable attention in the Information Systems (IS) and Information and Communication Technologies for Development (ICT4D) fields (Cushman et al., 2008; Stillman & Denison, 2014; Zheng, 2009). It offers conceptual tools to assess change in society in terms of individual well-being and social development (Robeyns, 2005; Sen, 1999). Sen has argued for developing policies and projects which improve individual capabilities so that people have freedom to live the lives they value (Sen, 1999). Functioning and capabilities are key concepts: functioning consists of various things a person may value doing or being (Sen, 1999, p.75). Sen defines capabilities as a person's ability to perform valuable acts or reach valued sets of being (Sen, 1999, p.30). Functioning is an achievement, whereas capability is the ability to achieve. Thus, functioning is an outcome of capabilities, for example, if an individual does not have professional and educational capabilities, he/she might not be able to achieve the functioning of working in an office. A major strength of the Capability Approach is its consideration of human diversity. People are different in terms of gender, race, ethnicity, age, physical abilities etc. and their ability to convert resources into capabilities is influenced by personal, social and environmental conversion factors, for example, physical abilities, mental state, health, social norms, culture, climate, public sector policies and procedures, legal rules and regulations etc. (Robeyns, 2003). To assess a person's well-being, Sen suggests considering functioning (Sen,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

431

1992). As capabilities are difficult to measure, in this paper we also assess outsourcing employees' abilities to do things they value on the basis of various types of functioning that outsourcing employees value doing or being.

4. RESEARCH METHODOLOGY

This research comprises a longitudinal interpretive case study (Walsham, 2006) using qualitative research methods including semi-structured and informal interviews and observation. Data was collected over seven months (September 2013 to March 2014); during that time 72 semi-structured interviews were undertaken of between 15 and 60 minutes duration. Interviews were conducted with outsourcing employees and company middle and higher level management. Two interviews were conducted through video conferencing and seven were conducted through Avaya (an official internal communication device), while the remaining 63 interviews were undertaken face to face in the offices in Kashmir, Pakistan. The respondents were asked questions which were broadly derived from the theoretical frame – for example, the difference in their circumstances, personal, economical and social status, and various abilities before and after being employed. We asked questions related to enablers and constraints, such as: what kind of constraints they had faced getting this job; enablers and challenges during initial days of work and how they overcame these challenges; family reactions; etc. These interviews were taped and transcribed (where permission to record was granted).

During fieldwork in Pakistan, the researcher was enrolled on a staff orientation course focussed on the company's core operations and functional departments, which provided valuable data on the background and philosophy of the organisation as well as management processes. Alongside the semi-structured interviews, during breaks and after work it was possible to observe work in the centres and informally interview outsourcing employees. Notes from these observations and conversations were written up as soon as possible afterwards as a research diary. The researcher's understanding of local language, actual presence at data collection sites, cross checking/comparison of interview findings during interviews with outsourcing employees and management, as well as researcher's field notes and observations, are strategies which were followed during fieldwork to ensure the authenticity and validity of the research finding (Golden-Biddle & Locke, 2007). Transcripts and other field data were uploaded to a computer based qualitative data analysis package (NVivo 9) and coded into the theoretical themes drawing on the concepts of capabilities and functionings from the theoretical frame. To analyse our case study, we constantly iterated between the data and the literature to map the case study findings to existing literature for theoretical richness (Miles & Huberman, 1994). Thematic Analysis is used to analyse data (Miles & Huberman, 1994). To create the primary organisation categories for sorting out the bulk of the data (Maxwell, 2005), we adopted a top-down approach where the initial codes were generated from the literature to give a starting point for data analysis (Urquhart, 2013). We read our data line by line for identification of codes and organised them under various themes. All identified codes are presented in Table 1. The theorisation of the data presented in this paper was accomplished by written summaries of the findings in relation to the extant literature and feedback from reviewers and peers at workshops and conferences, coupled with intensive discussion between the three authors.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

432

Table 1. Data Structure

Theoretical Themes	Descriptive Themes	Basic Codes Generated from Data
Personal and Professional Development	Personality Development Capabilities	Patience and tolerance Respect others opinion Punctuality and self-discipline Planning and setting life goals Interpersonal skills Multicultural adjustment Improved self-confidence
	Professional Skills Improvement	Communication skills Discipline and punctuality Decision making Management Language proficiency Work planning Team work Team management Stress management Stamina building for work Sense of professional responsibilities Professional behaviour
Informal Learning and Education	Capabilities to Acquire Higher Education	Capabilities to pursue higher education
	Capabilities to Learn and Transfer Knowledge	Peers learning Capabilities to gain knowledge Knowledge seeking capabilities Guiding friends and family
Economic Development	Self and Family Financial Support Capabilities	Financial contribution to meet domestic expense Financial self-dependency Spending on education Spending on health
	Savings and Investment Capabilities	Savings for wedding expense Savings for future Savings for education Spending on assets Spending in small business
Socialization and Networking	Personal Social Capabilities	Socialization with friends and families Attending family functions
	Professional Social Capabilities	Professional networks Entertainment External exposure
Empowerment	Social and Personal Empowerment	Acceptance and appreciation Sense of achievement(Self-reliance) Self-belief
	Financial and professional Empowerment	Improved financial status Employability because of personal and professional grooming Future employability because of company image

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

433

5. CASE DESCRIPTION

5.1. Research Context

Research was conducted in two offshore-outsourcing centres in Azad Jammu and Kashmir, which was hit by a devastating earthquake on 8th October 2005 that badly affected the social, economic and physical infrastructure. According to the Earthquake Reconstruction and Rehabilitation Authority (ERRA), at the epicentre in the small district of AJK (where the case organisation was opened in 2009), 9,366 people lost their lives and 7,440 were injured (ERRA, 2007). After the earthquake, public sector reconstruction and rehabilitation and the activities of many national and international NGOs resulted in the establishment of a number of educational initiatives in the region, producing a large number of educated youth. Private sector employment is almost non-existent in this region except for some small branches of banks. Thus, the educated youth tend to migrate to other cities in Pakistan or abroad to find employment opportunities.

Although large numbers of girls (especially belonging to educated families) move to other cities in AJK and Pakistan to receive higher education, nevertheless the majority of them do not receive permission from families to move to other cities for work due to conventional social and cultural norms. Teaching was considered as the only respectable profession for girls, and educated females in communities had no work opportunities other than teaching in schools and receiving the lowest salaries. People join the public sector or migrate to other cities in Pakistan and abroad to find employment opportunities.

5.2. Case Organisation

The case study comprises a US-based IT and business process outsourcing service provider in the healthcare industry, AlphaCorp (a pseudonym). AlphaCorp provides medical transcription and billing services to clinical practitioners and doctors in the USA, where it has its head office which is involved in marketing, sales and face-to-face client support activities. It also provides ITO services and support relevant to its information systems. The two offshore-outsourcing centres in Pakistan undertake the processing of billing services. The outsourcing employees provide healthcare outsourcing business services and follow a complete medical billing process: claims receiving from clinical practices, data entry, claim processing with insurance companies and final payment to the doctors.

The Islamabad office, established in 2002, is the main office in Pakistan providing IT and business process service. In 2009, AlphaCorp established another centre in AJK having two main objectives: to act as a backup office and to provide employment and growth opportunities to the educated youth of that region. AlphaCorp's AJK office is acting as an impact sourcing centre that particularly focuses on providing employment opportunities to the educated youth of AJK, especially women.

AlphaCorp runs a dedicated morning shift for female outsourcing employees as part of its corporate social responsibilities (CSR). The respondents told us that there was no tradition of girls working in offices or the outsourcing sector there. To encourage a certain number of female employees in the company, AlphaCorp took many steps to gain the trust of the local community so that they could allow their daughters to work and learn; for example, separating girls only to the morning shift, pick-up and drop-off services, hiring a renowned local female HR manager whom the local community may trust to send their daughters to work, and an office culture reflecting the religious and cultural norms of the area. AlphaCorp provides additional training in business operations as well as personal and professional skills development to bring these inexperienced and lower-exposure marginalised employees to the same professional level as metropolitan city-based outsourcing employees.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

434

6. RESEARCH FINDINGS

The empirical findings that follow show how Impact Sourcing has affected the capabilities of outsourcing employees. The findings are presented in five main themes: personal and professional development, empowerment, learning and education, economic development, and socialization and networking. In the following sub-sections, we analyse each theme individually.

6.1. Personal and Professional Development

The effect on personal and professional development capabilities of outsourcing employees is a most prominent theme we interpreted from empirical data. Respondents mentioned the functionings that they are capable of performing after their employment in AlphaCorp, such as confidently communicating with people, handling difficult situations etc. These functionings present evidence of various personal and professional capabilities that these employees have acquired. One outsourcing employee reported their personal and professional capabilities improvement thus:

> *My whole personality has changed. Previously when few people were presented, I could not speak in front of them. I felt reluctant and shy. Now we speak during OJT (On Job Training) because I have overcome my shyness. If we are being asked a question now, I do speak; no matter if I answer it wrong.* (Respondent 18)

The work experience and training provided by the outsourcing organisation have polished employees' communication skills, decision making, work and stress management, and planning skills. As most of the outsourcing employees were fresh graduates, this professional experience taught them how to work efficiently in teams and how to behave professionally. One respondent said:

> *I get professional experience on how to work in tough circumstances under work pressure; how to work in teams; how to treat and obey seniors; how to manage juniors for work distribution and to achieve targets; and how to handle your boss.* (Respondent 30)

This was the first official work experience for the majority of the respondents. Respondents told us about their improved punctuality and self-discipline that they have gained over time since becoming professionals in AlphaCorp. They value their improved capabilities; most of them felt that becoming more punctual and well-disciplined had also positively affected their personal lives outside the workplace. The researcher observed a remarkable difference in levels of self-confidence of senior and junior outsourcing employees during the fieldwork. The respondents who had been working in the centre for a year or more were noticeably more comfortable and confident while talking with the researcher compared to employees who were recruited only within the last few months. The longer established group told us that they had learnt how to adjust and work with people belonging to different regions and cultures. They considered their capability as a strength that could help them in dealing with different people while progressing professionally. One respondent expressed the learning experience as follows:

> *The main thing I have learnt is how to tolerate and understand other people while working with so many different people.* (Respondent 2)

Respondents mentioned an increase in work stamina after joining the company. They reported that initially it was very hard to sit and work for "long hours":

> *But after a few weeks we had started taking our professional responsibilities seriously and worked harder.* (Respondent 25)

We noticed that every respondent specifically mentioned the long working hours, which initially was interpreted by the researcher as an effect of the highly pressured global outsourcing

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

435

industry, meaning outsourcing employees must spend extra working hours in the office to serve clients across time zones. For instance, one respondent stated:

> *I have developed the skill of working for long hours in office.* (Respondent 19)

After spending several days in the offices, the researcher realised that the centre operates in three shifts of 8 hours each with lunch and tea breaks. During data collection in the Islamabad offshore-outsourcing centre it was surprising that no one remarked on the long working hours despite the same shifts being in operation. This puzzle can be explained by the dominance of public sector employment in AJK, where working hours are from 8am to 2pm and thus an eight hour workday was considered "long" according to local norms. The respondents realised, however, that the lack of a private sector office work culture in this region meant that they were not used to the routines of a typical office environment and valued this as a functioning.

6.2. Empowerment

We summarise the findings related to self-dependency and self-reliance as empowerment in this case study. Respondents talked about different kinds of empowerment which they felt they had accomplished as a result of employment in AlphaCorp. Almost all respondents talked about financial empowerment during interviews. They felt that they were not depending on anyone to meet their personal living expenses, for instance:

> *Everyone appreciates me that I am working and now stand on my own feet.* (Respondent 21)

Respondents, especially female outsourcing employees, commented that prior to the establishment of AlphaCorp in that area there was no culture of women working in private sector offices (partly because there was not a single private IT company in this region). But now female outsourcing employees felt a sense of social empowerment. They were appreciated by their families for their professional achievements and also accepted and respected by society for working in a private sector company. One respondent shared the experience:

> *Now I can take firm decisions. Before that I remained in doubt about my decisions and their results. My family members have started giving importance to my decisions, because they know I am a professional and much more mature now.* (Respondent 10)

During interviews, participants expressed a sense of achievement and self-belief, as one outsourcing employee commented:

> *We have trust and faith in ourselves that we are a productive part of the society.* (Respondent 15)

Respondents also felt they were financially and professionally empowered. Respondents were very confident about their future employability because of their improved professional skills, work experience and the positive market image and reputation of AlphaCorp. All outsourcing employees had prepared a career progress plan for progress within AlphaCorp, including a plan to avail themselves of other growth opportunities outside the organisation. Overall, the respondents were aware of the market demand for particular skills sets and professional experience in this industry.

6.3. Informal Learning and Education

Learning is a process of acquiring knowledge; informal learning is knowledge acquired without following a formal organised learning programme or event (Eraut, 2000). The outsourcing employees were able to continue higher studies and also sought knowledge through informal learning. Respondents valued their ability to continue into higher education as employees of

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

436

AlphaCorp as they were aware of the importance of being highly qualified and knowledgeable. Peer learning enabled outsourcing employees to gain knowledge by learning informally from each other ("on the job" training). One outsourcing employee acknowledges the broader learning:

> *We have gained knowledge about US states, their systems, policies and procedures. One thing I often think why not we implement the same procedure and medical insurance system here for poor people. When we expose to other country's systems, we can learn how we would implement good practices in our country.* (Respondent 1)

Capability is spread outside of the organisation into the community by knowledge transfer from employees to their social networks (friends and family). Respondents told us they were willing to give advice for choice of educational degree and career counselling to their network as they learned from their experiences and tried to guide others accordingly. The Manager Operations (MO), who was previously an outsourcing employee, commented:

> *When I joined AlphaCorp, I realized that if I would have had a computer related education then how much beneficial it would have been for me. After that, I did not let my younger siblings and cousins randomly select any degree for the sake of just getting a degree. Random education means education without career planning.* (Respondent 32)

During informal conversations with outsourcing employees, the researcher identified a mutually held interest of many respondents in continuing their higher degree in parallel with their jobs. Senior outsourcing employees who had joined AlphaCorp after graduation had completed their Master's degrees. Some respondents were also in the middle of their Master's degrees, and others who wanted to earn their degree from a renowned university in a major city were saving money to finance their education and follow their dreams. One female respondent shared her future plan thus:

> *I do this job for myself. I save my salary for my higher education. My dream is to earn higher degree and study in a renowned institution.* (Respondent 14)

6.4. Economic Development

The economic development capabilities theme describes the empirical findings related to the earning abilities of outsourcing employees. There is clear evidence that impact sourcing employment opportunities at AlphaCorp have positively influenced the economic capabilities of the respondents.

Respondents were financially stable and spent their earnings to meet their personal expenses. They were financially self-dependent and as a result did not need to ask anyone to bear their living expenses. Many respondents contributed to domestic expenses and supported their families' daily livelihood, education and healthcare expenditures:

> *I keep my pocket money and give rest of the salary to my mother. She manages all finance. I and my sister now financially support our family. This job is our need. My brother is also working but my father's business is not doing well.* (Respondent 8)

The respondents who did not have major responsibilities to support siblings and other family had saved or invested some portion of their salary. The capability of budgeting and managing finance is an indirect outcome of the economic development capabilities developed as a result of Impact Sourcing initiatives. The respondents told us that they spent some portion of their monthly salary and kept the remaining amount saved in the bank. A few respondents who were going to get married in near future were saving for their wedding expenses and others who were focussed on higher education were saving to cover their educational expenses. One female

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

437

respondent told us:

> *I want to continue my education and study MSc Economics. To obtain this degree I have to leave my town and move to other city. Right now I am saving money for my higher education. I am extremely fond of study. I love books.* (Respondent 14)

One female respondent shared her investment initiative with the researcher. She invested in a village-based small boutique business and tailoring school for her mother, who was a home-based tailor and wanted to expand her sewing skills commercially.

As AJK had been badly affected by the earthquake in 2005, some respondents told us about their investment in rebuilding their houses or buying some assets for their homes. One respondent said:

> *After the earthquake our financial situation became so bad. My father faced financial crisis. Then I saved my salary and rebuilt our house which was destroyed in the earthquake. Our house had been completely demolished because of earth-quake and we had been stayed in a shelter.* (Respondent 5)

6.5. Socialization and Networking

Our interpretation of socialisation capabilities is the ability of outsourcing employees to network and participate in social activities. Unlike the previously discussed positive effects on capabilities, respondents stated that working in an outsourcing organisation has a negative effect on their personal socialisation activities. Respondents complained about their limited personal social activities after being involved in full time jobs in AlphaCorp:

> *My social life becomes very limited now. I am so busy and can't give time to my friends and relatives. My aunties and uncles always complain that you have forgotten us.* (Respondent 16)

Respondents could not find time to meet friends and families like they did in student life. They felt very tired when returning home after work and could not keep in touch with friends. Due to the intensely competitive outsourcing industry, outsourcing service providers run highly disciplined, high quality services for their clients, 24/7. Daily BPO operations demand full attention and regular presence of outsourcing employees in the office. Respondents told us that work in an outsourcing company means it is not easy to take leave and attend family functions or events, especially those which require travel outside the city. This upsets family dynamics, which in rural Pakistan are traditionally close-knit.

> *I could not attend majority of family functions which upset my family.* (Respondent 22)

Overall, respondents reported negative impact of Impact Sourcing on socialisation capabilities. The respondents pointed out the deprivation of socialisation capabilities, and compared working in the outsourcing industry with other jobs. They told us that serving US clients meant that they were not able to spend many of Pakistan's national public holidays with their family members. For example, Eid is a religious occasion in Pakistan and three days' public holiday is the state's tradition. The majority of employees apply for their entitled work holidays together with Eid holidays to visit families. The respondents told us that they are not allowed to have three- to four-day long holidays for the Eid celebration "because outsourcing companies in developing countries can't afford shutdown of the business services for a week; it may annoy their clients belonged to the developed countries."

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

438

7. DISCUSSION AND CONCLUSION

This study responds to the research call of Carmel et al. (2014) and fills a gap in ICT4D literature by studying the impact of Impact Sourcing on its major stakeholder – the employee. Revisiting the research question of *how does Impact Sourcing contribute to the capabilities of marginalised outsourcing employees*? In relation to the empirical findings shows mostly positive and one negative impact of Impact Sourcing on the capabilities of marginalised outsourcing employees. The improvement in capabilities, such as personal and professional development capabilities, empowerment, learning and economic capabilities, supports and builds on the theoretical findings of Malik et al. (2013a) and Madon and Sharanappa (2013). The novelty of this research lies in its employee focus and its research context – Pakistan and Azad Kashmir – which has not been studied previously. The respondents' sample is also different from existing studies' respondents; the reason for marginality is not poverty or low-education level, but lack of availability of private sector employment opportunities. Capability Approach has received various criticisms for not identifying a list of functionings or capability set (Nussbaum, 2003; Robeyns, 2000). Although the findings of this case study can be useful for other Impact Sourcing cases, the set of capabilities identified in this paper is specific to this case study, which supports Sen's argument for not prescribing a set of capabilities. Moreover, ICT usability capability was a major theme identified in Malik et al. (2013a); however, rather surprisingly, in this case there was no mention by respondents of ICT Usability Capabilities. The apparent difference can be explained by the prior knowledge of employees hired by AlphaCorp. These people are marginalised but have existing knowledge of basic ICT, due mainly to the education institutions put in place as part of post-disaster relief efforts.

Some negative impacts were encountered on the socialisation and networking capabilities of the outsourcing employees; their personal socialisation activities have become very limited, whereas professional socialisation and networking activities have increased at the same time. This is where our work goes beyond the existing work of Madon and Sharanappa (2013) and Malik et al. (2013a), which is particularly focused on positive contribution to capabilities achievement. The theoretical contribution of this research is not only focused on those capabilities that are influenced positively by Impact Sourcing arrangements, but also bring researchers' attention toward identifying negative implications. There is also a practical contribution to enable managers and consultants to carefully implement Impact Sourcing arrangements to reap maximum social development benefits and manage the negative implications for family socialisation, which requires careful management in cases of traditional societies such as in rural Pakistan that have strong family and religious traditions.

8. REFERENCES AND CITATIONS

Accenture. (2012). Exploring the Value Proposition for Impact Sourcing - The Buyer's Perspective: Rockefeller Foundation.

Avasant. (2012). Incentives & Opportunities for Scaling the "Impact Sourcing" Sector: Rockefeller Foundation.

Carmel, E., Lacity, M. C., & Doty, A. (2014). The Impact of Impact Sourcing: Framing a Research AgendaInformation Systems Outsourcing.Towards Sustainable Business Value. In R. Hirschheim, A. Heinzl & J. Dibbern (Series Eds.), (4th ed., pp. 397-429): Springer Berlin Heidelberg.

Cushman, M., McLean, R., Zheng, Y., & Walsham, G. (2008). Inequality of what? Social exclusion in the e-society as capability deprivation. *Information Technology & People, 21*(3), 222-243.

DFID. (1999). DFID sustainable livelihoods guidance sheet.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

439

Eraut, M. (2000). Non-formal learning and tacit knowledge in professional work. *British Journal of Educational Psychology, 70*(1), 113-136.

ERRA. (2007). District Profile - Bagh (Earthquake Reconstruction & Rehabilitation Authority).

Golden-Biddle, K., & Locke, K. (2007). *Composing qualitative research* (2nd ed.). USA: Sage.

Heeks, R., & Arun, S. (2010). Social outsourcing as a development tool: The impact of outsourcing IT services to women's social enterprises in Kerala. *Journal of International Development, 22*, 441-454.

Lacity, M., Carmel, E., & Rottman, J. (2011). Rural outsourcing: Delivering ITO and BPO services from remote domestic locations. *IEEE Computers, 44*(12), 55-62.

Lacity, M., Rottman, J., & Khan, S. (2010). Field of dreams: Building IT capabilities in rural America. *Strategic Outsourcing: An International Journal, 3*(3), 169-191.

Lacity, M., Rottman, J. W., & Carmel, E. (2014). Impact sourcing: Employing prison inmates to perform digitally-enabled business services *Communications of the Association for Information Systems* (Vol. 34, pp. 1-20).

Madon, S., & Sharanappa, S. (2013). Social IT Outsourcing and Development: Theorising the Linkage. *Information Systems Journal, 23*, 381-399.

Malik, F., Nicholson, B., & Morgan, S. (2013a). *Assessing the Social Development Potential of Impact Sourcing*. Paper presented at the Proceeding of SIG GlobDev Sixth Annual Workshop, Milano, Italy.

Malik, F., Nicholson, B., & Morgan, S. (2013b). *Towards a taxonomy and critique of impact sourcing*. Paper presented at the The 8th International Conference in Critical Management Studies, Manchester.

Maxwell, J. A. (2005). *Qualitative Research Design: An interactive Approach* (Vol. 41): Sage.

Midgley, J. (1995). *Social Development: The Developmental Perspective in Social Welfare*: SAGE publications limited.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*: Sage.

Monitor. (2011). Job Creation Through Building the Field of Impact Sourcing Retrieved 14 Nov 2012

Nussbaum, M. (2003). "Capabilities as fundamental entitlements: Sen and social justice." *Feminist Economics, 9*(2-3), 33-59.

OECD-DAC. (2002). Glossary of Key Terms in Evaluation and Result Based Management. Retrieved from http://www.oecd.org/development/peer-reviews/2754804.pdf

Prahalad, C. K., & Hart, S. L. (2002). The Fortune at the Bottom of the Pyramid. *Strategy and Business, 26*(1), 1-14.

Robeyns, I. (2000). *An unworkable idea or a promising alternative: Sen's capability approach re-examined*. Paper presented at the Workshop on Poverty, Social Capital and Development.

Robeyns, I. (2003). Sen's capability approach and gender inequality: selecting relevant capabilities. *Feminist Economics, 9*(2-3), 61-92.

Robeyns, I. (2005). The capability approach: a theoretical survey. *Journal of human development, 6*(1), 93-117.

Rockefeller Foundation. (2011). Impact Sourcing: An Emerging Path to Sustainable Job Creation? *Report on Impact Sourcing Conference 2011*: The Rockefeller Foundation.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

440

Sen, A. (1992). *Inequality reexamined*: Oxford University Press.

Sen, A. (1999). *Development as freedom*: Oxford University Press.

Stillman, L., & Denison, T. (2014). The capability approach community informatics. *The Information Society, 30*(3), 200-211.

Urquhart, C. (2013). *Grounded theory for qualitative research: A practical guide*: Sage.

Walsham, G. (2006). Doing interpretive research. *European journal of information systems, 15*(3), 320-330.

Zheng, Y. (2009). Different spaces for e-development: What can we learn from the capability approach? *Information Technology for Development, 15*(2), 66-82.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

441

COMMUNITY ENGAGEMENT FOR E-HEALTH: LESSONS LEARNT FROM INDEHELA-INFORMATION SYSTEMS DEVELOPMENT FOR DEVELOPMENT (ISD4D)

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Abstract: This paper is drawn from research done under the project INDEHELA-ISD4D. The empirical material was collected in two sites, namely kaTembe in Mozambique and Grabouw in South Africa. Several researchers in formation systems have published and looked for reasons why development and implementation of information systems in developing countries fail in most of the cases. Through qualitative research methods, action research and interpretative paradigm, the study looked to respond how to engage community in the process of development of e-health solutions. Community engagement is argued in this paper to be one of the reasons development and implementation of e-health applications do not respond to the needs of the end users and failure exists in the implementation of such initiatives. Based on the insights from the fieldwork and literature reviews, guidelines in dealing with community engagement are drawn in this paper and the contribution in this paper is seen as enhancing the debates in theories of e-health development and implementation, and improving practice and methodological concern with regard to community engagement.

Keywords: kaTembe, Grabouw, community engagement, e-health, information systems, ICT, INDEHELA, information systems development for development, ISD4D.

1. INTRODUCTION

The provision of effective healthcare in developing countries is still a huge challenge. From the world reports it can be observed that although the Millennium Development Goals (MDGs) have aimed to improve the healthcare provision, mainly with regard to reducing child mortality by two-thirds (MDG4), improve maternal health by three-quarters (MDG5), combat HIV/AIDS, malaria and other (MDG6) by 2015, many developing countries may not reach these aims and targets. It implies therefore that a lot needs to be done to be faithful to the millennium development goals. According to the United Nations (2014) globally, the maternal mortality ratio dropped by 45% between 1990 and 2013, the mortality rate for children under the age of five dropped almost 50%, and antiretroviral therapy (ART) for HIV-infected people has been increasing dramatically.

Meanwhile, it is widely recognised that Information and Communication Technologies (ICTs) have the potential to contribute to meet the MDGs either as part of the MDGs themselves (MDG 8) and/or impacting the achievement of other MDGs, in this case MDGs, 4, 5 and 6. ICTs can be used to more effectively tackle MDGs through being means for achieving the goals, for

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

442

example, providing more efficient and effective provision of basic services or through improved monitoring and surveillance systems on progress towards the MDGs (UNDP, 2008).

The appropriation of ICTs to many domains of community development have attracted scholarly attention over the last two decades. Many projects have been reported to end up in failure either due to the producer of the solution or the implementer. Thus, researchers have tried to find out reasons why it happens and how to overcome these problems. As examples, we can find publications from Heeks (2005), Braa et al. (2004), Byrne and Sahay (2006, 2007), Puri et al. (2009), Sahay and Lewis (2010), Tedre et al. (2011), Latifov and Sahay (2013) and Braa and Sahay (2013) and among many others.

In trying to explain why ICT based solutions, especially information systems fail Heeks (2005) created the concept of design-reality gaps. One of his arguments is that information systems are designed in a reality that is not the one where the solution is going to be used, and it is assumed that as it worked in the context of development will also work in the context of implementation. In fact Heeks (2005) infers engagement in the process of development and implementation of who (the community) is going to benefit from that solution. Nearly ten years after Heeks publication, things changed slightly, however not yet in the desired way. Other complex reasons why ICT based solutions fail in developing countries are well described by Tedre et al. (2011), who says that nearly everything is different in developing countries where these solutions are implemented and Braa et al. (2004), Byrne and Sahay (2006, 2007), Puri et al. (2009), Sahay and Lewis (2010), Latifov and Sahay (2013) and Braa and Sahay (2013) who present real case studies in developing countries and raise a set of specific kind of community participation in each case and in trying to create a global network of e-health. Research done under HISP has shown a set of issues that hinder e-health implementation in developing countries. The concept of community engagement is the central theme of this paper. The critical question raised in the paper is:

How can the process of community engagement in designing ICT based health solutions in under-resourced communities be conducted?

To respond to this research question empirical work was developed in Mozambique and in South Africa under the project INDEHELA-ISD4D, during the period 2012- 2013. INDEHELA-ISD4D - (Informatics Development for Health in Africa – Information Systems Development for Development) is a long-term initiative to strengthen the capacity of the participating African higher education institutions to contribute to the socio-economic and human development in their countries, particularly in the scientific field of Health Informatics (HI) and the practice of e-health. And ISD4D is a joint research of Academy of Finland, aimed at producing methods for information systems needs analysis and design that takes the socio-economic and human development of local communities as its point of departure; action research within real-life community development projects in the area of maternal health services. The partners are: School of Computing, University of Eastern Finland (UEF) (Kuopio Campus), Finland; Departamento de Matemática e Informática, Universidade Eduardo Mondlane (UEM), Maputo, Mozambique; Department of IT, Cape Peninsula University of Technology (CPUT), Cape Town;

The rest of the paper is organized as follows. In the next section, we review literature relating to community engagement and discuss the theoretical relationship between the concepts surrounding community engagement. In Section 3, we discuss the research methodology adopted. Section 4 gives a description of the research context and the empirical work done in kaTembe in Mozambique and Grobouw in South Africa. We continue with the analysis and discussion of the empirical data in Sections 5 and in Section 6, we draw the conclusions and recommendations of the study.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

443

2. RESEARCH SETTING

This paper finds its empirical home in Grabouw and kaTembe communities of South Africa and Mozambique respectively. The underpinning similarity between the two communities is that they are both resource restricted within an overpopulated environment. In Grabouw, the INDEHELA-ISD4D research focused on the home-based health care (HBHC) service and in kaTembe the study was on maternal health. The cases are presented in the sub sections which follow.

2.1. Grabouw: Home-based health care service

Grabouw is an agri-commercial centre in the heart of the Elgin Valley, about 70 km from Cape Town along the Garden Route. This Valley is the agricultural service centre and hosts about 76 farms. It is the largest fruit production and export region in South Africa. Due to poor socio-economic environment in the SADC region and Africa in general, the little town of Grabouw, and all towns in the Overberg District, attract seasonal and informal labour from across the province and country. Some migrant labourers travel from as far North as Mozambique, Zimbabwe, and the Limpopo (Van Zyl et al., 2013). Grabouw therefore carries the resultant burden of having to sustain the ever-growing migrant population. A myriad of socio-economic challenges face the farming community of Grabouw because the town is over-populated. Crime and violence, HIV and AIDS scourge, substance abuse, teenage pregnancies, uncontrolled migration, lack of jobs, growing ageing population, poor hygiene, inadequate health facilities, are some of the challenges the community faces.

Researchers from CPUT's INDEHELA-ISD4D group sought to engage the Grabouw community for the purposes of engendering social improvement through the appropriation of ICTs. Multi-layered interdisciplinary work with researchers from information technology, anthropology, design, and journalism domains was carried out with the Grabouw community. The flagship research project which the researchers co-designed with the community is the home-based health care project.

The HIV and AID's impact on community health influenced South African Department of Health to acknowledge the activities of HBHC, in 1997 as a necessity to providing patient care within Home and community settings. The Department of Health (DoH) in collaboration with the Department of Higher Education and Training tasked the Health and Welfare Sector Education and Training Authority, to coordinate the training for HBHC with SAQA (Ngubo and Machedi, 2006). Entry requirements are a minimum education level of Grade 7 Matriculation. Training is involves a 3 year program where learners obtain skills rated NQF level 2,3, and 4. It is conducted by qualified Registered Nurses, who have worked in Public Health Nursing. Through a tendering process, the Department of health selects which None-gevernmental Organisations (NGO) will manage patients who are on a home based care program. The NGO is responsible for recruiting and training home based careers after getting permission from Government. The NGOs then sets up administrative centres where home based careers collect a list of activities to do and forms to fill out before they head into the field. On a daily basis, home based care workers submit to the administrator the activities that have done for the day. This information is collated and submitted to the department of health at the end of the month. Please note that it is the department health, through a local hospital that decides on which patients the home based care workers are to see and what tasks they are to conduct. The NGO just acts as the go in between. The NGO also manages the payments of salaries released by the DoH to home based health care workers. The Elgin Learning Foundation (ELF) has for over ten years, been the implementing NGO for the home based health care services in Grabouw. The following section describes the concept of community engagement in the context of the ISD4D work with ELF and the Grabouw community.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

444

2.2. kaTembe: Maternity healthcare

kaTembe in Mozambique is one community with which the INDEHELA-ISD4D researchers engaged for the purpose of depicting its healthcare landscape with a focus on maternal health. kaTembe is one of the poorest and most under-developed areas of Mozambique – just across the most developed city in the country. With a population of slightly above 21,000 inhabitants, keTembe has about 11,000 women, 5,307 of which are within the fertility age group of 15 to 49 years. Economic activities in kaTembe include subsistence farming (in the inner parts of kaTembe) - maize, peanut, beans, cassava and sweet potato; small scale fishing and migrant work in the mines. People have minimal purchasing power, despite all tourism that passes through to idyllic beaches and an elephant reserve.

This research took place having into consideration that mothers with young children in the postnatal period living in low resource communities do not have easy access to relevant health information. This can make them less likely to engage in preventive activities and seek treatment. Researchers, through community engagement, sought to identify the information needs of these mothers leading to the development of appropriate e-health solutions such as mobile application that can provide women with the necessary information. During the visit it was also mentioned what neighbourhoods were served by the health center and what other health facilities are available in kaTembe. The other health facilities available in kaTembe are two health posts, namely the Incassane and Xamissava Health Posts. The health posts offer basic primary health care services and use the kaTembe Health Center as referral.

3. LITERATURE REVIEW

3.1. What is a Community?

Definitional variances of a community exist depending on one's standpoint. In its *lato sensu* community means a group of people living in the same place or having a particular characteristic in common. According to the CommunityToolBox (2014), four distinct perspectives stand out in defining a community, namely systems perspective, social perspective, virtual perspective and individual perspective. The systems perspective holds that for the community to function each part or component has to effectively carry out its role in relation to the whole community. The social perspective considers social and political networks that link individuals, community organizations and leaders. In a virtual perspective, communities map on computer-mediated communications to access information, meet people, and make decisions that affect their lives. The individual perspective is where individuals have their own sense of community membership that is beyond the definitions of community applied by researchers.

In the absence of a standard definition of a community, the INDEHELA-ISD4D context has factored in all four perspectives to understand a "community" as:

A geographically-connected people who are affected by the health issues being addressed. This particular definition recognises that the community has historically been excluded from health improvement initiatives.

Within the INDEHELA-ISD4D context, the communities of Grabouw and kaTembe have common identity shared by its members, thus a member of a community may be from a different religion, tradition, race, gender, etc. but they are inhabitants of an underprivileged settlement with social needs.

In activity theory (Engstrom, 1999) it is assumed that community and its members play specific activities, meaning that they are not passive rather active elements engaged in something in the system. In spite of that in information system research, mainly in the development and implementation of IT solutions it seems there is always part of the community which is not engaged or participating accordingly impacting negatively in the overall expected result. Power

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

445

relations play a great role in such results, according to Sahay and Lewis (2010) there are inherent asymmetries, which are beyond the scope of an information systems designer to modify, The entities with power then have the capacity to direct the health information systems to suit their special interests and agendas. Participation, especially in the context of community, is intricately linked to questions of democracy, power, and asymmetries that historically exist within communities. The popular participatory approaches and methodologies were initially criticized for their technical limitations, and it was realized that there was a need to re-examine these approaches to ensure that the techniques used facilitate more equitable participation rather than perpetuating the status quo (Byrne and Sahay 2007). Participatory Design empower the disadvantaged communities, and enable local control and ownership when the system is located (Braa and Sahay 2012).

3.2. Community informatics and e-health

In community informatics (CI) communities and community members are not seen as passive recipients of technological opportunities. People are seen as active actors in the perception and doing of problem solving towards change. The concern of CI is the relationship between people and technology. There might have been lack of technological depth in CI approach in the past, because many researchers have come from humanistic and social work backgrounds. Many of the challenges CI deals with, could also be handled with IS discourse, yet IS approach may lack the depth of community focus. Stillman and Linger (2009) suggest IC is a discipline agenda of which is information system problem solving in addition to the community problem solving approach. Gurstain (Gurstein 2008) takes it further with multiple dimensions of CI of community development, social activism, policy studies public administration, ICTs for development and service design with also links to information systems management- all in all a belief that all this can be enhanced through the rational use of ICT and a sophisticated user-focused understanding of Information Technology.

The most common evidence of successful use of community informatics is the use of technology in health provision and awareness, commonly known as e-health. According to the World Health Organisation (WHO), e-health is the transfer of health resources and health care by electronic means (WHO, 2013). Three main areas of e-health are identified by WHO and these involve electronic delivery of health information for health professionals and health consumers; improving public health services like training, through technology; and using e-commerce and e-business practices in health systems management.

Research has argued for more active participation of the concerned users in various facets of systems design, development and Use (Puri et al. 2009) and recognizes the need for the participation of people at different levels vertically distributed within an organization (Byrne and Sahay 2007). Noticeable research in community participation in e-health in developing countries can be found in publications and action research developed by the Health Information Systems Programme in which Mozambique and South Africa are part of. HISP can be described as a global research, development and action network around health information systems (HIS) for the Global South, enabled through South–South–North collaboration. The network is by no means homogeneous and static, nor in harmony following a single goal, including how participatory design techniques have been and should be used. HISP was initiated through the efforts of a few as a bottom-up Participatory Design project in South Africa in 1994/5, and has today evolved into a global and thriving network spread across multiple countries and contexts (Braa and Sahay 2013).

With regard to community engagement and participation in e-health HISP research reports a set of successful and failure results in trying to implement e-health. According to Titlestad et al., (2009) and Sahay & Lewis (2010) research has established the key role of participation of end users into processes of system design helping to promote ownership, build capacity, and make design more relevant. For Byrne and Sahay (2007) it is not only the users of the IS who should

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

446

participate, but also those individuals who are affected by the IS, even when those individuals have no direct interaction with the system itself. The capacity of the users and those impacted by the system needs to be developed to ensure effective participation in the IS design and development processes.

In Sahay et al. (2009) the participation of the community with stress to political participation was seen as the reason to proceed with integration of health information systems in India did not succeed although technical conditions were built to go ahead. While in Sierra Leon, Braa and Sahay (2012) showed how political participation contributed to the success of implementation of IS.

Continuing in the endeavor of examining some of the reasons for their lack of success in the developing world Sahay and Lewis (2010) propose the Scott's "metis approach" a form of local and practical knowledge which is aimed at local problem solving, that is contextual and local. The assumption made is that public health practitioners are the experts in their own, and that, based on their experience and local contextual knowledge, they have an in-depth understanding of both the health situation and the kinds of interventions that may work in practical situations. However, on its own is inadequate, and that it requires information support provided that is appropriate and well-designed.

3.3. Community Engagement

According to Centre for Disease Control (CDC), community engagement is "The process of working collaboratively with groups of people who are affiliated by geographic [or other form of] proximity, special interests, or similar situations with respect to issues affecting their well-being. It often involves partnerships and coalitions that help mobilize resources and influence systems, change relationships among partners, and serve as catalysts for changing policies, programs, and practices" (CDC, 1997:9). Researchers are gradually realising that anything that they do in a community requires them to be familiar with the community's people, issues, and history.
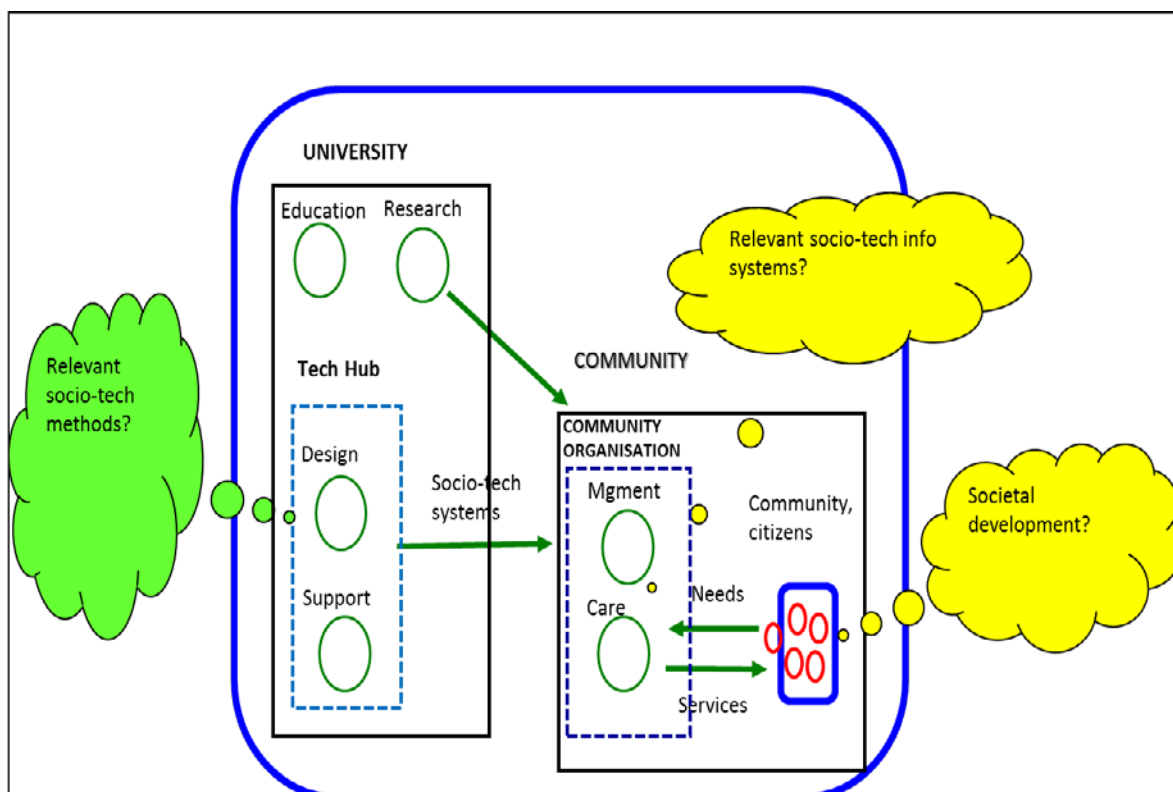

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

447

Figure 1. Relationship between the university and the community

Figure 1 depicts the relationship involving the university and the community. In this context, university refers to the Cape Peninsula University of Technology (CPUT) or Universidade Eduardo Mondlane (UEM) while community is Grabouw or kaTembe. The university as a learning and research institution, hosts a technology hub within the faculty of informatics and design for CPUT and the Computer Science Department for UEM. The technology hub's main agenda is design and develop community-based information technology projects. The hub falls within the ambit of the INDEHELA-ISD4D projects, whose researchers reach out to communities and engage participatory and co-design methodologies in information systems development. The community on the other hand, hosts several community organisations of which NGOs are some of them. The researchers set out to know the people in the communities - their culture, their concerns, and relationships - and also developed their own relationships with the community.

4. RESEARCH METHODOLOGY

This study took an interpretive research paradigm, that starts out with the assumption that access to reality (given or socially constructed) is only through social constructions such as language, consciousness and shared meanings (Myers and Avison 2002). We explored the process of designing health services and information that can be provided through mobile technologies. The exploration process included being in the context, observing women behavior/attitudes and healthcare provision in the setting, the roll out of the healthcare provision, attending meetings, listening to and analyzing what stakeholders were saying about their experiences, whishes, indignations, dreams, reading official documents of healthcare provision and e-health, exploring future plans for e-health in the country and comparing practices and theories of community engagement and service design.

It was conducted using qualitative research methods (Straub et al. 2005; Creswell 2003; Myers and Avison 2002) both in data collection and analysis, as the aim was to understand the phenomenon of community engagement within the context in order to develop rich interpretive insights.

This is an action research (Baskerville, 1999;Baskerville & Wood-Harper, 2002) aiming in general to support the strengthening of health care systems in developing countries and in particular community engagement in the development of IT solutions, though a cyclical approach to implementing, analyzing, and evaluating community participation in a multiple-case-study, where 2 different setting were selected in the Southern Africa region.

This study applied multiple styles of data collection (Denzin 1970) which helped methodological triangulation (Denzin 1970, Kimchi et al. 1991, Thurmond 2001). Co-design was used a methodological framework for both cases. Interviews (30) and observational techniques were also employed especially in kaTembe. Archival research constituted secondary data sources for both cases. The use of triangulation helps to decrease the investigator's bias, increases validity, and strengthens the interpretative potential of the study (Denzin 1970).

The purpose for the excursion by the ISD4D researchers to Grabouw and kaTembe was to do co-design with the communities, using a method agreed to during the co-design planning session. This was going to be done using the storyboard method. In both cases, the primary data collected was in text format. Information gathered was still useful and can be taken further to form the basis for future story. This paper is not reporting on the findings of the co-design sessions but on findings about the process of engaging a community in designing systems.

In addition to the co-design session, some interviews and observations were also some data collection methods which were employed at kaTembe. In this study 30 interviews were conducted, designed in a semi-structured and unstructured way (Patton, 1990). Most of the

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

448

interviews with mothers and health care professionals were done in the first phase. Interviewing mothers at their homes, allowed the researcher to observe the community's different settings. It also allowed the mothers to be more at ease during the interviews. Aside from mothers, nurses and health professionals that deal with maternal and child health at the KaTembe health Center were also interviewed. Additionally to the one-to-one interviews, a group-session interview with the health committee was held. The health committee is a group of people from the community who help the formal health institutions communicate with the community. They work is voluntary, and since they are part of the community they can offer useful insights regarding the community health.

Before going to field and starting with interviews and co-design sessions, materials regarding the kaTembe community were getter throughout a desk research. The desk research had as its main objective the gathering of statistical and historical material about the kaTembe community through the internet. To get updated information on kaTembe statistics was one of the challenges faced throughout the research. Statistical data available online was scarce and/or outdated.

5. FINDINGS AND LESSONS

The motivation behind the choice of qualitative research methods and the design here reported was drawn from the fact that community engagement is an interdisciplinary and complex issue that requires the exploration of the context rather than the use of formal methods. We found community engagement as a concept that involves in this particular case, gender sensitive issues, health sensitive issues, poverty, levels of emancipation, politics, culture and literacy (both the ordinary and ICT related literacy)

Scholarly discourse around the concept of community engagement in e-health is slowly attracting attention (Korpela et al, 2008). Drawing from the two empirical cases in this study, we contribute to the discourse with attention on socially heterogeneous communities in resource-restricted environments. A general willingness to cooperate with researchers was observed among community stakeholders in Grabouw and among the inhabitants of kaTembe. The main finding from the Grabouw case is the multiple stakeholders in the home based health care project. The ISD4D team had to understand the interests of each stakeholder for effective community engagement process. Most of the stakeholders are non-governmental organisations (NGOs) and the department of health (DoH). Major NGOs include ELF, Right to Care and Themba Care. The DoH offers service via the district hospital in Caledon and the day hospitals and clinics. In kaTembe, the main observation was the intimate way that the mothers care for one another. In cases where a pregnant woman is not taken to the clinic in time, a group of mothers act as traditional mid-wives. This practice however was mentioned only a a measure in emergency situations.

Despite definitional differences around the concept of community engagement, it is important that researchers define and understand the "community" in the way the community defines itself. In kaTembe, the researchers listened to the women as they narrated their history, their day to day lives, their interests and also their maternal health needs. From the interactions, the researchers gained more insight into the glue that kept the people together. Positive lessons, which in Figure 2 are depicted as benefits of community engagement, have been learnt from the two empirical cases.
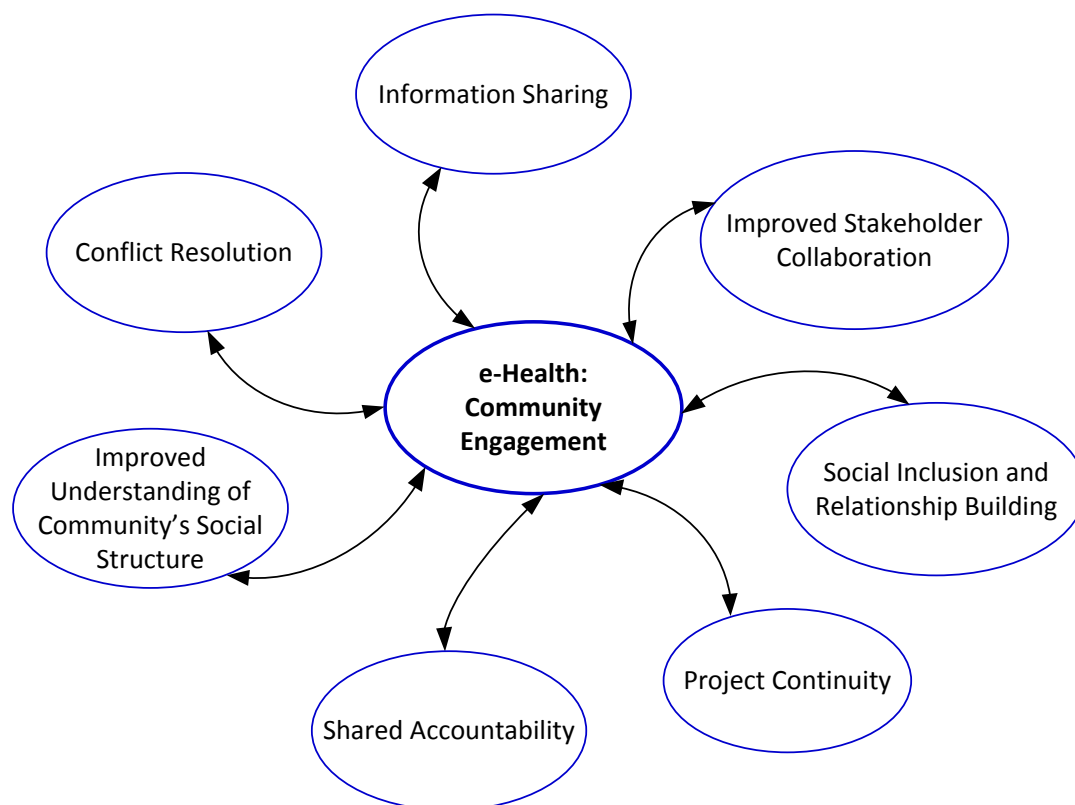
Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

449

Figure 2. Benefits of Community Engagement in e-health

Social inclusion and relationship building. Social inclusion, according to the World Bank (2013), is the process of improving the terms for indviduals and groups to take part in society. Evidence shows that social inclusion is central to ending extreme poverty and fostering shared prosperity (World Bank, 2013). From the findings of this study, we contend that community engagement in multi-stakeholder partnerships promotes social inclusion and relationship building. Through co-design session at Grabouw, spin-off benefits from the relationship were realised in the form of other networking activities. The wider CPUT community was later involved in other projects involving support for computer training and network installation. The research team at CPUT was added onto a wide network of organisations already working with ELF in other projects. Of particular significance is the m-Learning project which involve other stakeholders in Finland. CPUT research team was then engaged to evaluate the system's performance and this required further engagements with other partners.

Sharing of vital information. - community engagement promotes transparent sharing of information using an open and transparent process. This was clearly demonstrated during the co-design session at Grabouw where junior staff were in the same session with their managers and researchers. The free flow of information relating to better ways of home-based care treatment came from the carers themselves, much to the benefit of their managers.

Conflict resolution - Real or perceived conflicts can be resolved amicably. It was observed that in co-design sessions, participants are genuine about how they contact business. Any variance between what implementers like care givers do and expectations of management are discussed in an open platform and standard practice is then defined.

Improved understanding of community's social structure – a deep understanding of social structures is gained through community engagement. The INDEHELA-ISD4D researchers from trans-disciplinary domains obtained rich data about the social fabric making up the communities. This made co-design and co-creation simple with assurances of readily acceptable technological interventions.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

450

Improved collaboration among stakeholders – the co-design workshops at Grabouw pulled together the following stakeholders: ELF staff involving home-based care givers, coordinators, administrator and project manager; DoH District hospital administrators, day hospital administrators, and researchers from the university. The sessions generated much interest among all stakeholders to improve processes and attend to each other's challenges and requests. Through collaboration, Wagner et al (2001) contend that organisations benefit from a variety of services and resources that are not available in their own organisation. Increasing access to effective programming in the community through linkages with other stakeholders becomes a cost-effective way to obtain important services such as nutrition counseling or peer-support groups (Wagner et al, 2001).

Assurance of project continuity – community engagement fosters relationship building and the involvement of all start to finish brings additional efficiency and increases chances of project continuity.

Shared accountability – a resultant solution that is constructed through participation of all stakeholders, then a sense of accountability is realized by all.

6. CONCLUSIONS AND RECOMMENDATIONS

Both the kaTembe and the Grabouw cases presented opportunities to researchers to appreciate the role of community engagement in research. The strongest emphasis in the INDEHELA-ISD4D work was on understanding that community engagement requires patience and tolerance. Relationship building was carefully planned which led to cooperation of all stakeholders in a friendly way. In order to achieve outcomes that benefit communities, researchers must shift their paradigm from thinking that the community lives independent of their work and careers.

Community engagement benefits the community in so many ways including empowering community members for social change, capacity building through exchange of information with experts, as well as social transformation.

The INDEHELA-ISD4D projects have facilitated knowledge exchange among the partners and stakeholders. NGOs, universities, clinics and community members in both kaTembe and Grabouw learnt from one another. The sharing of knowledge was a vital tool for organizational growth and development. Students in the team from the university gained a general sense of empowerment to contribute meaningfully to community development.

Based on the experiences of the HBHC and maternal health projects, further work to engage the same communities to expand projects to other domains as appropriation of ICTs to agricultural activities, education, youth at risk and sports is necessary.

7. REFERENCES AND CITATIONS

Amaratunga, D., Baldry, D. And Sarshar, M. (2001). *Process Improvement Through Perfomance Measurement: The Balanced Scorecard Methodology*. Work Study, 50 (5): 179-189.

Baskerville, R. L. (1999). Investigating information systems with action research. *Communications of the AIS*, 2(3es), 4.

Baskerville, R. L., & Wood-Harper, A. T. (2002). A critical perspective on action research as a method for information systems research. In M. D. Myers, & D. Avison (Eds.), *Qualitative research in information systems* 129–145. Sage Publications.

Boland, R.J. (1991). *Information Systems use as a Hermeneutic Process*. In Nissen, H.-E., Klein, H. and Hirscheim, R. (Eds) The Information Systems Research Arens of the 1990s: Challenges, Perceptions and alternative approaches. Proceedings of the IFIP, TC8/WG8.2 Eorking conference. Noodwijkerhout, North-Holland, Amsterdam.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

451

Byrne, E. & Sahay, S. (2007). Participatory design for social development: A South African case study on community-based health information systems. *Information Technology for Development*, 13(1), 71- 94.

Byrne, E. and Sahay, S. (2007). Information Technology for Development. *Information Technology for Development*. 2007. Vol. 13 (1): 71–94. Published online in Wiley InterScience. Available from http://www.interscience.wiley.com

Centre for Disease Control, *Principles of Community Engagement Report* 1997. Available from: http://www.atsdr.cdc.gov/communityengagement/pdf/PCE_Report_508_FINAL.pdf

Community toolbox, *Tools to change our world*. 2013. Available from: http://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources/describe-the-community/main

Creswell, J. W. (2003). *Research Design. Qualitative, Quantitative and Mixed Methods Approaches*. Thousand Oaks, Sage Publications.

Denzin, N. (1970) *The Research Act: A Theoretical Introduction to Sociological Methods*, Chicago, Aldine.

Denzin, N. and Lincoln, Y. (2000). *Introduction: The Discipline and Practice of Qualitative Research*. In Denzin , N. and Lincoln, Y. (Eds.) Handbook of Qualitative Research. Thousand Oaks, Sage Publications.

Denzin, N. and Lincoln, Y. (Eds.) (2005). *The Sage Handbook of Qualitative Research*, London, Sage Publications.

Eisendhart, K. (1989). *Building Theory From Case Study Research*. Academy of Management Review, 14(2): 532-550.

Engestrom, Y. (1999). *Perspectives on activity theory*. Cambridge, UK: Cambridge University Press.

Gadamer, H. G. (1976). *Heidegger and Marburg Theology*. In Linge, D. (Ed.) Philosophical Hermeneutics. Berkley, University of California Press.

Gurstein M. (2009). Community Informatics: *Enabling communities with information and communication technologies*. In Gurstein M (editor). Community Informatics: Communities with information and communication technologies. Hershey (PA) IGI Global:1-30.

Gurstein, M. (2008). *What is community informatics (and why does it matter)*? Polimetrica Milan, Italy. 2008. Available from http://eprints.rclis.org/10919/1/WHAT_IS_COMMUNITY_INFORMATICS_reading.pdf

Heeks, R. (2005). Health Information Systems, failure, success and improvisation, *International Journal of Medical Informatics* (2006) 7(5): 125—137

Kaplan, B. and Maxwell, J. A. (1994). *Qualitative Research Methods for Evaluating Computer Information Systems*. In Anderson, J. G., Aydin, C. E. and Jay, S. J. (Eds.) Evaluating Health Care Information Systems: Methods and Applications. Thousand Oaks, Sage Publications.

Kaplan, B. and Maxwell, J. A. (1994). *Qualitative Research Methods for Evaluating Computer Information Systems*. In Anderson, J. G., Aydin, C. E. and Jay, S. J. (Eds.) Evaluating Health Care Information Systems: Methods and Applications. Thousand Oaks, Sage Publications.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

452

Korpela, M., de la Harpe, R. & Luukkonen, I . 2008: *Depicting the Landscape around Information Flows: Methdological Propositions*. Proceedings of SIG GlobDev's First Annual Workshop. Paris, France December 13th 2008

Kimchi, J. , Polivka, B. and Stevenson, J. (1991). *Triangulation Operational Definitions*. Nursing Research, 40(6): 364-366.

Miles, M. B. and Huberman, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*, Thousand Oaks, Sage Publications.

Myers, M. and Avison, D. (Eds.) (2002). *Qualitative research methods in information systems*, London, Sage Publications.

Mukherjee, A. S.; Aanestad, M. & Sahay, S. (2012). Judicious design of electronic health records: Case from public health system in India. *Health Policy and Technology*, 1(1): 22-27.

Neuman, W. L. (2003). *Social Research Methods: Qualitative and Quantitative Approaches*, Toronto, Allyn and Bacon.

Ngubo T, Machedi S. Learning about Primary Health Care. (2006). *Juta Learning Department of Health. Strategic Plan* 2014/15–2018/19 . Department of Health South Africa

Patton, M. Q. (1990). *Qualitative Evaluation and Research Methods*, Newbury Park, Sage Publications.

Sahay, S., Monteiro, E. & Aanestad, M. (2009). Configurable politics and asymmetric integration: health eInfrastructtures in India. *Journal of the AIS*, 10(5): 399-414.

Sahay, S. & Lewis, J. (2010). Strengthening metis around routine health information systems in developing countries. *Information Technologies and International Development*, 6(3), 67-87

Schell, C. (1992). *The Value of the Case Study as a Research Strategy*. Manchester Business School.

Stillman L, Linger H. (2009). Community Informatics and Information Systems: Can they be better Connected? 2009. *The Information Society*, 25 (4): 255- 264.

Straub, D.W., Gefen, D. and Boudreau, M.C. (2005). *Quantitative Research*. In Avison, D. and Pries-Heje, J. (Eds.) Research in Information Systems: A Handbook for Research Supervisors and Their Students. Amsterdam, Elsevier

Straub, D.W., Gefen, D. and Boudreau, M.C. (2005). *Quantitative Research*. In Avison, D. and Pries-Heje, J. (Eds.) Research in Information Systems: A Handbook for Research Supervisors and Their Students. Amsterdam, Elsevier.

Strauss, A. and Corbin, J. (1990). *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*, London Sage Publications.

Tedre, M., Kemppainen, J. and Ngumbuke, F. (2011). *What IT Professionals Should Know About IT Work in Developing Countries*, IST-Africa 2011 Conference Proceedings Paul Cunningham and Miriam Cunningham (Eds)

Titlestad, H. O., Staring, K., & Braa, J. (2009). Distributed development to enable user participation:

Multilevel design in the HISP network. *Scandinavian Journal of Information Systems, 21*(1): 27–50. Available at: http://aisel.aisnet.org/sjis/vol21/iss1/3/

Thurmond, V. (2001). *The Point of Triangulation. Journal of Nursing Scholarship*, 33(3): 253-258.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

453

UNDP (2008). *MDGs and e-Development Cluster Strategic Programme Framework* 2008-2011. UNDP (Bangladesh).

Van Zyl I, du Perez V. Youth at Risk – Envisioning a Design Response. (2013). *Proceedings of the 12th International Conference on Social Implications of Computers in Developing Countries*, Ocho Rios, Jamaica, 19th-23rd May 2013

Wagner, E. H., Austin, B. T., Davis, C., Hindmarsh, M., Schaefer, J. and Bonomi, A. (2001). Improving chronic illness care: Translating evidence into action. *Health Affairs*, 20(6): 64-78

Walsham, G. (1993). *Interpreting Information Systems in Organizations*, Chichester, John Wiley and Sons.

World Bank (2013). *Social Development*

World Health Organisation (2013). *Trade, foreign policy, diplomacy and health*

Yin, R. K. (1994). *Case Study Research*, California, SAGE Publications.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

454

WELLBEING AND INEQUALITY: REPORT ON A NEW ZEALAND ICT EDUCATION INTERVENTION TO PROMOTE SOCIAL INCLUSION FOR MINORITY GROUPS IN ECONOMICALLY DISADVANTAGED COMMUNITIES

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Abstract: This paper outlines the ongoing challenges of achieving digital inclusion for all citizens in a first-world developed nation. New Zealand's Computers in Homes (CIH) is an ICT community initiative that enables families in disadvantaged communities to take up opportunities for education, economic and personal advancement. Inequality of income, segregation of community by income and ethnicity and child poverty are social issues that have reached a crisis point in New Zealand. In this paper we report on research outcomes that relate to the promotion of well-being, social inclusion and confidence for the individual families who are participating in the programme and the wider community where their lives are centred. A key focus is on the social well-being of indigenous Māori families, where 1 in 5 such households are living below the poverty level and who make up more than half the numbers currently participating in CIH.

Keywords: low-income, ethnicity, digital inclusion, social inclusion, participation, inequality

1. INTRODUCTION

In this paper we discuss how New Zealand's Computers in Homes (CIH)[1] project contributes to the well-being of the participating individuals, families and communities through the 'insider' perspective of the practitioner involved in day-to-day service delivery and the 'outsider' perspective of the researcher/evaluator. The research focus is understanding the impact of ICT tools and training on the life chances and opportunities of families who have been excluded from the digital world. We make reference to a body of literature documenting the impact of growing inequalities in New Zealand society on well-being. Examining the gap between the digital 'haves' and 'have-nots' at the community level gives real-life insights into the social consequences of the growth of inequality in New Zealand.

In addition we draw on the growing body of community informatics literature including research frameworks for developmental evaluation of ICT projects. We make reference to sociological theoretical constructs that underpin the philosophy of this initiative: community, social cohesion, social capital and social inclusion. Finally we refer to our own research and other initiatives to close the digital gap in New Zealand communities.

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[1] CIH is the flagship programme of the 2020 Trust. The Trust's mission statement is "Enabling New Zealanders to fully participate in a digital world: Ka taea tātou katoa o Aotearoa ka mahi ai i te ao rorohiko me te ipurangi".

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

455

1.1. Social Well-Being

In this paper our concern is with adult social well-being. Social well-being is an individual's assessment of their social circumstances and their place in the wider society. Our research investigates the link between the use of ICTs and living a fulfilling life. Social well-being has been at the centre of classic sociological theory, arguing that social integration and cohesion, a sense of belonging and interdependence are core dimensions of a healthy society (Durkheim, 1951). Keyes (1998) suggests some possible dimensions of social well-being that correspond to several of the indicators of well-being we use in our survey instruments. *Social integration* is the extent to which people feel they belong to their community and to society. The corollary is that society rejects their values, way of life and culture. *Social contribution* is the belief that you are an important member of society with something to contribute to the common good and others value that what you do. *Social coherence* is a concern for knowing about the world, caring about the way society is developing and believing one's life is meaningful.

1.2. Whānau Ora Concept of Family Well-Being

As a philosophy Māori, the Indigenous population in New Zealand, understand whānau ora to mean the well-being of the whole extended family, achieved when all aspects of lived experience, cultural, spiritual, physical, emotional, environmental and economic, are in balance (Durie, 1995). Māori are disproportionately represented in the poorer part of the general population, as indicated by poor health, school failure, and lack of opportunity (Rashbrooke, 2013). It is therefore not surprising that half of CIH participants are of Maori descent (see Figure 4). In response successive governments have trialled strategies to improve the social well-being of the Māori people, and the most recent is a social service delivery based on the Māori concept of whānau ora (Boulton and Gifford, 2011). As a model of practice, whānau ora indicators of social gains include health, education, social inclusion, economic gains, increased participation in Māori cultural life and increased participation in collective action and wider kinship networks. CIH fit with this intervention model, with similar measures of education, economic and social outcomes. Recognition of this close fit is reflected in the invitation from whānau ora primary health providers in one region to include their communities in CIH, with funding for additional families to participate in 2014.

1.3. Openness of Participation and Sharing

We argue that the social gains made by CIH families are facilitated by the new power and freedom that ICTs afford individuals to collaborate with others in political and community life, to participate in networks that extend beyond their local neighbourhoods and take part in online learning where they share and interact with others locally and worldwide.

We openly share our research outcomes, survey data and curriculum with other New Zealand organisations and government agencies working in the digital inclusion space. The digital gap can only be narrowed through the collaborative efforts of all of us concerned with the growing disparities in New Zealand communities.

2. THE RESEARCH CONTEXT

2.1. Digital Exclusion in New Zealand

The latest Census data show that 421,152 New Zealand households do not have access to the Internet and within that group 24,135 households have no access to any telecommunications at home: no landline, cellphone or Internet access (Census 2013). There are 62,000 families with school-aged children who cannot access the Internet in their home (Statistics New Zealand, 2012).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

456
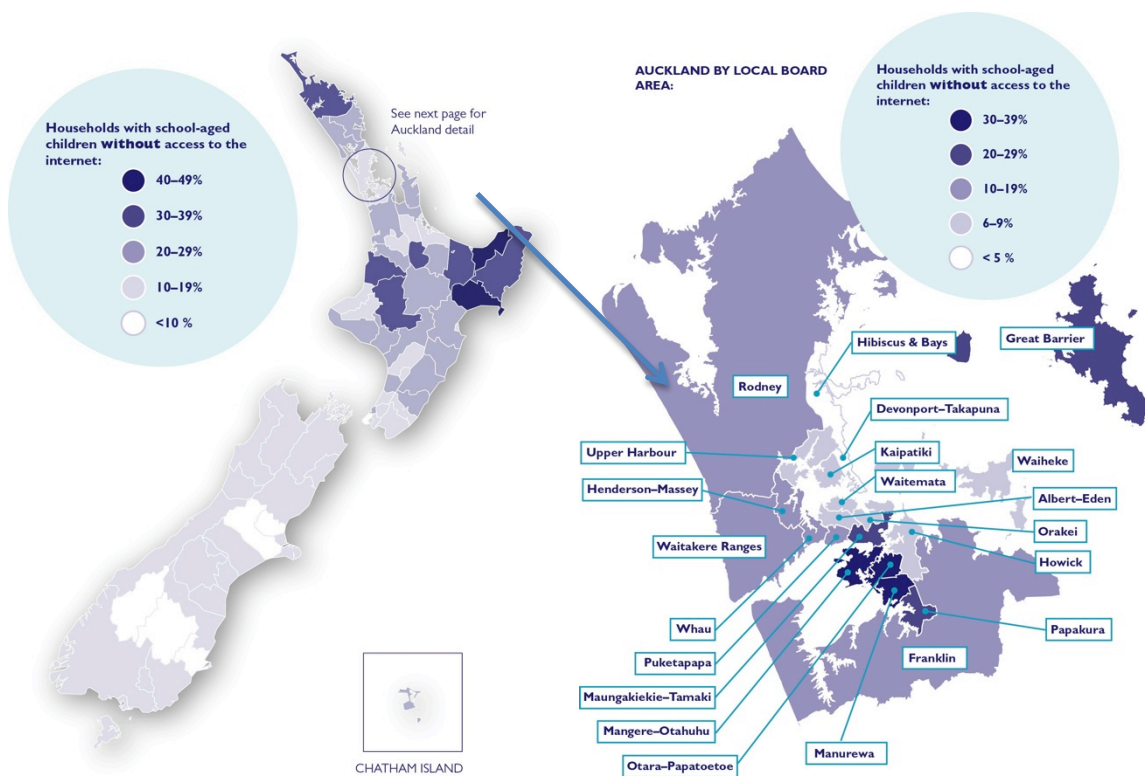
Map 1 Digital Disconnect in New Zealand

This dispels the story often told in the media that New Zealand has in fact reached saturation point in terms of Internet access. These statistics documenting the extent of disconnection in New Zealand are alarming, especially at this point in time when the government is implementing nationwide policies to put government services such as licensing motorcars and renewing passports online and to move students into paperless learning environments using portable devices.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

457

Reasons that households do not have Internet
2009 and 2012

Source: Statistics New Zealand

Figure 1: Why families do not have Internet

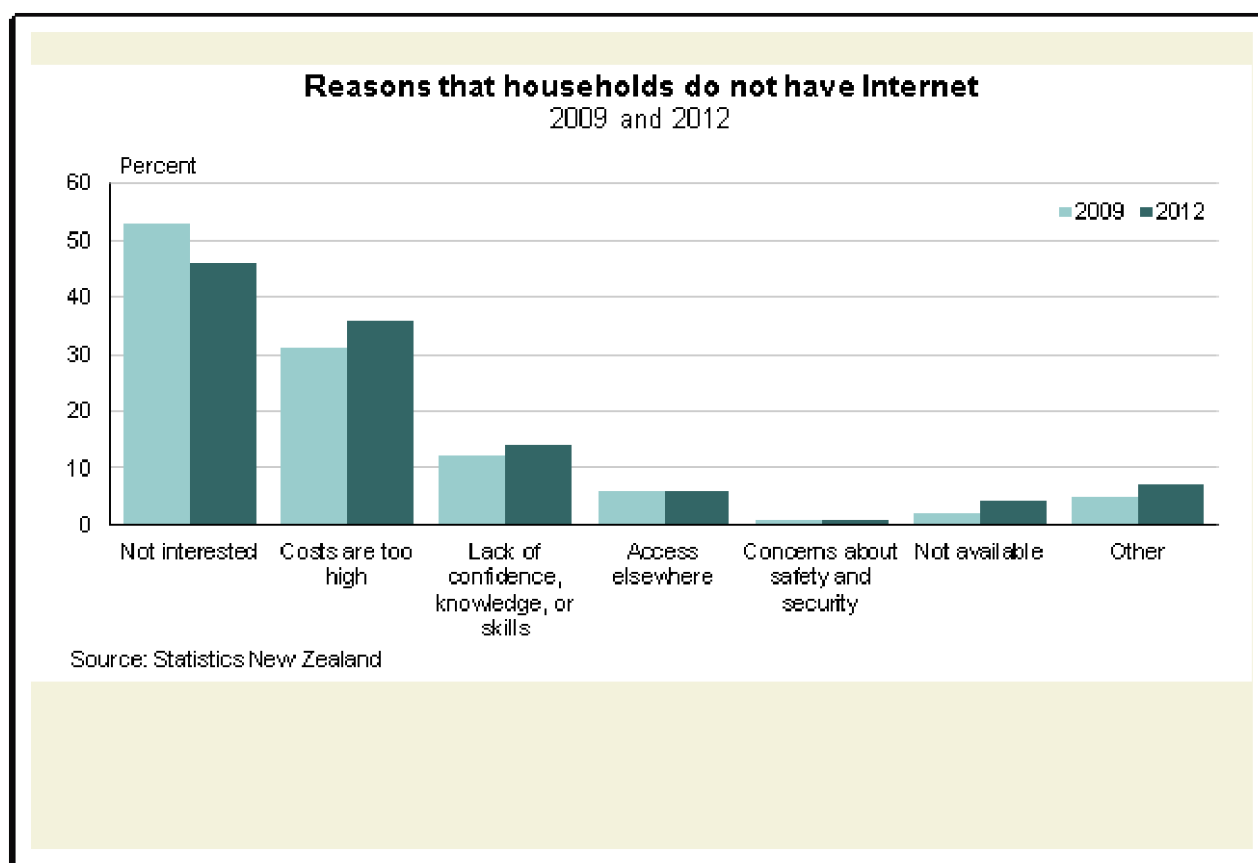A survey of New Zealand household use of and access to the Internet, computers and mobile phones is conducted every three years. Most recent statistics would indicate that households without Internet are simply not interested (Figure 1), yet when this data is broken down into households with or without dependent children between 55% and 71% give the reason that costs are too high and just between 17% and 26% [2] are not interested. Lack of money for these families represents not just material hardship but also powerlessness, diminished opportunities and barriers to fully participating in society as well as excluding their children from the digital world. These means of social exclusion are all damaging to well-being and sense of belonging. The 2020 Trust works through low-decile schools, Māori *marae*[3] and Pacific churches to digitally connect homes and community centres[4].

2.2. Inequality in New Zealand Society

Twenty-first century New Zealand society is marked by a fast widening gap between low-, middle-, and high-income communities. Historically New Zealand was one of the developed world's most equal societies (Rashbrooke, 2013). The Labour government (1935 to 1949) set out to end poverty by creating a 'cradle-to-grave' welfare system with pensions for all, free health-care, a family benefit and state housing. Statistics show that today from the mid-1980s to the mid-2000s the gap between rich and poor widened faster than in any other developed country,

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[2] Source: Household use of ICT 2012. Percentage ranges for responses are given to help account for sample errors given small sample size.

[3] *Marae* are the traditional meeting places of Māori, usually part of a village.

[4] Computers in Homes operates in low-income communities and in refugee communities. Specific details of the regions where there are active projects as well as information about early community sites can be found at http://www.computersinhomes.org.nz/the-programme/

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

458

that the top 1% of adults own 16% of the country's wealth, while the bottom half put together have just over 5% (Cheung, 2007). Thus there are today communities in New Zealand where families cannot afford the basics of life and where they are denied those opportunities and experiences most New Zealanders regard as a right and lack the connections and confidence needed to fully participate in the wider society. Income is a powerful influence on lifestyle, status and aspirations and all those indicators used to measure well-being (OECD, 2014). Inequality of income, segregation of community by income and ethnicity and child poverty are social issues that have reached a crisis point in New Zealand. New Zealand has between 170,000 and 270,000 children living in poverty, depending on the measure used (Rashbrooke, 1013). Further, New Zealand has a disproportionate number of indigenous Māori and Pacific people living in poverty. One in ten NZ European or Pākeha households is in poverty, whereas one in five Māori and Pacific families live below the poverty line.
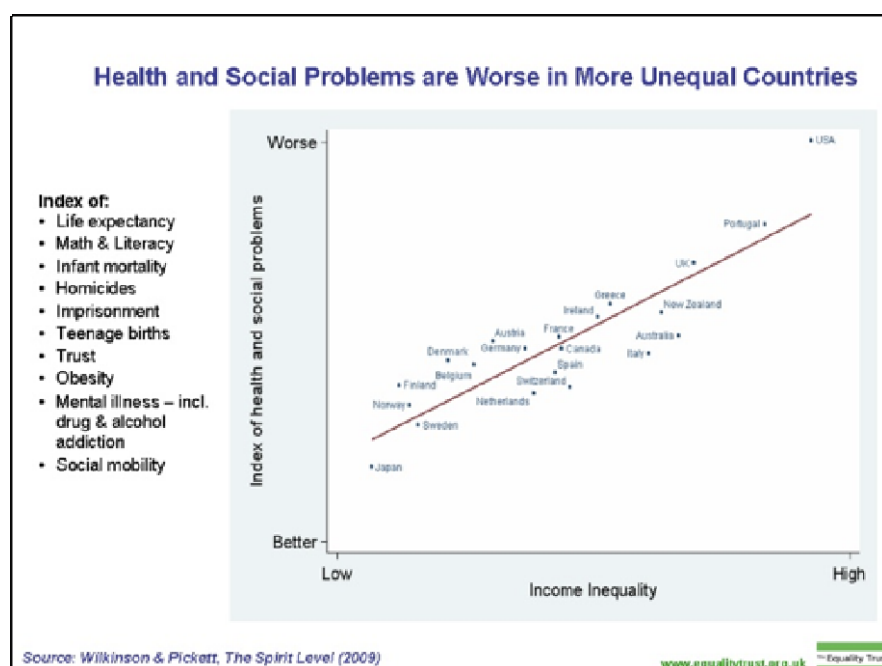
Figure 2: Health and Social Problems[5]

There is evidence that countries with large gaps between high and low incomes are those that do poorly on social cohesion scales, on well-being measures and are economically less sound and functional. Two health researchers, professors Richard Wilkinson and Kate Pickett, in *The Spirit Level*, republished in 2010, have put together complex graphs drawing on hundreds of data sets to show that countries with large income disparities do worse than more equal countries on a range of social measures. These include community life and trust in civil society, education performance, violence, teenage pregnancy, mental health and physical health. Their analysis shows that although New Zealand has high average reading scores relative to other countries, it has very high *social inequalities* in reading literacy suggesting that family life for children from poor homes lacks the support for learning and they start school already at a disadvantage. The possible outcome here for New Zealand is a widening gap between young people growing up in high-income families who spend time on education and career preparation and those who leave school early into a pattern of unemployment, low-paid work or single parenthood.

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[5] *Source*: R. Wilkinson & K. Pickett, *The Spirit Level, Why Equality is Better for Everyone*, Bloomsbury, New York, 2010 p. 20.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

459

2.3. Open Strategies to Address Digital Inclusion

Our view is that the use of the term *digital inclusion* combines research into technical and affordable access to the Internet as well as into understanding which groups in New Zealand have the skills and confidence to use digital technologies competently to gain benefits socially, economically and educationally and which groups are excluded. A growing body of research highlights digital inequalities for the family, community and the wider society in New Zealand. The term 'digital divide' is frequently used to refer to just one aspect of disadvantage – connectivity. *Digital literacy* training develops skills to use digital devices to access and communicate information and to foster the ability to keep up with technology and improve digital skills over one's lifetime. Digitally included individuals and communities need hardware and connectivity along with education and digital skills training.

Digital inclusion solutions require coperation and collaboration. There are several opportunities today, in the New Zealand policy context, for open sharing of research and strategies. An interagency government group is in process of a stocktake of all private and public sector digital inclusion research in order to identify future research priorities and possible collaborations between agencies. An online clearinghouse for all identified research and the sharing of research data is in process of being established. An annual conference Nethui[6] brings together the academic internet research community as well as a forum where projects share experiences and ideas.

CIH collaborates openly and cooperatively with other school-based ICT community initiatives. The Manaiakalani project in a low-income, predominantly Pacific Island community in our largest city Auckland is a cluster of schools that use netbooks for learning in the classrooms and at home, share resources between schools and use wireless technologies to communicate with students' homes. Evaluation is based on evidence of student progress in reading, writing and mathematics and parental engagement in learning (Jesson & McNaughton, 2014). CIH modelled their system of weekly payments for the purchase of devices for children by the parents on what has worked in this project. Ngā Pū Waea[7] established two clusters of networked schools in the Wellington region loosely modelled on Manaiakalani and CIH are connecting the students' homes and providing the parents digital literacy training.

3. THE COMPUTERS IN HOMES PROJECT

3.1. Background and Project Beginnings

The earliest CIH project initiatives were part of an experimental community network project called Smart Newtown funded by the local city council (Zwimpfer, 2010) and modeled on the Blacksburg Electronic Village community computer network project in Blacksburg, Virginia that from 1993-2000 enabled 80 percent of residents to access the Internet (Kavanauagh & Patterson, 2002; Kavanaugh, Kim, Perez-Quinones, Schmitz, & Isenhour, 2008).

Early CIH projects related to the call for research into home/school/community partnerships. Pilot CIH projects were supported by the Ministry of Education and set up in urban low-income communities (Cannons Creek in Wellington, and Panmure Bridge, in New Zealand's largest city, Auckland). These projects set up in 2000 were concerned with educational outcomes, in particular through getting parents inside the school gates, involved in the life of the school, and providing them with skills to help their children with their school work, then measuring changes

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[6] Nethui is an event (sponsored by InternetNZ which is the group that oversees the internet in New Zealand) that brings together the Internet community. See http://2015.nethui.org.nz/

[7] Ngā Pū Waea represents Māori interests in the government rollout of ultrafast broadband to urban and rural communities.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

460

such as numbers of parent helpers at school events and attendance at parent-teacher interviews. The project aims at building the adults' and the children's ability to achieve social and economic well-being through raising aspirations and opening new opportunities for work and family life.

An indigenous project from the early years, referred to colloquially as the Tuhoe CIH, was the first to be launched in a rural New Zealand community, and the first to be set up at the request of the community itself. The Tuhoe, an indigenous Maori iwi (tribe) with 15 schools governed by their own educational authority, partnered with the 2020 Trust to work in their schools. The Tuhoe (Children of the Mist) live in communities sprinkled throughout a remote, rural mountainous area but with many tribal members also dispersed globally and throughout other New Zealand communities. These local communities are economically depressed and geographically isolated but with a strong iwi identity and culture. Through a partnership with CIH and the 2020 Trust, and other partnerships with government and universities, they have installed wireless Internet across the valleys, put Internet access into homes, videoconferencing into schools and set up a digital gateway to communicate with dispersed tribal members and record their collective history. CIH in this case was about community development and the difference ICT makes to individuals managing their day-to-day life and how the Internet can be used for cultural and language preservation and iwi communication (Stillman & Craig, 2006).

Finally, since 2004, the Ministry of Education has funded CIH for refugee families to assist them with the immediate challenges of settlement as well as maintaining close ties with people and events in their countries of origin. A study investigates how the CIH model contributes to the social inclusion of refugees in New Zealand communities (Andrade & Doolin, 2014).

3.2. Engaging with CIH Communities

What did these early CIH communities have in common? They featured poor literacy, low educational attainment, and little participation in their children's education, low confidence, a history of failure, and more features to be detailed below. Thus in terms of community development, the CIH scheme sought to build community around the life of the school, providing parents with new opportunities to pursue their own dreams as well as giving them the tools to support their children through their educational careers. Early interviews with parents at Cannons Creek School (Wellington) revealed difficulties for them in becoming involved in their children's education because of a lack of confidence, negative attitudes based on past experiences, and limited understanding of what learning is about (Craig, 2004).
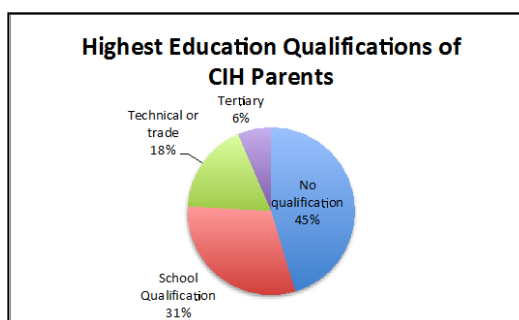
Figure 3 Education Background

These communities in which the early CIH projects were established were also characterised by their social make-up, predominantly low-income and low-employment, and high minority ethnic populations. CIH works with those schools that have the highest proportion of students from low socio-economic communities[8].

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[8]New Zealand schools are assigned a Decile ranking from 1 to 10, calculated from census statistics on income, occupation, household crowding, education and on income support (Ministry of Education, 2008, 'Deciles

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

461
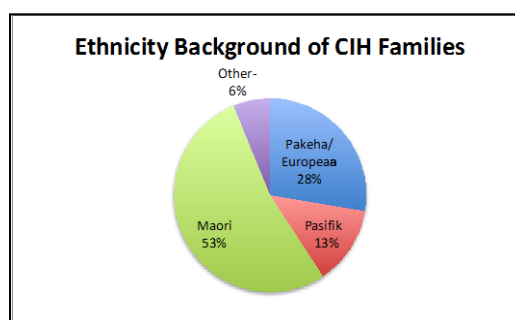
Figure 4 Ethnicity

Communities included indigenous Maori who had moved from their traditional communities to the cities some generations back, Pasifika peoples who had migrated from the Pacific islands in search of work, and other more recent immigrant and refugee groups. Mila (2013) makes the observation that half of Pacific children grow up in poverty in New Zealand, that "equal access to the rights, privileges and freedoms supposedly afforded by being born into a western society are being systematically denied" (p. 92). Likewise Māori, an indigenous peoples, have not had their rights as citizens realised.

Photo 1 CIH team

The project coordinators have come out of the culture in which they work and are models and mentors for the participants. They are selected on the basis of their relationship and established trust with the local community and a history of practice/activism in local concerns or issues. They in turn locate local trainers and technicians and are encouraged to employ graduates from the CIH scheme where there is interest.

3.3. What the Cih Project Delivers to Families

CIH teaches participants how to use online communication to bolster their connections and support networks within their immediate communities. It also encourages maintenance of identity, language and culture through e-mail and other forms of connecting online with extended family scattered around the globe. The project has also sought to encourage participants to form social networks outside the community, joining online communities that share interests and values. Training provided to the parents before they take their computers home demonstrates how to access the vast repositories of government, health, and social services information and resources that can be found online that can help migrant or isolated communities understand their rights as citizens. The training includes working knowledge of relevant education websites to provide skills for parents and caregivers to help their children

information' section). CIH works predominantly with the most economically disadvantaged 10% of communities ranked Decile 1.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

462

with their learning as well as encouragement to use email to communicate regularly with their children's school.

CIH sets up families with a computer, an Internet connection, relevant training and technical support for a cost of $50 per family. In practice today, this means CIH works with low-decile schools to provide a group of families, usually 25 at onetime, with a choice of refurbished desktop or laptop, software, assistance with purchase of handheld device for one school-aged child, subsidized broadband Internet for twelve months, weekly two hour training sessions for ten weeks, and technical support provided via the school with paid technicians as needed.

Families choose the type of Internet connection from a range of options depending on what is available in their community. Today an increasing number of homes have disconnected their fixed telephone line in favour of a mobile device; the 2013 Census reported that only 81% households had a landline compared to 88% in 2006. Hence most families choose Naked DSL as their broadband connection and a smaller number opt for wireless. The Government is currently rolling out ultrafast broadband in urban and rural areas so we anticipate an increasing number of fibre connections in the next year or so.

As a follow-up to the Computers in Homes programme, a digital literacy curriculum SteppingUP, offers free community-based training to develop skills further for work or personal life benefits. Team members who work at the grassroots with these learners have developed the CIH and SteppingUP curricula in-house and content is continually reviewed as new ICTS evolve.

For those in the community who then want to attain an internationally accredited qualification the 2020 Trust offers Kiwiskills ICDL[9] digital skills training at no cost to unemployed jobseekers.

3.4. The Philosophy of the CIH Programme

CIH delivers far more than technology and Internet connections. Its broadest goal is to build relationships, local groups and empowered communities that make it possible for citizens to achieve their aspirations and dreams.

Core to CIH philosophy is *community ownership*. Using ICTs to help CIH communities achieve social, economic and cultural goals begins with local affirmation that the community is ready to mobilise (Williams, 2010b) and involve existing community resources and connections to achieve social inclusion. The social inclusion aim was explicit in one community case study setting (Williams, 2009) where an agency involved in implementing the scheme, Housing New Zealand, viewed CIH as "one tactic in a larger strategy aimed at overcoming neighbourhood social exclusion" (ibid., p. 98. In this way CIH is seen by providers as having an important role to play in facilitating *social inclusion* and *community cohesion*.

Photo 2 Graduation ceremony

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[9] ICDL – NZ Online Computer Training & Certification

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

463

From the scheme's launch CIH has employed strategies to get the participants in each project working together and building a sense of group identity and belonging around the school community. There is strong evidence to suggests that social network ties to neighbours through local schools, churches and other community spaces do imact positively on life satisfaction and well-being (Helliwell and Putnam, 2004). The initial compulsory ICT training classes for parents and caregivers held at the school are highly social by their nature and include time for chatting over supper in the staffroom, and relationship building in general. Other tactics include the celebratory 'graduations' at which the parents are awarded a certificate showing they have completed their training, the computers are given to them, and they are recognised by their families, local public figures and politicians as well as the community at large for their achievement. Additionally CIH requires the host school to organise regular family gatherings after the parents have 'graduated' and taken their computer home that bring the learning community together for peer support. At these meetings, time is given for discussion of how the home internet experience is going, what issues may have arisen, and what difference internet at home is making to family life. Peer mentoring, through which more confident adults in the group make themselves available to guide others who are uncertain, is also a feature of the scheme. Both the content and the measured pace of training takes cognisance of the fear many participants had about any classroom experience and coming through a school gate where they have previously only known failure.

4. MEASURING DIGITAL INCLUSION

4.1. Overview

The CIH pilot projects drew on two international studies in its research design: Pinkett's study within a housing development in Boston that was focused around a neighbourhood Technology Center and provided participating residents with their own computer (Pinkett, 2002): and 'Netville' in Toronto built as a high tech middle class suburb where each house was to be provided with high speed internet connections and a range of internet based services such as desktop videophones and online health services (Hampton and Wellman, 2003). Both initiatives measured the building of social capital and the role of ICTs in developing bridging and bonding ties (Putnam,). Of interest to CIH was whether using ICT develops social capital for those whose social networks did not include computer users who can help get started and provide technical support (Warshauer, 2003).

A comprehensive review of local ICT initiatives concludes that that there is still no clear long-term evidence that ICTs can build community or produce social capital (Gaved & Anderson, 2006). ICTs can however support a range of quality of life indicators, including well-being, and grassroot community-led (as opposed to top-down) initiatives such as CIH are more likely to be sustainable and successful in reducing social exclusion.

CIH also aligned survey questions with PEW research on family Internet activities[10].

4.2. Open and Flexible Research Design

The approach is consistent with a participatory action research framework, with each data collection phase informing the next cycle of project development (Stillman, 2005; Stoecker, 2005). Evaluation approaches and methods are flexible and adaptable (Morell, 2010) and responsive to the local community as well as appropriate to the local context (Bishop, 1996; Smith, 1999). From the outset the purpose was to work at the grassroots level to fit it to local needs, to have it owned by the community and responsive to local cultural and indigenous concerns.

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[10] See publications available at http://www.pewinternet.org/topics/internet-activities/pages/2/

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

464

At the national level CIH collects quantitative survey data (online pre- and post- measures of social, education and economic benefits using SurveyMonkey) for government policy reporting and for lobbying purposes. These indicators have been developed in consultation with government department research groups. Participants complete the pre-survey at the end of their 20-week training, just before they take the internet-enabled computer home. They complete the post-survey 12 to 18 months later when they return the computer to the school for their 'rejuvenation' meeting, an occasion where they meet with their cohort socially at the school for the last official parent meeting and where the local technician 'rejuvenates' their computer by removing viruses, updating software and replacing any worn peripherals. At this time participants become responsible for their own hardware, software and internet connections.

Project team members are open to including questions of interest to other agencies in the digital inclusion field. Participants are those 'hard-to-reach' citizens who never respond to any research that using telephone or paper-based data collection. Government and other organisations request from time to time that we add questions of specific interest to them, as for example information about these families' uses of specific government websites and services.

CIH is similarly open to feedback and suggested changes to programme delivery outside of the twice-yearly reporting timeframes. The team of regional coordinators meet for two days every three months where experiences are shared and proposals put forward to pilot new ways of working in these communities.

At the local level regional coordinators capture rich narratives employing social media, specifically blogs, which not only permit communities to tell their own stories rather than a researcher doing so, but invite the expression of identity and culture. Twenty-one regional blogs may be accessed through the CIH website. The participatory research model is arguably beginning to operate at the community level; community development is now the responsibility of those in the local community.

Project researchers produce two reports a year with detailed analysis of current survey results and regional stories of participants' gains that are circulated to central and local government agencies and to funders/sponsors.

4.3. Well-Being Indicators

Participants report the pride they take over the *confidence* they have gained to communicate with a range of people outside the comfort of their own home and the confidence to take up new learning and work opportunities.
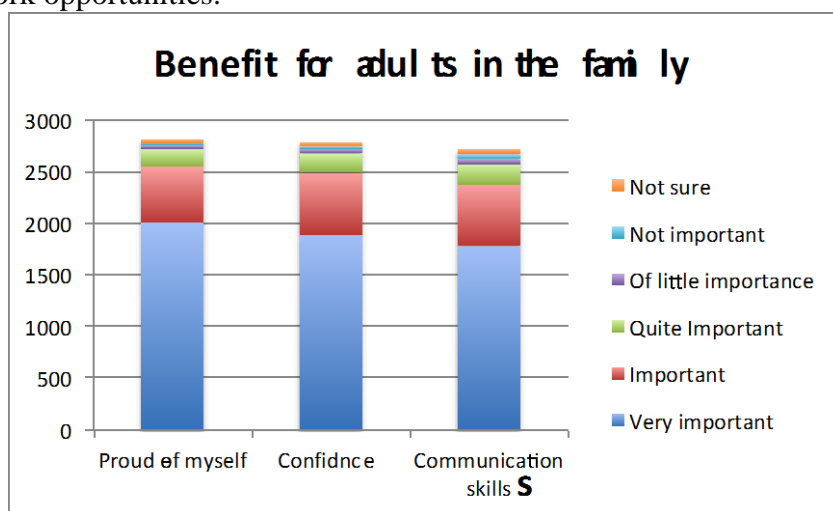
Figure 5 Confidence and belief in oneself

These tables report on the survey responses from participants 12 – 18 months after completion of

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

465

training and graduation. Over the 2010 – 2014 timeframe a total of 2,762 participants completed the online post-survey. These case studies are selected from the most recent project reports.

4.4. Social Integration: Bonding and Bridging Ties

In considering how CIH effects quality of life, we have looked to understand how bonding capital is used to encourage closer family and friendship networks and bridging capital to connect to education and employment opportunities and to find support and information to improve the family situation.
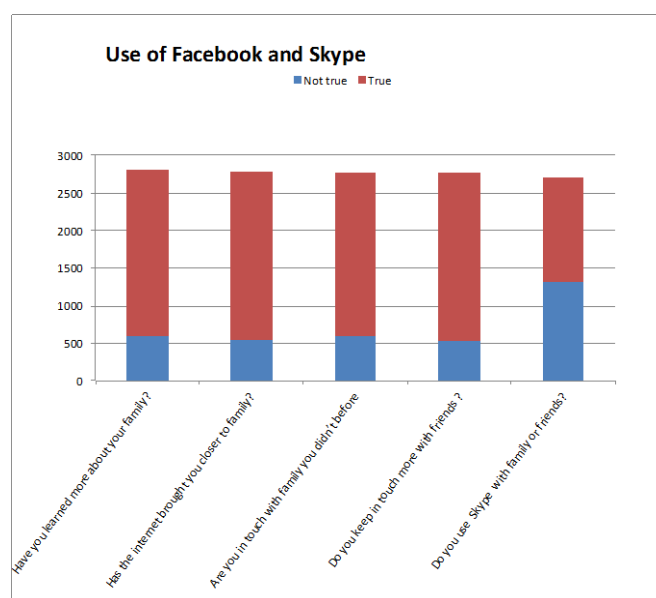
Figure 6 Bonding with extended family and close friends

Families use the tools of online social networking, in this case Skype and Facebook, to connect and in many cases reconnect with their family and whanau and friends (Figure 7). Early research among CIH families in the pilot schemes revealed how parents used online networking to find virtual support for them and their families (Craig, 2001). Instruction in the use of chat sessions and interacting with online support groups was not included in the training provided to participants, but they discovered such tools in playing around on the Internet at home and shared them very quickly among the families. Virtual community became a powerful tool for these parents. Today the possibilities for CIH participants to share and interact through social media go well beyond what could be communicated and accomplished in the earlier chat room text-based exchanges, and provide another means of cementing community cohesion, and sustaining connections made at face-to-face community events such as meetings and celebrations that bring families together.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

466

Value of CIH in promoting community involvement
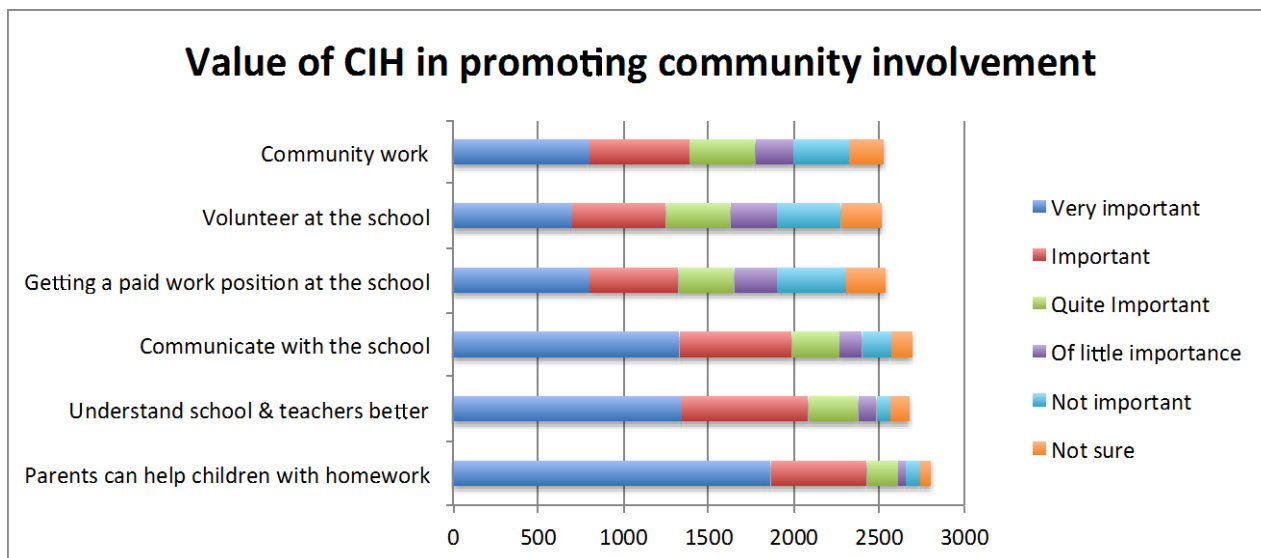
Figure 7 Connecting with local school and community

Educationalist Cathy Wylie (2013) investigates all those factors related to poverty that mitigate against parental engagement in their child's school: working long hours, holding down two jobs, inflexible work places, poor literacy and lack of enjoyment of reading and poor communication skills due to isolation through lack of work or living in a geographically cutoff community. The CIH parents report (Figure 8) that the whole family has very much benefited from the skills they have learned to communicate with the school, to connect with their child's learning at school and extend this at home. There are many possibilities for CIH participants to share and interact through their children's school as a means of cementing community cohesion and dealing with the social isolation experienced by many of these families.
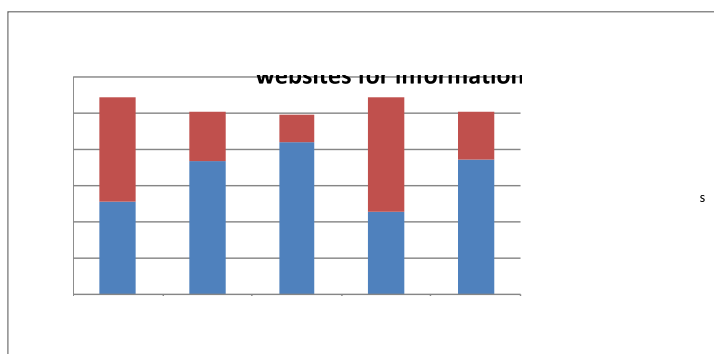
Figure 8 Communication with central government

Wilkinson and Pickett (2010) argue that significant income disparities leave people living very different lives with the consequence that families in low-income communities have limited experience of other groups in society and are less likely to engage with government or assert their citizenship rights. The CIH training has engendered more trust in communicating with outside agencies as evidenced in increasing frequency of participant contact with government agencies (Figure 10), often to question or claim their entitlements and benefits. Participants report feeling empowered when consulting with a medical professional or bank manager or some other community agency in full knowledge of entitlements (see Table 7). Access to the Internet has brought this information into the home and these families no longer feel they lack the skills to question advice offered them. One CIH family had a child with a rare heart disorder and hospital visits dominated their lives. Through being online they sourced more information on their daughter's disease and joined an international support group of parents experiencing similar challenges associated with this diagnosis. CIH has provided many parents with the

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

467

capacities to to use their rights as citizens, to take part in meaningful relationships and activities, to experience self-respect and self-esteem and to contribute to community life.
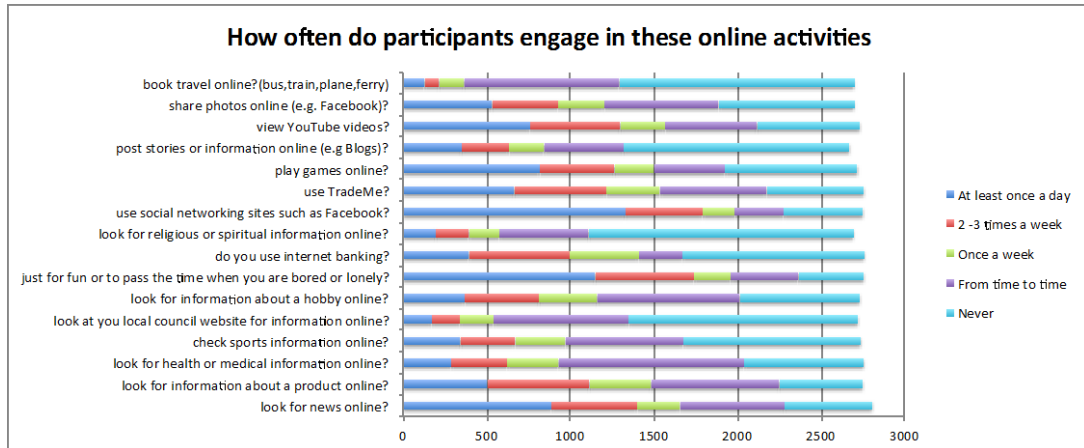
Figure 9 CIH Participant Use of the Internet

4.5. Social Contribution

Ganesh Nana (2014) argues that income inequalities damage well-being by creating unequal opportunities, which in turn limit the life chances of many. A school leaving certificate is probably the minimum level of education required for full participation in a modern economy, yet 45% of parents who sign up for CIH have no educational qualifications at all. Within a year of completing training, 27 % of CIH graduates had gone on to further education (32% to gain school-level qualifications) and 22% had found paid work.

Figure 10 Features of the CIH programme that helped participants find work

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

468

Figure 11 Features that helped participants enrol in further study

4.6. Social Coherence

Our survey questionnaires does not include measures of social coherence but the responses to open-ended questions and the narratives recorded by coordinators in the project reports tell how so many participants have come to believe in themselves and their children's futures.

I don't know how to explain it ... it has kind of lifted us up and we're no longer down-trodden. We feel like we have come into the technological world. If you said you didn't have a computer people would say "what!!" We feel lucky. I feel it's a privilege.

I was illiterate when I came here. I left with the keys to a whole new world. I've always found that learning is my greatest fun when I am discovering something. So each time I open my computer I would seek to discover, that's why learning to ask the right questions is so important for me and my whanau

5. INTO THE FUTURE

CIH works in the non-profit sector and is able to be much more responsive to the community than government interventions. The Tuhoe Education Authority (TEA) chose to partner with the 2020 Trust given our approach to work alongside the iwi or tribe. Government only works from the top down into a community. CIH cannot address the deeper roots of inequality in New Zealand but can work alongside families to help them find a voice, self-respect, assert their citizen rights and have the confidence to seize new opportunities. These things all contribute to well-being /Mana Atua.

Leading Maori educational researcher Linda Tuhiwai Smith critiques mainstream policy responses to poverty for Maori and other ethnic minority groups, cycles of programmes that prepare the unemployed with work readiness skills, interview skills, computer literacy but in communities where no jobs exist. She agrees with the 2020 Trust philosophy that 'education provides the most significant social pathway out of poverty and inequality' (Smith p.232). However what is needed in New Zealand is in her words a "whole-of-society' transformation if those with limited opportunity can ever make genuine self-empowering choices.
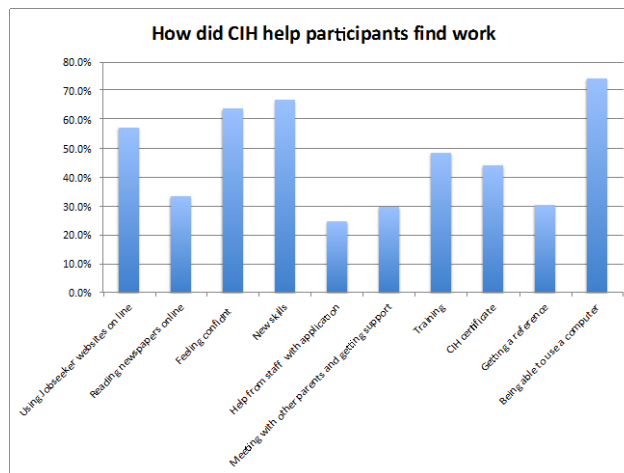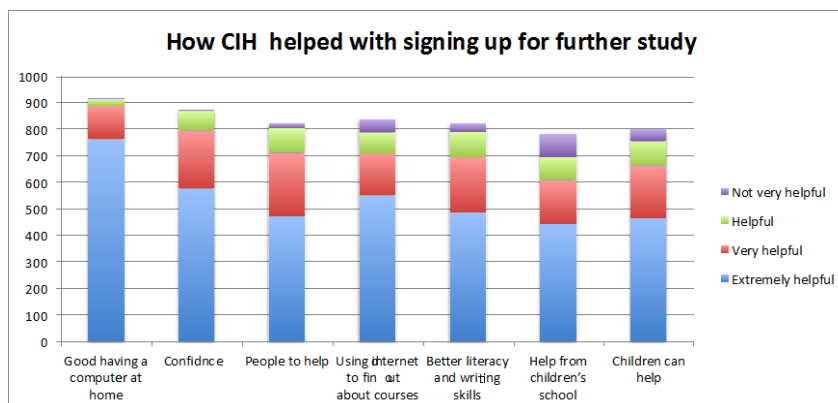
REFERENCES AND CITATIONS

2020 Communications Trust. (2002). *Newtown School Computers in Homes Report*: Ministry of Education.

2020 Communications Trust. (2009). 2020 Leader in communications ICT in New Zealand and the Pacific.   Retrieved March 12, 2009, from http://www.2020.org.nz/

2020 Communications Trust. (2014). *Computers in Homes Annual Report*.

Andrade, Antonio Díaz and Bill Doolin,(2014). *Computer-mediated information and communication practices of resettled refugees in New Zealand*. Auckland University of Technology: Auckland, New Zealand.

Bishop, R. A. (1996). *Collaborative research stories: whakawhanaungatanga*. Palmerston North: Dunmore Press.

Boulton, A & H Gifford (2011) Implementing Working for Families: the impact of the policy on selected Māori whānau, *Kōtuitui: New Zealand Journal of Social Sciences Online*, 6:1-2, 144-154, DOI: 10.1080/1177083X.2011.620971

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

469

Boulton, A. F. , Gifford, H. H. (2014). Whānau Ora; He Whakaaro Ā Whānau: Māori Family Views of Family Wellbeing. *The International Indigenous Policy Journal*, 5(1) . Retrieved from: http://ir.lib.uwo.ca/iipj/vol5/iss1/1

Bruns, A. (2007, 13-15 June 2007). *Produsage: Towards a broader framework for user-led content creation.* Paper presented at the Creativity & Cognition - Seeding Creativity: Tools, Media, and Environments conference, Washington, DC.

Cheung, J. (2007). *Wealth Disparities in New Zealand*. Statistics New Zealand. Available from www.stats.govt.nz/sofie

Clinton, J., Hattie, J., & Dixon, R. (2007). *Evaluation of the Flaxmere Project: When families learn the language of school*: Ministry of Education.

Coll, S. (2011). The Internet: For better or for worse. *The New York Review of Books, LVIII* (6), 20-24.

Craig, B. (2001). *Making connections: Virtual community and digital opportunities for low-income communities*. Paper presented at the The Eight International Literacy and Learning Research Network Conference, Spetses, Greece, 4 - 8 July.

Craig, B. (2004). Motivations for literacy in the information age: Report on an adult literacy Internet-based home training project in multi-ethnic communities in New Zealand. *Journal of Adult Literacy* (March).

Craig, B. (2010). *Unexpected twists and turns on the road to recognition: Engaging government and community in the Computers in Homes project.* Paper presented at the Vision and Reality in Community Informatics: CIRN-DIAC Conference, 27 - 29 October, Prato, Italy.

Crump, B., & McIlroy, A. (2003). The digital divide: Why the "don't–want–tos" won't compute: Lessons from a New Zealand ICT project, *First Monday* (Vol. 8).

Davison, E., & Cotten, S. R. (2003). Connection discrepancies: Unmasking further layers of the digital divide. *First Monday, 8*(3).

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2000). *Handbook of qualitative research* (2nd ed.). Thousand Oaks, CA: Sage Publications, Inc.

DiMaggio, P., Hargittai, E., Celeste, C., & Shafer, S. (2004). Digital inequality: From unequal access to differentiated use [Electronic version]. In K. Neckerman (Ed.), *Social Inequality* (pp. 355-400). New York: Russell Sage Foundation.

Durie, M. H. (1995). Te Hoe Nuku Roa framework: A Māori identity measure. *Journal of the Polynesian Society*, 104(4), 461 - 470.

Durie, M. (2006). *Measuring Māori wellbeing*. Paper presented at the New Zealand Treasury Guest Lecture Series, Wellington.

Durkheim, E. (1951). *Suicide*. New York: Free Press.

Eubanks, V. E. (2007). Trapped in the digital divide: The distributive paradigm in community informatics *Journal of Community Informatics, 3*(2).

Fragoso, S. (2003, 16 - 19 October). *The multiple facets of the digital divide.* Paper presented at the Association of Internet Researchers 4.0 conference: Broadening the Band, Toronto, Canada.

Freire, P. (1970). *Pedagogy of the Oppressed*. New York: Seabury.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

470

Gaved, M., & Anderson, B. (2006). *The impact of local ICT initiatives on social capital and quality of life, Chimera Working Paper 2006-6*. Colchester: University of Essex.

Greenhalgh, T., Robert, G., McFarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: Systemic review and recommendations. *The Milbank Quarterly, 82*(4), 581-629.

Haisken-DeNew, J. P., & D'Ambrosio, C. (2003). *ICT and socioeconomic exclusion*.

Hampton, K. (2007). Neighborhoods in the network society: The e-Neighbors study. *Information, Communication & Society, 10* (5), 714 - 748.

Helliwell, J. F. & R. D. Putnam(2004). The Social Context of Well-Being. *Philosophical Transactions: Biological Sciences, Vol. 359, No. 1449, The Science of Well-being: Integrating Neurobiology, Psychology and Social Science* (Sep. 29), pp. 1435-1446

Hookway, N. (2008). 'Entering the blogoshpere': Some strategies for using blogs in social research. *Qualitative Research, 8*(91), 91-113.

Hurtig, J. (2008). Community writing, participatory research, and an anthropological sensibility. *Anthropology & Education Quarterly, 39*(1), 92–106.

Jesson, R. and McNaughton S. (2014). *Manaiakalani Evaluation Programme: Summary of 2013 Data Analysis*. UniServices Task Number 31863.001: Auckland University.

Kamira, R. (2007). Kaitiakitanga: Introducing useful indigenous concepts of governance in the health sector. In L. E. Dyson, M. Hendriks & S. Grant (Eds.), *Information technology and indigenous people*. Hershey, PA: Idea Group Inc.

Katz, J. E. & R. E. Rice (2002). *Social Consequences of Internet use*. MIT: Cambridge MA.

Kavanauagh, A. L., & Patterson, S. J. (2002). The impact of community computer networks on social capital and community involvement in Blacksburgh. In B. Wellman & C. Haythornthwaite (Eds.), *The Internet in Everyday Life*. Malden, MA: Blackwell.

Kavanaugh, A., Kim, B. J., Perez-Quinones, M. A., Schmitz, J., & Isenhour, P. (2008). Net gains in political participation: Secondary effects of Internet on community. *Information, Communication & Society, 11*(7), 933 - 963.

Keyes, Corey Lee M. (1998). Social well-being. *Social Psychology Quarterly;* Jun; 61, 2; 121-140

Kennedy, T. L. M., & Wellman, B. (2007). The networked household. *Information, Communication and Society, 10* (5), 645 - 670.

Kiesler, S., Kraut, R., Cummings, J., Boneva, B., Helgeson, V., & Crawford, A. (2001). Internet evolution and social impact. *Journal of Social Issues*.

Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukhopadhyay, T., & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being. *American Psychologist, 53*, 1017 - 1031.

Lane, C. (2010). *Adult numeracy and literacy in New Zealand: Key factors*: Tertiary Sector Performance Analysis and Reporting Division, Ministry of Education.

Loader, B. D., & Keeble, L. (2004). *Challenging the digital divide? A literature review of community informatics initiatives*. York: The Joseph Rowntree Foundation/YPS, for the Community Informatics Research and Applications unit at the University of Teesside.

Lyons, L., & Chipperfield, J. (2000). (De)constructing the interview: A critique of the participatory model. *Resources for Feminist Research, 28*, 33-42.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

471

Merkel, C. B. (2003). *Beyond deficit models of technology use: Viewing "have-nots" as active technology users.* Paper presented at the Association of Internet Researchers (AoIR) 4th annual conference: Broadening the Band, Toronto, October.

Mila, K. (2013). Only One Deck. In Rashbrooke, M. Ed. (2013). *Inequality: A New Zealand Crisis*. Bridget Williams Books: Wellington.

Ministry of Education. (2008, August 8). Welcome to New Zealand Education: *Deciles*. Retrieved December10,2008,fromhttp://www.minedu.govt.nz/NZEducation/EducationPolicies/Schools/SchoolOperations/Resourcing/OperationalFunding/Deciles.aspx

Morell, J. A. (2010). *Evaluation in the face of uncertainty: Anticipating surprise and responding to the inevitable*. New York; London: Guilford Press.

Mossberger, K., Tolbert, C. J., & Stansbury, M. (2003). *Virtual inequality: Beyond the digital divide*. Washington D.C.: Georgetown University Press.

Nana, G. (2013) The Cost of Inequality. In Rashbrooke, M. Ed. (2013). *Inequality: A New Zealand Crisis*. Bridget Williams Books: Wellington.

Newman, K. (2008). *Connecting the clouds: The Internet in New Zealand.* Auckland, NZ: Activity Press in association with InternetNZ.

Nie, N. H., & Erbring, L. (2000). Internet and society: A preliminary report. *IT and society, 1*(1), 275-283.

OECD (2014). *Society at a Glance 2014 OECD Social Indicators: The crisis and its aftermath. Retrieved November 15 2014, from www.oecd.org/els/soc/OECD2014-SocietyAtAGlance2014.pdf*

OECD (2014) *How's life in New Zealand?* OECD Better Life Initiative

Pigg, K. E., & Crank, L. D. (2004). Building community social capital: The potential and promise of information and communications technologies. *The Journal of Community Informatics, 1*(1).

Pinkett, R. D. (2002). The Creating Community Connections (C3) System: community created, community focused, community content in a low- to moderate-income community. *Computer Support for Collaborative Learning (CSCL),* Boulder, Colorado, USA.

Postill, J. (2008). Localizing the Internet beyond communities and networks. *New Media & Society, 10*(3), 413 - 431.

Putnam, R. D. (2000). *Bowling alone. The collapse and revival of American community*. New York: Simon & Schuster.

Rashbrooke, M. Ed. (2013). *Inequality: A New Zealand Crisis*. Bridget Williams Books: Wellington.

Reed-Danahay, D. (2004). *Locating Bourdieu*: Indiana University Press.

Rowlinson, K. (2011). *Does income inequality cause health and social problems?* Joseph Rowntree Foundation www.jrf.org.nz

Smith, L. T. (1999). *Decolonising methodologies: Research and indigenous peoples*. London: Zed Books.

Smith, L. T. (2013). The Future is Now. In Rashbrooke, M. Ed. (2013). *Inequality: A New Zealand Crisis*. Bridget Williams Books: Wellington.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

472

Statistics New Zealand. (2013a). Household Use of Information and Communication Technology: 2012,retrievedfrom, http://www.stats.govt.nz/browse_for_stats/industry_sectors/information_technology_and_communications/hhold-use-of-ict.aspx and breakdown tables provided by request to StatsNZ

Statistics New Zealand. (2013b). 2013 Census Retrieved August 9, 2013, from http://www.stats.govt.nz/searchresults.aspx?q=census

Stillman, L. (2005). Participatory action research for electronic community networking projects. *Community Development, 36*(1), 77-92.

Stillman, L., & Craig, B. (2006). *Incorporating indigenous world view in community informatics.* Paper presented at the "On the move to meaningful Internet systems" Conference (Workshops) 29 October - 3 November, Montpellier, France.

Stoecker, R. (2005). *Research methods for community change: A project-based approach.* Thousand Oaks CA: Sage Publications.

Vishwanath, A. (2006). *An examination of the characteristics of technology opinion leaders and opinion seekers.* Paper presented at the International Communication Association conference, Dresden International Congress Centre, Dresden, Germany, June 16.

Warschauer, M. (2003). *Technology and social inclusion: Rethinking the Digital Divide.* Cambridge, Mass.: The MIT Press.

Wellman, B., Quan-Haase, A., Witte, J. and Hampton, K. (2001). "Does the internet increase, decrease, or supplement social capital? Social networks, participation, and community commitment." *American Behavioral Scientist* 45 (3): 437 - 456.

Wellington City Council. (1996). *InfoCity Strategy*: Wellington City Council / Absolutely Positively Wellington.

Wilkinson R. & K. Pickett (2010). *The Spirit Level, Why Equality is Better for Everyone*, Bloomsbury, New York.

Williams, J. (2007, 5-7 July). *Sustainability and community ICT: The critical role of participation.* Paper presented at the Communication, Civics, Industry: Australian and New Zealand Communication Association Annual Conference , 5 - 7 July, Melbourne Law School.

Williams, J. (2009). *Connecting people: Investigating a relationship between Internet access and social cohesion in local community settings.* Unpublished Doctoral thesis, Massey University, Palmerston North.

Williams, J. (2010a). *Resources in unexpected places: Social cohesion and successful community Internet.* Paper presented at the Vision and Reality in Community Informatics: CIRN -DIAC Conference, 27-29 October 2010, Monash Research Centre, Prato, Italy

Williams, J. (2010b, 7 - 9 July). *The role of opinion leaders in community Internet use: Connecting people, creating cohesion.* Paper presented at the Media, Democracy and Change: Australian and New Zealand Communication Association Annual Conference, 7 - 9 July, Old Parliament House, Canberra.

Wylie, C. (2013). Schools and Inequality. In Rashbrooke, M. Ed. (2013). *Inequality: A New Zealand Crisis*. Bridget Williams Books: Wellington.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

473

Zwimpfer, L. (2010). Building digital communities: A history of the 2020 Trust. In J. Toland (Ed.), *Return to tomorrow: Fifty years of computing in New Zealand*. Wellington: New Zealand Computer Society.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

474

DEVELOPING AN ICT BASED HEALTH INTERVENTION FOR FEMALE SEX WORKERS - AN ACTION RESEARCH AND PARTICIPATORY DESIGN APPROACH

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Abstract: The National AIDS Control Organization (NACO) in India has developed Targeted Intervention (TI) programs with participatory components to combat the epidemic of HIV/AIDS among the High-Risk Groups (HRGs) such as female sex workers (FSWs). Although ideal health promotion initiatives for these marginalized sub-groups of population are meant to be participatory, the end is rarely achieved. Syndromic management of reproductive and sexual diseases, monitoring of individual cases, and knowledge dissemination are the cornerstones of the program. We undertake a study with the goal of imparting a higher level of 'participatory' character to TI programs and garner ideas for supplementary data generation with full participation from the stakeholders. An information and communication (ICT) prototype solution, called KHID, is developed for the reporting, tracking, and syndromic management of sexual and reproductive infections among FSWs, and collaborative participation among the stakeholders.

Keywords: Female sex workers, reproductive and sexual health, syndromic management, mobile phone application, participatory action research, participatory design

1. INTRODUCTION

Female sex workers (FSWs) are a marginalized community in India. Living in an environment where prostitution in not legalized, FSWs suffer multiple forms of disadvantages. They include stigma, poverty, and exploitation by police, clients or agents of the sex trade (Cornish, 2006). With regard to sexually transmitted diseases, they are identified as a High Risk Group (HRG), and AIDS still continues to be an unchallenged threat.

In India, interventions designed for the FSWs through programs like Targeted Interventions (TI) of the National AIDS Control Program (NACP) focus exclusively on health issues of HRGs vis-à-vis sexually transmitted infections and HIV infections. These programs are linked with Integrated Counseling and Testing Centers (ICTC) that offer facilities for FSWs to conduct HIV testing and access counseling services. However, these programs are not grounded on the socio-demographic and cultural backdrop of the FSWs (i.e., the nature of their work, schedules, lifestyle, apprehensions, insecurities, stigmas, and complexes). The shady legal environments in which the FSWs work also makes it risky to identify themselves with an organization. Furthermore, in the unique context of FSWs, imposing a change from outside tend to create a force of resistance and non-compliance, and often fail to create an impact. Thus, the top-down approach of the TI programs has not been effective, and the support system offered by ICTC has fallen short in reaching their objectives. The programs can be effective only if they are sensitive to the unique needs of the FSWs, mobilize willful participation, and facilitate financial, physical, and cultural access to healthcare services.

At the heart of development is changing the ways of thinking of individuals, and this change in direction has to come from within each individual. Such behavioral changes are typically

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

475

initiated by community-based organizations that aspire for community participation in intervention design and implementation (Cornish, 2006). A collective voice that is participatory in nature may have a better chance of being heard and acknowledged in the society. Interventions that merge individual needs with the needs of the collective group, one that inculcates a sense of responsibility for their own health, enhances trust in the public health system, and reiterates their right to health is essential. It is therefore advisable for interventions to take a participatory approach as the number of FSWs to be included in the safety net is considerable, and as they must become self-sustaining (Cornish, 2006).

Given the work conditions of the FSWs, the National AIDS Control Organization (NACO) under the Central Government of India, has called for a system of care that involves minimal lab interventions to address the threat of AIDS. The program envisages preliminary care based on symptom-based (syndromic) management of disease threats. This is to assure that essential primary care is imparted without delay (NACO, 2013). The Strategic Information Management System (SIMS) framework (see Figure 1) is one of the pillars of NACP, and is built on evidence-based information (NACO, 2013). SIMS is proposed as an overarching program management strategy that encompasses the entire spectrum of activities starting with data generation to measuring program outcomes and dissemination of findings. The knowledge management strategy (the fourth quadrant of SIMS) is built on fundamental objectives of generating information, creating knowledge products, and translating knowledge. It highlights the need for surveillance, monitoring, and generation of research based data. NACO envisions SIMS for systematic generation, analysis, and distribution of knowledge for policy making.

In this study, we adopt a research approach that combines participatory action research (PAR) with participatory design (PD) process. PAR consists of five stages - diagnosing, action planning, action taking, evaluating and specifying learning. Axiomatic similarities can be drawn between the phases of PAR and the SIMS framework. The pre-program assessments phase of SIMS framework corresponds to the diagnosing and action planning phases. The knowledge management and translation phase of SIMS corresponds to the action taking phase of PAR. Program evaluation and in-program assessments phases of SIMS framework map to the evaluation phase of PAR. The fifth phase of PAR, specifying learning, that concerns knowledge sharing with the rest of the world, is not represented in SIMS.

This study explores the participative content of the TI program that falls under NACP, and develops an information and communication technologies (ICT) intervention to supplement the knowledge management component of SIMS. The study aims to address the following research questions:

- What barriers and socio-cultural challenges limit accessibility to health care among FSWs?

- What are ways to utilize ICT to overcome and transcend challenges that prevent FSWs from gaining access to health care?

- How can ICT be used to locally improve, promote, and facilitate reproductive health care intervention and delivery among FSWs?

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

476
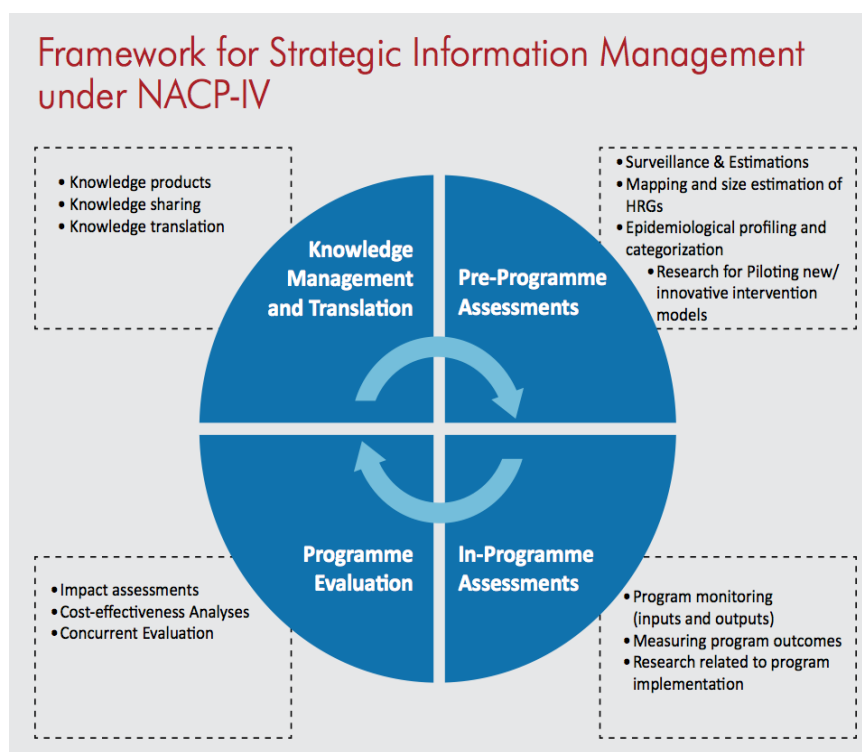
**Figure 1. Framework for Strategic Information Management,
(Adapted from NACO, 2013)**

The rest of the paper is organized as follows. First, we provide a review of the participation and development initiatives for addressing health issues faced by individuals in the HRGs. It provides the basis for developing the research plan. We then provide a background on PAR and PD. We describe in detail the assessment of the problem situation (diagnosing phase), intervention planning to address issues (action planning phase), and the development of an information system (action taking phase). We do this by discussing the role of PD as a design process within the PAR framework. The prototype information and communication technologies (ICT) solution that we describe, called KHID, serve to enhance the participatory characteristic of the TI program. As a knowledge product, the KHID platform enables knowledge generation, which can be used for detailed data analysis and future planning. It can serve to address the objectives of the knowledge management and translation specified in the SIMS framework. The last two phases in PAR, evaluating and specifying learning, are not within the scope of this paper, and hence not elaborated. They will be addressed in the continuation of this research project. We conclude the paper by summarizing the current state and future directions of this research.

2. LITERATURE REVIEW

Development is about bringing change in the society. The society is a blend of the rich and the poor, the marginalized and the mainstream. Transformation is fundamental to bringing the extremes closer to each other. It is hence the first step in all actions aimed at inclusion (Stiglitz, 1998). Change is not an end in itself, but a means to other objectives. Development related changes confer on people and societies more control over their own self and destiny. Development is desired to declare freedom from afflictions brought on by disease and poverty, increase life spans, and improve the quality and enhance the meaning of life (Oakley, 1995). Approaching development from the perspective of transforming society has profound implications not just for what governments and aid agencies do, but also for the way in which they proceed, and how they engage in participation and partnership (Stiglitz, 1998).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

477

AIDS control programs focus on high risk or vulnerable groups, in particular men and women with multiple sex partners, to achieve objectives of prevention of AIDS and increasing knowledge about AIDS. Although these programs persuade individuals to modify sexual behaviors through reducing sex partners and increasing condom use, evidence is lacking in its effectiveness to bring about behavioral change (Ngugi, Wilson, Sebstad, Plummer, & Moses, 1996). Ngugi and Plummer (1988) suggest that programs that collectively mobilize individuals, community groups, and health professionals are more successful in educating and creating awareness about AIDS among individuals in the HRGs. Similarly, an ethnographic research conducted as part of the Sonagachi Project elucidates the success of sex-worker led HIV prevention project in India (Cornish & Ghosh, 2007). It proves that, given the existing power relations in the community, the engagement of FSWs with a widened 'community' of donors, development agencies and government agencies is essential for the success of programs targeting the control of AIDS epidemic (Campbell & Cornish, 2010). Such engagements create opportunities for the sex workers to participate in decision making and forward planning. The fourth generation perspective put forward by Campbell and Cornish (2010) also reiterates the need for participatory model of interventions involving sex workers and community stakeholders. Intervention programs may find better success when they are developed with the people and for the people (Ngugi & Plummer, 1988).

2.1. Participation and Development

Participation of stakeholders in development can be looked upon as a process that assures inclusion of human resources in developmental efforts; that persuades people to participate and contribute to the process of development. Participation is a process that aims at addressing the structural causes of issues by analyzing, understanding, and correcting from within (Oakley, 1995). Altering the structure of involvement is therefore more likely to lead to a more sustainable solution to problems of inclusion.

In many developing nations, marginalized communities lack the momentum to initiate and engage in developmental activities. In these instances, participation is neither spontaneous nor original (Oakley, 1995). The stakeholders rarely participate in visualizing and designing programs, and hence powerless in controlling the project. However, they are usually willing to collaborate with external development projects, often by contributing their labor and other resources in return for some expected benefits. People's participation in such cases are sponsored by an external agency, and often programmed as part of the project input. Benefits of participation depend on the perspective with which the concept is employed. Participation should not be an 'element' in development, but the 'basis' for development (Dichter, 1992). When government initiated projects (vertical, top-down approaches) fall short in achieving its goals, alternatives such as bottom-up and horizontal approaches merit examination. Prerequisites of bottom-up approach, a natural alternative of top-down approach are contributions of stakeholders in terms of resources, knowledge, and skills. When planners envisage participation, they presuppose a certain skill endowment on the part of stakeholders (Hussain, Sanders, & Steinert, 2012). However, skill endowment of the marginalized sub-group populations in developing countries cannot be taken for granted. Hence, the bottom-up approach may not work in the context of developing countries (Braa & Sahay, 2012). Horizontal approaches involve individual contribution of stakeholders in specific capacities, which gives it a horizontal character, and thus a more suitable alternative of choice. In countries like India with very strong hierarchical structure and a history of government-initiated interventions, programs needs to have a stronger hue of horizontal participation and collaboration. Participation has to be transformative, continuing and dynamic, and generate empowerment among the stakeholders (White, 1996). This form of participation not only makes it suitable to gather living knowledge from FSWs, but also enable collective understanding of the health issues they face. For researchers and policy makers, it helps to develop processes and actions based on sound reasoning, rigor and care.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

478

Participative programs that are transformative in nature are increasingly used in the healthcare research (Bekker et al., 2014; Kerrigan et al., 2014; UNAIDS, 2009). Actively engaging FSWs in intervention programs to address challenges of reproductive health care has been utilized in different countries (Becker et al., 2012; Chersich, 2014; TAMPEP, 2007).

2.2. Participatory Action Research

Action research (AR) is a research technique that involves intervention experiments on problems and questions perceived by subjects in a particular context (Baskerville, 1999). As a research methodology that places the researcher in a 'helping role' within the context of study (Schein, 1987), AR has important implications for IS research (Baskerville & Wood-Harper, 1998). Action research in Information Systems (IS) is distinguishable by four characteristics (Baskerville, 1999): 1) multivariate social setting, 2) highly interpretive assumptions about observations and researcher intervention for problem solving and expanding scientific knowledge, 3) enhanced competencies of both researchers and subjects through collaboration, and 4) study of change in the social setting. Although various forms and orientations of AR have been identified in literature (e.g., canonical AR, participant observation, multiview, process consulting, etc.), they share some common characteristics such as action and change orientation, problem focus, iterative stages, and collaborative involvement of participants (Baskerville, 1999; Davison, Martinsons, & Kock, 2004).

Participatory Action research (PAR) is a specific form of AR that is distinguished by the involvement of the researchers and subjects in a more collaborative and synergistic manner. It facilitates subjects to prioritize and analyze information on themselves (Cornwall & Jewkes, 1995), and researchers to participate in the building and testing of interventions. In the specific context of healthcare, PAR contributes in identifying the appropriate research questions from the community's perspective, bridging the gap between knowledge and practice, and establishing credibility in research results by assuring involvement and activism of the beneficiaries in the PAR process (Loewenson, Laurell, Hogstedt, D'Ambuoso, & Shroff, 2014).

2.3. Participatory design

Participatory design (PD) is the development of information and communication artefacts, systems, services, and technology through a collaborative design process involving stakeholders that are affected by the technology designed (Asaro, 2000). It is a process envisaged by acknowledging that each and every participant is an expert in how they live their lives. In the PD process, ideas for the design of the IS are generated in collaboration with all stakeholders (Hussain et al., 2012), and related to workplace democracy and empowerment (Braa & Sahay, 2012). Local knowledge and perspectives are fundamental to this design approach (Cornwall & Jewkes, 1995). The central idea behind this approach is that, whoever is affected by the intervention is given fair opportunity to identify their needs and specify how they can be addressed by the intervention. It is essential that the decision making process is democratic. PD presents challenges in innovating ways for involving and engaging the stakeholders (Hussain et al., 2012).

PD originated in Scandinavia during the 1960s and 1970s. Later explorations proved that the approach as developed could not be applied in the context of developing countries due to variations in human, social, cultural, religious, and financial aspects. The extent, possibility, and continuity of participation cannot be taken for granted in developing countries. Furthermore, the skill endowment of stakeholders can also be a hurdle in PD (Hussain et al., 2012). Nevertheless, for PD to be successful in developing countries, individual contribution i.e., complete and genuine participation of every member among stakeholders, is necessitated.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

479

3. STUDY BACKGROUND

FSWs are a core target of the HIV/AIDS programs initiated by NACO in India. NACP (under NACO) has been developed to combat the epidemic of AIDS with considerations to the socio-cultural aspects rather than just a public health focus. HIV incidences among FSWs are primarily driven by high-risk behaviors such as unprotected sexual intercourse (both heterosexual and same-sex) and injecting drug use (NACO, 2013). The epidemic is a serious concern in sub-groups of population identified as HRG or Most-At-Risk Populations (MARP), which include FSWs, Men who have sex with Men (MSMs), Transgenders/Hijras, and Injecting Drug Users (IDUs). These population sub-groups play a significant role in the transmission of HIV infection to general population through sexual networks. Transportation workers (such as truck drivers and loaders) and migrant laborers function as a bridge population. Hence, prevention through focused interventions among high-risk groups and their sex partners is of extreme importance for controlling HIV epidemic in the country.

This study is conducted in the district of Ernakulam in Kerala State, India. The study is carried out in association with the TI program initiated by the Kerala State AIDS Control Society (KSACS), which is the implementing agency of the NACP. The program is delivered through the KSACS clinic (called Suraksha). The TI program has one thousand five hundred registered FSWs who are monitored by twenty-two Peer Educators (PE) designated from among themselves. PEs and Out Reach Workers (ORWs) employed by KSAC keep contact with the members regularly, track their activities, and prompt medical consultation at least once in three months. In the event of FSWs not consulting a Preferred Private Practitioner (PPP - the doctor identified and chosen by the sex workers) in a three-month timeframe, it is the responsibility of the delegated PE to contact them for follow-up. The PE then delivers a medical kit to the FSW that contains broad-spectrum medicines as a countermeasure for potential reproductive and sexuality transmitted infections (RTI/STI). The PEs and ORWs also persuade FSWs to do necessary tests at the ICTC laboratories as a safety check. However, the rigor with which such initiatives are being carried out is unsatisfactory. PEs and ORWs very frequently face challenges such as non-response from FSWs when contacted, and resistance to cooperate. Effective monitoring of sexually transmitted infections and delivering information on sexual and reproductive health services is thus rendered ineffective. This reiterates the need for an alternative solution that is developed through participation of the FSWs, and sustained by their active involvement.

4. METHODOLOGY

A locally relevant and patient-sensitive ICT solution can assist FSWs in overcoming the challenges of reporting disease symptoms, sharing information, and gaining access to sexual and reproductive health care. The first step in this direction is to conduct a need gap analysis to determine shortcomings in health services delivered to FSWs through the TI program. Only then an ICT based intervention can be developed to improve, promote and facilitate health care among FSWs. The study background described above elucidates the importance of understanding the challenges faced by FSWs that limit accessibility to healthcare, and the barriers to the delivery of health services through the TI programs.

The methodology adopted for this study combines PAR with the PD process. The study involves participation of FSWs, TI program managers, PEs, PPPs, ORWs, and researchers from different areas of expertise for the generation of a workable ICT design that is likely to improve the lives of the FSWs. This signifies the PD aspect of the study. PD is appropriate for understanding and interpreting stakeholder requirements and building iterative design prototypes (Foth & Axup, 2006). Further, the study aims to introduce change in the community through action and intervention. This marks the PAR component of the research. In the context of this study, PAR contributes to the continuity and currency of the PD process. Correspondingly, PD informs the various stages of the PAR. Thus, PAR and PD seamlessly complement each other.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

480

An exploratory research is initially planned for the project. For the diagnosing and action planning phases of PAR, data was collected through qualitative method such as in-depth personal interviews with the various stakeholders. Content analysis of interview data is used for need gap assessment. The action taking phase is concerned with the design and development of the ICT solution utilizing the PD process. The evaluation phase involves quantitative assessment using survey-based questionnaire to determine the level of penetration of the ICT intervention. The specifying learning phase shares the knowledge gained among the various stakeholders, and researchers. The different stages of the combined approach are described below.

4.1. Diagnosing

Diagnosing is the first step in PAR. This phase concerns identifying the nature of the problem, and relating them to the causes of the problem. It involves the interpretation of the problem situation in a comprehensive manner. It contributes to a collaborative nature of understanding between the subjects, practitioners, stakeholders, and researchers (Baskerville & Wood-Harper, 1998). Diagnosing phase includes the collection of data, analysis and interpretation. This phase is a critical prerequisite (Davison et al., 2004) in developing the appropriate ICT intervention. The next phase i.e., action planning depends on the interpretations drawn in the diagnosing phase.

During the diagnosing phase, processes and procedures in the TI program were identified through in-depth interviews with the Program Managers, PPPs, PEs and ORWs. This was followed by extensive interviews with the FSWs. The analysis and comparison of the data helped researchers in developing a thorough understanding of the occupational, cultural and infrastructural problems faced by the FSWs in accessing and utilizing the facilities offered by the TI program. Interviews also helped to gather information on corrections to the mode of delivery of health services wishfully suggested by the FSWs. The participation of FSWs in identifying the functionalities of the ICT solution is not only likely to increase future enrollment in the intervention plan, but also reduce attrition in the health care delivery loop, improve reporting of the diseases, and increase receptiveness of the proposed intervention.

4.1.1. Findings

As part of an initial exploration, data collection was carried out over a period of four months with eight FSWs registered in the TI program. Interviews were highly interactive and intrusive. The conversations with each FSW were recorded, and later transcribed for analysis to identify most prominent statements and commonly shared ideas. The statements were further analyzed to identify problems and challenges of healthcare access on which little information was available thus far. Repeated concerns and responses indicated the overarching possibility of continuing the enhanced syndromic case management with minimal laboratory tests. The statements also hinted at the possibility of introducing a participatory approach to decision-making in the management of sexual and reproductive health among FSWs. Key issues that emerged from the analysis of the interview data are summarized below.

A major barrier to pursuing medical care that emerged from the statements of FSWs was the need for ***masking the profession***. Many FSWs are home-based and lead a normal life, but entertain their clients secretly during the daytime. They lead a lifestyle where the family members and the society are unaware of their profession. Quite often during the medical visits, the doctors insist on interacting with their spouses. This makes them concerned and nervous to see a doctor. As stated by an FSW,

"I have severe vaginal discharge. My husband is under the belief that I am working in a government office in the city. So I take up work during daytime and I am not able to see the doctor or talk to her. I take some over-the-counter (OTC) medicines, which are not very effective.""

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

481

"I consulted the nearest gynecologist with severe vaginal infection. I could not go to the TI doctor as her visit was due only the following week. I could not disclose to the doctor (I consulted) that I am a sex worker. So she assumed that my husband was infected and asked me to bring him as soon as possible. I was helpless.""

"I only know doctors who have clinics in my locality. I cannot consult them and disclose my health problems. I am afraid the doctor might suspect me. So it will be great if I can consult a doctor, disclose my symptoms, and get treated without a face to face meeting".

Another major barrier to healthcare access was **conflict with work commitment**. Interactions revealed that the FSWs found it difficult to avail the opportunities provided by TI clinics due to schedule conflict. Many FSWs see more that one client during the day. They opt for opportunities to earn income than spare time to consult the PPP during clinic hours. This prompts them to ignore their health problems. An interactive ICT solution that gives FSWs an opportunity to consult the medical practitioner without sacrificing working hours may enable them to gain access to primary care and ensure higher levels of participation.

"I serve at least two clients during the day. And I have to wait for their calls, and must be able to join them any time they call me. If I go to see the doctor, I might lose them. If they are regular clients, they will not like it if I say that I am unable to join them. So, if I can report my symptoms and later on get a reply on the medicines to be taken through my mobile phone, it will be very good".

"We would like to have a reporting system which can work without our spending time to consult the doctor".

Fear of **identity disclosure** was another behavioral manifestation that limits the utilization of TI programs. The FSWs are in full realization that it would be most preferable if the PPP treats them with awareness of their profession. Even when voicing concerns of revealing their profession, the FSWs recognize that medical care is most effective when the medical practitioner has a complete picture of the occupational hazards they face.

"If the doctor who treats me do not know my profession, they (the doctors) might consider these symptoms as one time, stray occurrence, and might take it casually. The kind of care I get might be more casual. However, I would like to avoid seeing the doctor face-to-face".

"At least in the initial stage we would very much like to check whether the health issue can be solved over phone consultation with the doctor".

"I contracted the infection from my client. I cannot tell anybody at home or go and see a doctor face to face. I am ashamed."

The FSWs were also troubled about medical consultations for **repetitive symptoms**. Due to the nature of the occupation, many FSWs have repetitive symptoms. They are also aware of the genuine need to address the problem.

"I have seen that the problem of white discharge occur at some time interval. I had a prescription from the doctor that I used to purchase the medicines with. But I have lost it now. The chemist will not give me medicines without the prescription. What can I do?"

"Many of the issues that the TI program taught us to be aware of (like severe persistent body pain, intermittent fever, itching in the genital region), we have them quite often. So how many times do we go to the doctor for consultation for the same health issue?"

Interpersonal issues also lead to the refusal to consult a doctor. The current healthcare system does not care of issues faced by FSWs compassionately, nor does it offer solutions.

"I do not like the PPP even though we have selected her. I am very much afraid to consult another doctor for fear that she might realize that I am a sex worker. I work during daytime. What do I do?"

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

482

"I know that the health problems that I effectively mask from my client can infect him as well. But, I cannot formally consult a doctor."

Compulsion to undergo medical evaluation**,** such as blood tests and other lab evaluation (which the PEs will insist on) also lead to the non-reporting of issues.

"Whenever I contact the PE with some health issue, she forces me to go to ICTC. They make us do blood tests every time we go there. I do not know why. So it is better not to tell anyone."

The interview data helped to identify data gathering, information sharing, and knowledge disseminating features required of an ICT solution. It is highly desirable that the solution enables FSWs to report their symptoms without the need to meet the PPP personally. The solution should enable the PPP to respond with adequate details of the medical intervention (i.e., prescribe medicines, suggest tests, and follow up). From the TI program perspective, the information generated by the ICT solution should be patient centric. The solution should respect the need for virtual anonymity of FSWs, yet enable backtracking for treatment suggestions, follow-ups, and in case of urgency of health needs. Based on this analysis, requirements essential to the ICT solution can be summarize as follows:

- enable symptom filing without in-person consultation with the doctor
- asynchronous, anonymous, confidential, and secure communication between FSWs, healthcare providers, PEs, and TI program evaluators
- dissemination of information for managing repetitive symptoms
- store historic data of the individual's symptoms and prescriptions

The analysis of interview data also identified other crucial socio-cultural barriers that shape the access to sexual and reproductive health services. For instance, the fear of revealing their profession results in a life of silent suffering and subjugation. As visible disease symptoms and disabilities can affect clientele, there is a perpetual state of threat and desirability concerns prevalent among the FSWs. Furthermore, the insensitive and discriminatory attitude of health officials toward FSWs, and criminalization of sex work lead to additional stress when considering medical visits. Although we recognize the significance of these socio-cultural barriers, they are not detailed here, as the purpose of this paper is to describe how the combination of PAR and PD was employed to identify challenges that may be addressed via ICT solutions.

4.2. Action planning

The diagnosing phase is followed by action planning where interventions to correct the situation are planned. The interventions can be either directive (where the researcher directs a change) or non-directive (where indirect changes are envisaged). Action planning phase can also draw from social psychology concepts like engagement, learning, unfreezing and reframing (Baskerville & Wood-Harper, 1998). Theoretically, initial stages in the action plan include making decisions on who are involved in the process of inquiry, their profiles, and gathering comprehensive knowledge from prior research conducted in similar contexts (Siddiqui, 2014). The types of inquiry needed, its scope, goals, and expected results are also defined in this phase.

To specify organizational actions that relieve or improve the primary problems identified in the diagnosing phase (Baskerville & Wood-Harper, 1998), we investigated existing theoretical frameworks and design approaches to guide our research direction. The diffusion of innovation (DOI) theory (Rogers Everett, 2003) offers insights into the cumulative process by which innovations are adapted in any segment of the population. Trained as a rural sociologist, Rogers conceptualized rural communities as the social systems of study to propose the classical diffusion paradigm and the role of communication in the diffusion of an innovation among members in the social system. The DOI theory identifies potential adopter perceptions of relative advantage (effectiveness and cost efficiency relative to alternatives), complexity (how easy the

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

483

innovation is to understand), compatibility (the suitability of the innovation in accomplishing the established goals), observability (the extent to which outcomes can be seen), and trialability (the ease of experimenting with the innovation) (Dearing, 2009; Oliveira, Thomas, & Espadanal, 2014). The concept of innovativeness in the creation of behavior change intervention has been found to have a high potential for affecting rates of diffusion (Conley & Wolcott, 2007).

DOI theory is increasing utilized by researchers in the field of social work to establish the effect of new practices, programs, and policies (Dearing, 2009). We utilized DOI theory as a theoretical framework in the formative stages of action planning. It helped us in designing the structure of the ICT intervention, defining its central focus, and deciding the categories of participants in the intervention. The tenets of the DOI theory forewarned us to be duly considerate of the characteristics of the adaptors, their social network and environment, the way in which innovation is communicated, and the characteristics of those who promote the innovation (Brown, 2003). The DOI theory also helped establish the importance of end user involvement as an essential component for technology diffusion (Brown, 2003). Exploration along these lines enabled the research team to plan the next phase (action taking) of the PAR.

PD assumes collaboration of all involved - subjects, TI team, and researchers - for the development of interventions which improve the well being of the users of the intervention (Foth & Axup, 2006). In this project, representatives of all categories of stakeholders are involved. Every district has a designated Program Manager. PPPs (doctors chosen by the FSWs) are appointed in different parts of the district for counseling and consultation. FSWs who have volunteered to function as PEs are appointed by KSACS to identify, locate, maintain contact, and prompt their peers to utilize the health and medical programs established by the TI program. ORWs are paramedical staff appointed by KSACS to work among FSWs. Their responsibilities match those of the PEs. The ORWs, with their paramedical background, interpret symptoms from a medical standpoint and direct FSWs to the appropriate medical intervention as needed. Finally, registered FSWs are the target of enquiry for comprehensive documentation of the processes and need gap analysis.

4.3. Action taking

The KSAC Health Information Dashboard (KHID) is a prototype tool developed for the collection, validation, aggregation, analysis, and presentation of data to support the integrated health management activities of the TI program. It is designed to capitalize on the proliferation of mobile phones among FSWs (primary research indicates close to 99% mobile phone penetration among FSWs at the study location), and take advantage of the simple, yet powerful messaging features available on mobile phones. The KHID is designed for the nascent environment characterized by individuals with a little or no technological competency, minimal literacy levels, and culturally inculcated in a combination of substantiated beliefs and appropriated desires. It relies on the SMS (Short Message Service) technology to gather and aggregate patient health symptoms. The KHID platform is designed to facilitate participant involvement, and mediate communication among FSWs, TI team, and members of the health system. The KHID application allows PEs, ORWs and PPPs to manage patient data. For the PPP at the Suraksha Clinic, the KHID software offers extensive dashboard capabilities with features to conduct medical assessment based on the symptoms filed by patients and respond quickly to those requiring immediate care. The system allows the doctor to communicate messages intended to improve health, persuade FWSs to adopt health modifying actions, and correct (or legitimize) beliefs associated with sexual and reproductive health symptoms.

A FSW, PE or ORW may report symptoms for a patient. To report a patient's symptoms, the user would use SMS to create the record. The SMS format for creating a new symptom is "99 PatientID SymptomCode DateSymptomObserved[optional]". An example of such a SMS text message will be "99 1 2 3" (see Figure 2). The symptoms 2 and 3 are recorded for the patient with ID 1, and an acknowledgement message is returned. The symptom codes (eight) are

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

484

distributed to the FSWs in the form of a single page pamphlet. The symptoms and the corresponding codes (see Table 1) are as specified by NACO.

Figure 2. SMS to report symptoms.

The proposed solution offers benefit-outcomes that encompass three specific functions: *informate*, *communicate*, and *educate*. For the FSWs, the KHID solution represents a means to report symptoms in a convenient and confidential manner. The system of self-reporting is thorough and comprehensive, and enhances the quality of data beyond the current approach of relying on manually created reports and frequency counts. For the TI team, KHID offers extensive dashboard capabilities with features to conduct patient-centric analysis of data based on the information filed by FSWs. As syndromic management of disease symptoms is recommended by NACO, the PPP can use the drill down features of the KHID dashboard to monitor individual cases and provide syndromic treatment (Singh, Devi, Garg, & Mehra, 2001) of the illness. The solution allows the PPP to communicate with PEs, specifically to reach those who require immediate clinical attention. The KHID software uses the RapidSMS framework (RapidSMS, 2012) to centralize the exchange of information among the stakeholders. The solution increases the possibility of successful follow-up when FSWs fails to report at the Suraksha clinic. It serves as a repository for storage and retrieval of historic data. The KHID solution can also be used to disseminate information for educating FSWs on consumable health care options.

Symptom Code:	Symptom:
1	Vaginal/ cervical discharge
2	Lower abdominal pain
3	Genital ulcer (herpetic)
4	Genital ulcer (non-herpetic)
5	Urethral discharge
6	Ano-rectal discharge

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

485

7	Genital warts
8	Other STI symptoms

Table 1. Sexual and reproductive health symptoms and codes
(Source: M&E monograph, NACO)

4.4. Evaluating

The UN Millennium Development Goals (MDGs) assert the criticality of an inclusive process that allows participation of stakeholders (Siddiqui, 2014). More recently, the post-2015 UN Development Agenda also emphasizes the importance of a participatory strategy that gives weightage to information generated from marginalized groups related to their specific needs and priorities (Siddiqui, 2014). However, in the context of public health, participatory models built upon community consultation with users of health system and designers of the solution are yet to become commonplace.

The exploratory research discussed above was effective in gathering information on the unmet health care needs of the FSWs. Preliminary inquiries among FSWs on the management of RTI/STI revealed the operational issues (on the demand side) of the current health care delivery practices (see discussion in the findings section above). The qualitative data highlighted the need for integrating a culturally sensitive, user-centric, confidential, and time-saving symptom reporting system as part of the TI program. As NACO advocates a syndromic approach for the initial management of STIS/ RTIs, we use this approach as the basis for developing a prototype ICT solution. The ICT solution simultaneously generates data on the real health issues, as well as transfer ownership of the corrective behavior to the FSWs.

The exploratory research with its qualitative base only provides an initial assessment of the barriers and challenges that limit accessibility to health care among FSWs. Therefore, we developed a questionnaire based survey for the comprehensive assessment of the socio-cultural context, public health infrastructure, utilization of health care services delivered by NACO, and the impact of TI in addressing disease threats. The survey will help researchers obtain confirmatory data and crystalize the need-gap analysis. Data collection using the survey is currently in progress and is estimated to take four months to complete, as face-to-face meetings with FSWs are unpredictable and difficult to schedule. The analysis of the survey data will be used to finalize the prototype application. We plan to complete this part of the research during the second half of 2015. As the research is conducted with the active participation of KSACS, the State-level wing of NACO, training the TI team and evaluation of the KHID application will be carried out in 2016.

4.5. Specifying learning

PAR is a research method where the knowledge generated about the conditions of the subjects and the environment is a rich reflection of the reality of the situation (Loewenson et al., 2014). The specifying learning phase of PAR is an ongoing process, where the knowledge gained from the activities are shared among the subjects, practitioners, stakeholders, and researchers (Baskerville, 1999). Regular interactions with FSWs as part of PAR represent an opportunity for researchers and TI team to communicate behavior change messages. The specifying learning phase is also an opportunity for researchers to present scientific knowledge to the TI team that is relevant to their interest. This ongoing phase enables the researchers to share the knowledge gained from the experience with the scientific community, irrespective of whether the interventions proved successful or not (Davison et al., 2004).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

486

5. DISCUSSION

Insensitivity to the particular needs of FSWs, discriminatory attitude of health officials, and criminalization of the profession force this sub-group of population away from the network of medical care (Scheibe, Brown, Duby, & Bekker, 2011). A participatory model that empowers FSWs to design, use and control access to sexual and reproductive health services may assure larger participation and better utilization of available options. To accomplish this goal and to provide FSWs a stronger motivation to get involved, existing intervention programs to combat the epidemic of HIV/AIDS have to be modified.

In India, NACO is the apex body constituted for effective prevention of HIV/AIDS and support High-Risk Groups (HRGs). NACP is the specific program designed for achieving the vision and mission of NACO, and SIMS is one of the pillars of this program. SIMS is envisaged as the program management strategy for the generation, integration, and dissemination of knowledge needed by the TI team. The KHID solution is developed to complement and supplement SIMS. It is a tool developed on the participatory model, and foresees the inclusion and active engagement of stakeholders in planning and inducing behavior change. The solution is currently under evaluation at the Surakhsha clinic in Ernakulam district in the State of Kerala. The solution can serve as a means for data gathering, and as an enabler for transferring ownership of the corrective behavior to the FSWs. The extent to which the system is effective in assisting FSWs to overcome elementary barriers to health care have to be determined via longitudinal assessment. Nevertheless, the solution represents the first step towards the tough challenge of data gathering and disease surveillance. Precise and accurate data from the use of the KHID solution can provide the needed primary evidence on the pattern and prevalence of disease severity among FSWs.

A participatory model for health development, must consider interventions in areas other than health. That is, only an intervention with wider scope than health may help in creating meaningful channels of communication and involvement required for promoting changes in health behavior. This has to be the approach at least in the initial phase of a project that targets health issues among FSWs. Interventions for other social issues (such as, rehabilitation, alternate livelihood options, etc.) and dialogues which in no way immediately and directly revolve around health has to be initiated. Gaining the confidence and trust of the FSWs can help initiate meaningful discussions, and generate a participatory mode of developmental change. Such an approach can help transcend the scenario from that of centrally planned development to a horizontal model involving contributions of all stakeholders.

In the current phase of the research, a questionnaire-based survey is being conducted among the stakeholders for a comprehensive assessment of the challenges faced by FSWs and their unmet healthcare needs. Long-term objectives are to determine whether the ICT intervention serves to meet the desired goal of transformative participation. A qualitative evaluation of the artifact will also be conducted to address usability improvements. Long-term objectives are also to integrate the KHID solution into the TI program for data analyses, report generation, and activity planning.

6. CONCLUSION

The TI program of NACP is aimed at reducing sexual and reproductive infections among HRGs for the effective prevention and spread of HIV/AIDS. The twin forces of syndromic case management and monitoring of diseases are intended to provide support for the management of HIV/AIDS. In this regard, comprehensive information on the prevalence of the disease is an essential prerequisite for containing AIDS. The vertical, top-down approach has so far been inadequate in actively engaging FSWs in the intervention programs. A participatory model of health development that considers the socio-cultural and demographic challenges in the design

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

487

of the intervention will be more meaningful in creating active channels of communication and involvement.

Involving participation of FWSs in the design, control, and use of the intervention may assure larger participation and better utilization of available sexual and reproductive health services options. Instead of the traditional doctor-patient mode of relationship, innovations have to happen in consultation, practice, knowledge generation, and knowledge translation. The KHID application described in this paper aim to serve as the platform required for this transformative change. Our preliminary assessment found behavior similarities of FSWs to coincide with those reported from other parts of the world. The KHID solution could therefore be tested and used in other communities where FSWs face similar barriers and challenges in accessing sexual and reproductive health services.

REFERENCES

Asaro, P. M. (2000). Transforming society by transforming technology: the science and politics of participatory design. *Accounting, Management and Information Technologies, 10*(4), 257-290.

Baskerville, R. L. (1999). Investigating information systems with action research. *Communications of the AIS, 2*(3es), 4.

Baskerville, R. L., & Wood-Harper, A. T. (1998). Diversity in information systems action research methods. *European Journal of Information Systems, 7*(2), 90-107.

Becker, M., Ramanaik, S., Halli, S., Blanchard, J. F., Raghavendra, T., Bhattacharjee, P., . . . Mishra, S. (2012). The intersection between sex work and reproductive health in northern Karnataka, India: identifying gaps and opportunities in the context of HIV prevention. *AIDS research and treatment, 2012*.

Bekker, L.-G., Johnson, L., Cowan, F., Overs, C., Besada, D., Hillier, S., & Cates, W. (2014). Combination HIV prevention for female sex workers: what is the evidence? *The Lancet*.

Braa, J., & Sahay, S. (2012). Health Information Systems Programme. Participatory Design within the HISP network. In J. Simonsen & T. Robertson (Eds.), *Routledge international handbook of participatory design*. New York, New York: Routledge.

Brown, M. M. (2003). Technology diffusion and the" knowledge barrier": The dilemma of stakeholder participation. *Public Performance & Management Review*, 345-359.

Campbell, C., & Cornish, F. (2010). Towards a "fourth generation" of approaches to HIV/AIDS management: creating contexts for effective community mobilisation. *AIDS care, 22*(S2), 1569-1579.

Chersich, M. (2014). Fast forwarding health access for female sex workers: Findings from 1 Indian and 3 African sites *Differ Project*. Center for Health Policy and Systems Research: University of the Witwatersrand, Johannesburg.

Conley, J. G., & Wolcott, R. C. (2007). Scaling from prototype to production: A managed process for commercial offerings. *Scale-up in education, 1*, 103-121.

Cornish, F. (2006). Empowerment to participate: a case study of participation by Indian sex workers in HIV prevention. *Journal of Community & Applied Social Psychology, 16*(4), 301-315.

Cornish, F., & Ghosh, R. (2007). The necessary contradictions of 'community-led' health promotion: a case study of HIV prevention in an Indian red light district. *Social science & medicine, 64*(2), 496-507.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

488

Cornwall, A., & Jewkes, R. (1995). What is participatory research? *Social science & medicine, 41*(12), 1667-1676.

Davison, R., Martinsons, M. G., & Kock, N. (2004). Principles of canonical action research. *Information Systems Journal, 14*(1), 65-86.

Dearing, J. W. (2009). Applying diffusion of innovation theory to intervention development. *Research on social work practice*.

Dichter, T. (1992). Demystifying Popular Participation: Institutional mechanisms for popular participation. *World Bank Discussion Papers*, 89-89.

Foth, M., & Axup, J. (2006). *Participatory design and action research: identical twins or synergetic pair?* Paper presented at the Participatory Design Conference 2006: Expanding Boundaries in Design, Trento, Italy. .

Hussain, S., Sanders, E. B. N., & Steinert, M. (2012). Participatory design with marginalized people in developing countries: Challenges and opportunities experienced in a field study in Cambodia. *International Journal of Design, 6*(2), 91-109.

Kerrigan, D., Kennedy, C. E., Morgan-Thomas, R., Reza-Paul, S., Mwangi, P., Win, K. T., . . . Butler, J. (2014). A community empowerment approach to the HIV response among sex workers: effectiveness, challenges, and considerations for implementation and scale-up. *The Lancet*.

Loewenson, R., Laurell, A., Hogstedt, C., D'Ambuoso, L., & Shroff, Z. (2014). Participatory action research in health systems: a methods reader. *Regional Network for Equity in Health in East and South Africa (EQUINET), TARSC, AHPSR, WHO, IDRC Canada,*.

NACO. (2013). Annual Report 2012-13 (G. o. I. Department of AIDS Control, Trans.). In G. o. I. Department of AIDS Control (Ed.): Ministry of Health & Family Welfare.

Ngugi, E. N., & Plummer, F. A. (1988). Health outreach and control of HIV infection in Kenya. *JAIDS Journal of Acquired Immune Deficiency Syndromes, 1*(6), 566-570.

Ngugi, E. N., Wilson, D., Sebstad, J., Plummer, F. A., & Moses, S. (1996). Focused peer-mediated educational programs among female sex workers to reduce sexually transmitted disease and human immunodeficiency virus transmission in Kenya and Zimbabwe. *Journal of Infectious Diseases, 174*(Supplement 2), S240-S247.

Oakley, P. (1995). *People's participation in development projects* (Vol. 7): INTRAC.

Oliveira, T., Thomas, M., & Espadanal, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. *Information & Management, 51*(5), 497-510.

RapidSMS. (2012). from http://www.rapidsms.org/

Rogers Everett, M. (2003). *Diffusion of innovations*. New York: Free Press.

Scheibe, A., Brown, B., Duby, Z., & Bekker, L. G. (2011). Key populations, key solutions: a gap analysis for key populations and HIV in South Africa, and recommendations for the National Strategic Plan for HIV/AIDS, STIs and TB (2012Á2016). *Desmond Tutu HIV Foundation, Joint UN Team on HIV and AIDS*.

Schein, E. H. (1987). *The clinical perspective in fieldwork*: Sage Publications, Inc.

Siddiqui, F. R. (2014). Annotated bibliography on participatory consultations to help aid the inclusion of marginalized perspectives in setting policy agendas. *International Journal for Equity in Health, 13*(1), 124.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

489

Singh, M. M., Devi, R., Garg, S., & Mehra, M. (2001). Effectiveness of Syndromic Approach in Management of Reproductive Tract Infections in Women. *Indian Journal of Medical Sciences, 55*(4), 209-214.

Stiglitz, J. E. (1998). *Towards a new paradigm for development*.

TAMPEP. (2007). Gap Analyss of Service Provision to Sex Workers in Europe *TAMPEP European Network for HIV/STI Prevention and Health Promotion among Migrant Sex Workers*. Amsterdam: TAMPEP International Foundation.

UNAIDS. (2009). UNAIDS Guidance Note on HIV and Sex Work. *United Nations Programme on HIV/AIDS*.

White, S. C. (1996). Depoliticising development: the uses and abuses of participation. *Development in practice, 6*(1), 6-15.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

490

MOBILE PHONE, SPATIALITY AND INEQUALITY: A CASE STUDY OF RURAL-URBAN MIGRANT WORKERS IN SHANGHAI

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Abstract: This paper is concerned with the extent to which mobile phones and other ICTs address displacement as a result of mobility and enhances social inclusion of rural-urban migrant workers in the context of China. We present a case study of mobile phone practices among rural migrant workers in a Shanghai restaurant, who are uprooted from their hometown and reside in urban environments as marginalized residents in a luminal, transient and fluid state of being. The study adopts a multi-spatial approach. Through the juxtaposition of spaces as relations and practices, we seek to show that technological practices are deeply embedded in socio-spatial inequalities and could be seen as the locus of class reproduction, notwithstanding the reconfiguration of mobility and connectivity through mobile technologies. We also discuss the implications of a socio-spatial perspective in ICT4D research.

Keywords: Mobile Phone, Spatiality, Inequality, Mobility, China, Migrant Workers

1. INTRODUCTION

The discourse of open development enabled by the proliferation of information and communication technologies (ICTs) often assumes that sharing of information is beneficial to all and often ignores questions about structural barriers, power relations, persistent inequalities and social inclusion/exclusion. This paper focuses on the entanglement of ICTs, in particular mobile phones, in the mobility and marginality of disadvantaged social groups by presenting a case study of rural migrant workers in a Shanghai restaurant.

By the end of 2013, the number of Internet users in China had reached 618 million (45.8%), of which 500 million can access the Internet from a mobile phone (CNNIC, 2014), but there is a significant discrepancy in ICT proliferation between urban and rural areas. Within this "digital divide" is an under-recognised "network labour" (Qiu, 2009) residing at the edge of the information society - the millions of rural-to-urban migrant workers who are uprooted from their hometown and reside in urban environments as a marginalized population in a luminal, transient and fluid state of being. While rural-to-urban migrant workers in China have mostly been converted into consumers of ICT products, severe social inequality and the lack of institutional and social support render them a class of "information have-less" (Cartier et. al., 2005). Limited research in ICT4D has explored the impact of ICTs among this group of users in-between the "have" and "have-nots".

Rural-urban migrant workers in China represent a group who are mobile but have been displaced and marginalized over an extended period of time (usually decades). Their usage of mobile phones and other ICTs are therefore of significance to research, as ICTs are often assumed to provide connectivity and mitigate distances. Studies of mobile phone usage among rural migrant workers in China have shown that they mainly use mobile phone and social media for entertainment and social networking (Law and Chu, 2008; Lin and Tong, 2008; Wallis, 2011).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

491

Some may develop "informal literacies", such as technological skills, creative writing, and communication skills; and some are able to enact these skills in the negotiation of gender relations and enhancement of social capital (Lin and Tong, 2008). There is however little evidence to suggest that the use of mobile phones, in connection to other ICTs, effectively integrates rural migrant workers into the urban environment.

Mobility is inevitably bound up with spatiality. This study takes a multi-spatial approach (Georgiou, 2010) to explore the mobile phone practices of the migrant workers from the perspective of identities as constitutive of spatialised relations. The spatial distribution of inequality has been well researched in disciplines like geography, anthropology, sociology, development studies and political science (e.g., Harvey 1996). We try to show that technological practices are deeply embedded in socio-spatial inequalities and could be seen as the locus of class reproduction, notwithstanding the reconfiguration of mobility and connectivity through information technologies.

The rest of the paper is structured as follows. The next section outlines the conceptual basis for the paper, followed by a description of the methodology. We then present the research findings based on a multi-spatial approach, within the context of rural-urban migration in China. The last section combines discussion and concluding remarks.

2. SPATIALITY, CONNECTIVITY AND INEQUALITY

In this section we present the ideas of spatiality and mobility as related to social inclusion. Regional concentration of economic activities, resources and power are integral to discourses of globalization and global development, as discussed in path-dependency theory and post-colonial theories. With the proliferation of ICTs, the spatial distribution of inequality has been argued to be less demarcated by geographical boundaries but more related to positionality in the global network (Castells, 1997, 2000). Castells' (2000) depiction of information society highlights the differentiation of hot spots and cold spots defined not by locations but intensity of information flow and interconnectivity of resources and opportunities. This departs from the idea of spatiality as territorial and localised, as the "here and now". Space is therefore a critical concept in understanding the flow of resources and differentiations of life opportunities implicated in the processes of mobility and connectivity.

Concepts of space and place have been much problematized and developed in various fields of study (Goodchild et al. 2000). As Foucault suggests, space is fundamental in any form of communal life, and "fundamental in any exercise of power" (in Harvey, 2006, p.538). This paper draws upon the notion of space as relational (Massey, 1999, 2005), situated and produced through everyday practices (de Certeau, 1984; Lefebvre, 1991). Space is perceived as assemblages of multiple elements and interactions (de Certeau 1984), and is non-linear and non-scalar (Tuan, 1977). According to Georgiou (2010), "[s]pace is not singular; it brings together into meaningful relations and formations of places and practices. Space also carries social meanings – and these are always plural. The meanings of space are shaped in contexts of continuities, links and conflicts (p.22)." She argues that "space is a framework that allows us to study identity through mobilities, meeting points, settlement/re-settlement, but also meaningful relations – including those of subordination, exclusion, and participation in publics and communities – as they emerge at the meeting of the political (e.g. formal citizenship) and the cultural (e.g. education, health, communication) spheres (p.19)."

Following Georgiou (2010), a multi-spatial approach is adopted in this case study to explore how mobile phones, as boundary objects, connect, mediate and shape the multiple spaces of belonging and identities for rural-migrant workers in Shanghai. Through this analysis, we wish to consider the role of mobile phones in the configuration and reconfiguration of socio-spatial order, and reveal the complexity, multiplicity and sociomateriality of inequalities in ICT for

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

492

Development. While mobile phones usage blurs the boundaries of multiple spaces, they also serve as a locus of class and cultural reproduction.

3. METHODOLOGY: A MULTI-SPATIAL APPROACH

This qualitative interpretivist case study was conducted in a restaurant in a suburb of Shanghai. 34 semi-structured interviews were conducted in a restaurant of about 200 staff. Interviewees include both genders and the age range was from 19 to over 50. Interviews were conducted in Mandarin Chinese, lasting from 20 to 60 minutes. 30 interviews were recorded with consent from the interviewees and subsequently transcribed in Chinese. The transcriptions were then used as a raw data set for thematic analysis. One of the co-authors previously conducted ethnographic research in the same restaurant spanning over 2011 to 2014, which involved working as a waitress herself and living in one of the dormitories provided. Her ethnographic understanding of the living conditions of the migrant workers situated in the social environment of Shanghai provides rich contextual grounding for this research.

The interviews took place in one of the dining halls in the restaurant. It was semi-open but relatively segregated from other seating areas of the 5-level restaurant, containing about 10 big round tables and a flat screen TV on the wall. This room is normally used as a resting area for the staff during lunch breaks, although the staff on different shifts take their lunch break at different hours. The conversations were mostly carried out in the presence of other members of staff which may to a certain extent affect the responses from the interviewees. The researchers conducted the semi-structured interviews in the form of informal chats with the workers, centring on the usage of their mobile phone, in connection to their background, social relations, life in Shanghai and aspirations. A small gift was offered to the respondent after the interview as a token of appreciation.

Analysis of the paper is based on a multi-spatial approach, drawing upon Georgiou (2010). We derive four spaces of identity from the data: the space of labour (the restaurant), the space of living (the urban environment of Shanghai), the space of belonging (their rural home), and the space of self-expression (social media). The categorisation of the four spaces arises from the data and are only analytically constructed, with blurry boundaries and indeed overlapping. For example, one of the important functions of social media is interaction with family and friends from the participants' hometown, which is fostering their sense of belonging. Meanwhile, social media provides a virtual space where practices of self-expression can be more clearly observed, compared to other spaces where they are more subjugated to existing social norms and power relations.

4. CASE STUDY: RURAL-URBAN MIGRANT WORKERS IN SHANGHAI

In 2012, average income per capital of rural households was about one third of that of an urban household (NBS, 2013). Moreover, while 70% of the population are registered as rural, they only account for 30% of the consumption expenditure (Yang, 2010, p.20). Despite the abolition of agricultural tax in 2006 and the introduction of rural health insurance and pensions for the elderly in rural areas, uneven regional development compounded with weak infrastructure in education and healthcare, as well as the lack of employment opportunities, provide strong impetus for young people to move to urban areas seeking employment, especially from the interior of China to coastal areas. The large scale rural-urban migration in China leaves 61 million children behind in rural areas without parental care[1]. Migrant workers are not legally registered residents but transient labour in the adopted cities, thus having limited access to the urban infrastructure of social welfare, healthcare and education, although Shanghai has in recent years introduced social policies that aim to improve the basic welfare of rural migrant workers.

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[1] http://acwf.people.com.cn/n/2013/0510/c99013-21437965.html

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

493

This study looks at one small group of such migrant workers in a Shanghai restaurant. They work as waiters/waitresses, chefs, cleaners, receptionists, etc. Most of the respondents come from the nearby province Anhui, one of the most economically underdeveloped areas. In the rest of the section, we present the findings from a multi-spatial perspective. We discuss how mobile phones are used in four different spaces of the migrant workers' lives: the workplace (restaurant), the city of Shanghai, the rural home of the migrant workers, and the virtual space of social media. As introduced earlier, the concept of space here is not presented as bounded territories but juxtapositions of relations. These multiple spaces co-exist as multiple and interconnected aspects of the identity and being of the migrant workers. They are always becoming and co-constitutive.

4.1. Space of labour: the restaurant

As noted earlier, the big semi-open room where the restaurant staff took their lunch break was the main location where we carried out the interviews, and observed the usage of mobile phones. There is a big screen TV on the wall but it was turned on only once during the three weeks when the study took place. When the TV was on, almost everybody was watching TV. On most of the other days, their attention was devoted to mobile phones. Only two respondents, a 46 year old woman (bar staff) and a man in his late 50s (cleaner), did not use a colour screen smart phone. Both were illiterate and only used the basic functions of the phone. The cleaner also used the radio application that came with the phone, and listened to folk opera his son downloaded on the phone.

The main age group of the migrant workers in the restaurant was 20 to 35. All of them used smart phones, ranging from iPhone 4S (one person) to unknown Chinese brands that cost about 50 pounds. The majority used mid-range Samsung or a competitive Chinese brand Xiaomi in the price range of 120 to 250 pounds, a significant portion of their monthly wage of 300-400 pounds. During the two hour lunch break when they had lunch and rest in the hall, smart phones became small screen TV sets. Most people were watching some Chinese TV series on their phone, either individually or sharing with another person. Watching TV is almost the most important function of the phones for most people, which partly explains why many of their phones have a 5 inches screen and usually of decent quality. The restaurant does not provide Wifi, so most of the staff would have downloaded the TV series at their residence, or through a public Wifi. There was a public Wifi available in the local governmental building next to the restaurant, albeit with unstable signal, which some of the restaurant staff used to browse the Internet or download content to their phones.

As one of them commented, "…the mobile is often just an entertainment, to kill time when you are bored." Alleviating boredom seems to be one of the key utilities of mobile phones in their lives, apart from expedient communication, either at home or during the lunch break at work. In fact, many of them used the phone to watch TV at home as well. Carrying the TV series they were following on the phone thus served as an extension of home, constructing a bubble of comfort that protects them from the tedium, repetition, and pressure from work in the restaurant. A part-time waitress who also worked in a digital manufacturer said that they would be secretly chatting or playing games on the phone during work hours, when the supervisor was not watching. She was referring to a private factory during a non-busy period. Some scholars consider such strategy to escape from boredom and workplace restrictions as a form of resistance, "symbolic protest" to unequal power relations in the workplace and to develop a sense of self (Wallis, 2011; Yang, 2008).

We argue that such practices are a reflection and coping mechanism of the fluid and transient nature of the restaurant as a space of labour. The fluid nature of the workspace is an integral part of their identity as rural migrant workers in Shanghai, where there is hardly any prospect of them settling down in the city under the current *hukou* (household registration) system. Moreover, the turnover rate of the restaurant was very high. There were 119 permanent workers in April 2012,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

494

while in March 2014, there were only 76 employees and among whom 20 were the same faces as two years earlier. The restaurant converted almost half of the workforce into part-time staff in order to cut cost and be responsive to seasonal fluctuations. Meanwhile, apart from the chefs who had the possibility to upgrade their qualifications, most of the migrant workers considered the job as temporary or transitional, ready to move on to the next job that offers slightly higher pay or better work conditions; some sought easier tasks, and very few would intentionally seek employment opportunities for skill development. It is therefore very difficult to develop a strong sense of community when temporality is a norm.

While mobile phones allow co-workers to remain in touch via social media after changing jobs, they are also used to watch TV, chit-chat, and play games at the workplace, which generates the effect of "feigned presence" (Yang, 2008), i.e. mentally being somewhere else while physically present, an escape from "the here and now". This reflects a lack of commitment to the employment and to cultivate in-depth co-present relationships. We consider it a coping strategy to the boredom and alienating nature of their work. The identities of migrant workers at work are reflective of the fluidity, transitionality, and the lack of future prospects at the workplace. The main goal for most of the migrant workers was to save enough money and ultimately build a better life back home. Their identity in the city is likely to remain as "the Other" for the period they spend here as secondary citizens. This transient and precarious existence needs to be better understood by exploring their living experience in Shanghai, which we will come to next, again through the lens of ICTs.

4.2. Space of living and leisure: Shanghai

The restaurant workers either live in employer-provided housing or self-rental accommodation. The latter primarily encompasses urban village and group-renting. Almost half of the migrant workers live in the dormitories. Employer accommodation is free to the employees, monthly bills are usually no more than 5 pounds. Group-renting (qunzufang), or shared-renting refers to a flat partitioned into various smaller rooms for renting purpose. It can be frequently seen in residential neighbourhoods in Shanghai. The monthly rental fees are usually ranged from 40-60 pounds per room. It is not unusual for up to 10 tenants to share a 3-bedroom flat equipped with only one bathroom. For example, a couple both working in the restaurant occupy a bedroom of 10 sqm in a two bedroom flat, sharing with two other households. In most cases of group-renting, the soundproofing is poor; and fire hazards exist due to the pervasive use of extensions to get electricity and also due to the illegal use of gas cylinder. The problems of these settlements include overcrowding, poor infrastructure and high crime rate (Hao and Zhang 2009; Zheng et al. 2011). One of our respondents refers to his residence as a "slum". One of the informants chose to live in the dormitory while his wife worked in a factory in another part of Shanghai two hours away and resided in the factory dormitory. In other words, hardly any of these habitats provides a space of home and privacy.

ICTs again serve as a means to escape, distract and endure the sense of displacement. Wifi is often installed and shared in the dormitories or group-renting accommodation. TV is a common procession because they are cheaply available. A minority of young migrant workers also keep personal computers, and a couple of informants own a tablet too. The main functionalities of these technologies include watching news and TV series, playing games, and using QQ (to be discussed later). Mobile phones are very important for migrant workers to keep in touch with family members, either back in rural home or working in other regions, as well as relatives and friends. Some migrant workers have one or more relatives in Shanghai, but not all of them are close to their relatives. Friends mainly consist of people from the same hometown, and selective current or past co-workers, who are also highly mobile and may not be living in the same city. Most workers found their job through the introduction of a friend or relative. Only a few were able to use the Internet, either through PC or the mobile, to search for jobs.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

495

In terms of consumption, restaurant workers often went shopping in the nearby supermarket or in the National Drawer, an indoor low-price supermarket targeting rural migrants. The workers were clearly aware of the social class distinction between the National Drawer and the Dragon's Dream, a middle-class shopping-mall in the area, where they sometimes hang out but mostly for window-shopping. Indeed, the income discrepancy is an acute reminder of their identities as rural migrant workers despite sharing the same physical place of Shanghai with local residents. However, through smart phones and PCs, they are able to do online shopping, mostly on tmall.com (formally taobao.com) where low-price commodities are prevalent and which middle-class consumers also frequent. Also, similar to the middle-class, migrant workers occasionally go sightseeing in Shanghai (but rarely to other places) and take photos with their mobile phone to share on QQ or Wechat (social networking sites). As mentioned earlier, the restaurant workers mostly use midrange to high end smart phones, which is also comparable to middle class consumers, although most of them consider iPhone too high-end and out of reach. In a limited sense, ICT consumption blurs the class boundaries and provides an enhanced sense of well-being for the disadvantaged group.

The elderly cleaner mentioned earlier admitted that he never went out to see the city of Shanghai as he had no relatives in the city and did not know where to go and how to use public transport. Instead he was content with working seven days a week in the restaurant, considering it an easier life than farming anyway. His phone kept a few blurry photos of his grandson who lives back home with his wife. Connections with the rural home remain the strongest and more important part of the identity of migrant workers, as we will discuss next.

4.3. Space of belonging: rural home

Calling parents and children who are mostly still living in the hometown is clearly one of the most important utilities of mobile phones for the migrant workers. In a small number of cases, their parents were also working as migrant workers in the same city or other places. Many would buy mobile phones for their parents for convenience of communication. Most of their rural homes were attached to a piece of farming land and a house. In general, the pattern is that migrant workers leave their children with grandparents in the rural home, usually until they finish junior high school (around the age of 15). As one of the restaurant employees described, "…where I am from, we usually leave the children with grandparents, as soon as they can walk. The grandparents will take them to school. And the two of us will come out to work." As the grandparents are often illiterate, little guidance and support are available for the children's education, which is undertaken with rather weak education facilities and teaching resources in the first place, hence a high drop-out rate. Indeed, some peasant workers are second generation of a migrant workers' family, i.e. they were left-behind children themselves who moved to the cities after dropping out from school. When asked about aspiration for the future, most informants expressed the wish to return to the hometown when they have saved enough money, probably in their late 40s, start a small business, and lead a peaceful life with their parents and children.

Friends and former classmates from the hometown also tend to constitute core social relations for the migrant workers, albeit not necessary co-present in the same location. Some migrant workers will keep their old mobile phone number from home, so they can they remain easily reachable by family and friends back home. Sometimes they keep two phones, one with the old number and one to use in the area they live. While the new SIM card is easily replaceable and tied to the location of their current job, keeping active the mobile number from home is both symbolic and performative in preserving a crucial part of who they are, which in a Chinese context is defined by family and community-based social relationships. Maintaining these relatively stable and strong connections is of particular importance amidst the transient and fluid life style of the migrant workers, especially when deprived of a sense of home and belonging in the adopted city, as described above. For individuals constantly perceived and self-perceived as

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

496

being the Other in the urban setting, a virtual link to the hometown maintained by the mobile phone, the most intimate possession for most people, provides a fundamental sense of psychological security.

4.4. Space of self-expression: social media

Apart from making phone calls, another way of communicating with family members and other social connections is social media. In China, the most popular instant messenger type applications are QQ and Wechat, both products of the company Tencent. The former is similar to MSN, started in the 1990s and is probably still the most widely used social networking application in China. The latter only emerged in 2011 as a smart phone application, similar to Whatsapp or Line, and as of April 2014 has over 438 million active users[2]. Interestingly, very few migrant workers use Weibo, the twitter-like Chinese social media which functions more as an open virtual public sphere (albeit censored) than a private circle among personal connections as Wechat supports. In other words, very few migrant workers are interested in following public affairs and participating in public discussions. Indeed, hardly any of them use the free subscription function of Wechat to read news, magazine articles or other knowledge-production type of public accounts. Chatting with friends and families occupy most of their time on social media, which, as discussed in the last section, could be seen as a confirmation and reproduction of the fundamental aspects of their self-identity.

On the other hand, social media also provides a very different space for the expression of other dimensions of their self-identity, including aspects deliberately hidden from their most intimate relations. As an anonymous platform, QQ offers such opportunities. For example, as QQ allows contact from strangers, migrants could chat with people they have never met, even though most of these relations remain virtual. Like MSN, QQ provides an individual blog space for each user, where articles and photos could be shared. While most use the space to share photos taken with their phone, some also write diary-type entries, mostly as an outlet for their emotions, or to re-post content from other people's QQ space.

What is interesting is that several informants mention that they would rather reveal their real thoughts and emotions to selected strangers rather than among personal connections. One worker explains, "For example, sometimes I feel very tired in real life, want to talk to someone but there is no one I could confide in. If there is an un-known person who is able to listen and give me some suggestions, I will talk to him. I will delete those (strangers) who are full of nonsense." Another worker said he set privacy barriers on blog entries that reveal his real emotions, as he only wanted to let off steam but not interested in other people's comments. Yet another worker created a separate anonymous QQ account only open to people who did not know him in real life. These online practices corroborate on the fact that when asked what they would do if they had problems in life, most workers (especially women) responded that they would mull over these by themselves rather than getting their family worried. Nobody mentioned that they could turn to people with whom they share accommodation, indicating weak connections despite co-presence, and a general lack of social support in the lives of this mobile group of workers.

5. DISCUSSION AND CONCLUDING REMARKS

This paper is concerned with whether and how mobile phones and other ICTs address displacement and marginality as a result of mobility, and enhances social inclusion of rural-urban migrant workers in the context of China as a transitional society. The mobile phone practices of the rural migrant workers to a large extent align with their socio-cultural background and social resources available (Kleine, 2010). Migrant workers with college level education are more likely to use job hunting websites to seek upward mobility, while those without high

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[2] "Tencent - Investor Relations - Financial Releases - 2014". Tencent. 14 August 2014.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

497

school degrees tend to rely on personal connections for job opportunities, and use ICTs mainly to alleviate boredom and provide comfort (watching TV, playing games and chatting online). One could argue that on the one hand, ICTs as coping mechanisms have improved the well-being of rural migrant workers as marginal groups in society and make their lives more endurable; on the other hand, the aforementioned practices to a great extent reproduce existing social stratification, as pointed out in Giddens' (1984) argument of structuration. In other words, mobile phones, or the assemblage of ICTs, can be seen as the locus of reproduction of class and social inequalities.

In terms of theoretical contribution, this paper constitutes an early attempt to integrate a spatial perspective in ICT4D, which we argue helps to reveal the multiplicity and relationality of technological practices in social development. Technology is embedded in and constitutive of spaces of social meanings, and produces and reproduces social structure. We have tried to examine the identities of rural migrant workers through "the mediated connections within and across space that provide human subjects information and communication for being and becoming (Georgiou, 2010. p.17)." Access to or ownership of technologies such as mobile phones does not automatically translate to social inclusion. It is thus important to ask "inequality of what" (Zheng and Walsham 2008), and to recognize the multiple facets and layers of social exclusion. The multi-spatial approach, through the juxtaposition of spaces as relations and practices, provides a prism to examine the complexity and multiple dimensions of inequalities in technology-mediated contexts.

The study sheds insights on socio-spatial inequalities with regard to co-presence and mobility through the lens of mobile phones. As shown in the multi-spatial analysis, co-presence does not easily lead to social inclusion in the case of marginalised social groups such as rural migrant workers in big cities. Nor does mobility necessarily alleviates spatial inequalities, but reconfigures and often reproduces them. In contrast to the neoliberal discourse of technology-mediated post-modernity and globalization, which often celebrates mobility, fluidity, flexibility of the labour force and expedition of communication, our study points to "coerced mobility" (Urry, 2002), where the experience of rural migrant workers are dominantly characterized with transience and precarity, long periods of separation from family, and living constantly as "the Other" in a city to which they have limited access, and are deprived of community-based social support. While technology may serve as a coping mechanism, it does not easily counteract the displacement and the social exclusion as a consequence of coerced mobility.

In terms of limitations, we would like to point out that rural migrant workers in China are a diverse, heterogeneous and dynamic group of population spread throughout China. This small case study of 34 interviews can hardly be claimed as representative. As mentioned earlier employees in this restaurant often come from Anhui province which is relatively lagging in economic development, although our data also includes workers from other parts of China. We also notice that this sample contain few migrant workers with college degrees, thus unable to comment more on their mobile phone practices. Nevertheless, we have tried to demonstrate holistically the significance of mobile phones (and ICTs) in the work and lives of migrant workers, in particular with relation to the transient, fluid and uncertain ways of being and becoming.

Finally, we argue that consideration of the developmental outcome of technology can benefit from a spatial, or multi-spatial, investigation of the identities of technology users, namely, an examination of social relations, histories, daily practices and power. A multi-spatial perspective also allows us to circumvent the distinctions between macro and micro analyses and the demarcation between context and process (Hayes and Westrup, 2012). Just as space is always becoming, ICT4D from a socio-spatial perspective steers away from technological determinism and embraces openness, dynamism and indetermination.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

498

6. REFERENCES

Amin, A., Massey, D. and Thrift, N. (2000), Cities for All the People Not the Few, Bristol: Policy Press.

Cartier, C., Castells, M. and Qiu, J. (2005), "The Information Have-Less: Inequality, Mobility, and Translocal Networks in Chinese Cities", Studies in Comparative International Development (SCID), Vol. 40 No. 2, pp. 9–34.

Castells, M. (1997), The information age: society and culture: The power of identity, Blackwell Publishers Inc., Massachusetts.

Castells, M. (2000), The information age: society and culture: The rise of the network society, Blackwell Publishers Inc., Massachusetts, Vol. 2nd.

CNNIC. (2014), 33rd Statistical Report on Internet Development in China, China Internet Network Information Center (CNNIC), available at: http://www1.cnnic.cn/AU/MediaC/rdxw/hotnews/201401/t20140117_43849.htm

De Certeau, M. (1984), The practice of everyday life (Trans. Steven F. Rendail), University of California Press, Berkeley, available at: http://www.ubu.com/papers/de_certeau.html.

Georgiou, M. (2010), "Identity, Space and the Media: Thinking through Diaspora", Revue européenne des migrations internationales, Vol. 26 No. 1, pp. 17–35.

Giddens, A. (1984), The Constitution of Society, Outline of the Theory of Structuration, Polity Press, Cambridge.

Goodchild, M.F., Anselin, L., Appelbaum, R.P. and Harthorn, B.H. (2000), "Toward Spatially Integrated Social Science", International Regional Science Review, Vol. 23 No. 2, pp. 139–159.

Hao, Junying, and Yunhan Zhang. 2009. "Analysis on Housing Problems of Peasant Migrant Workers in Urban Araes (Chengshi Nongmingong Zhufang Wenti Yanjiu Fenxi)." China Real Estate (Zhongguo Fangdichan), no. 1: 73–74.

Harvey, D. (1996), Justice, nature, and the geography of difference, Blackwell Publishers, Cambridge, Mass.

Harvey, D. (2006), Spaces of Global Capitalism, Verso.

Hayes, N. and Westrup, C. (2012), "Context and the processes of ICT for development", Information and Organization, Vol. 22 No. 1, pp. 23–36.

Kleine, D. (2010), "ICT4WHAT?—Using the choice framework to operationalise the capability approach to development", Journal of International Development, Vol. 22 No. 5, pp. 674–692.

Law, P. and Chu, W.R. (2008), "ICTs and Migrant Workers in Contemporary China", Knowledge, Technology & Policy, Vol. 21 No. 2, pp. 43–45.

Lefebvre, H. (1991), The production of space, Oxford Blackwell, Vol. 142.

Lin, A. and Tong, A. (2008), "Mobile Cultures of Migrant Workers in Southern China: Informal Literacies in the Negotiation of (New) Social Relations of the New Working Women", Knowledge, Technology & Policy, Vol. 21 No. 2, pp. 73–81.

Massey, D. (1999), "Philosophy and politics of spatiality: some considerations. The Hettner-Lecture in Human Geography", Geographische Zeitschrift, Vol. 87 No. 1, pp. 1–12.

Massey, D.B. (2005), For space, SAGE, London ; Thousand Oaks, Calif.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

499

National Bureau of Statistics (2014). National Monitoring Survey Report on Peasant Workers (2013 Quanguo Nongmingong Jiance Diaocha Baogao). http://www.stats.gov.cn/tjsj/zxfb/201405/t20140512_551585.html.

Qiu, J. (2009), Working-class network society communication technology and the information have-less in urban China, MIT Press, Cambridge, MA :

Tuan, Y.-F. (1977), Space and place: The perspective of experience, U of Minnesota Press.

Urry, J. (2002), "Mobility and Proximity", Sociology, Vol. 36 No. 2, pp. 255–274.

Wallis. C. (2011), "Mobile phones without guarantees: The promises of technology and the contingencies of culture", Vol. 13 No. 3, pp. 471–485.

Yang, K. (2008), "A preliminary study on the use of mobile phones amongst migrant workers in Beijing", Knowledge, Technology & Policy, Vol. 21 No. 2, pp. 65–72.

Yang, L. (2010), Annual report on the catering industry development of China: 2010 (in Chinese), Social Science Academic Press (Shehui Kexue Wenxian Chubanshe), Beijing.

Zheng, Siqi, Jiuping Liao, Rongrong Ren, and Yang Cao. (2011), "Housing Policy for Migrant Workers and Economic Growth (Nongmingong Zhufang Zhengce Yu Jingji Zengzhang)." Economic Research Journal (Jingji Yanjiu), No. 2, pp. 73–86.

Zheng, Y. and Walsham, G. (2008), "Inequality of what? Social exclusion in the e-society as capability deprivation", Information Technology & People, Vol. 21 No. 3, pp. 222–243.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

500

CRITICAL REFLECTIONS ON INFORMATION SYSTEMS FOR COMMUNITY DEVELOPMENT

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Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

501

ROLE OF POWER IN SHAPING PARTICIPATORY DESIGN PROCESSES: THE CASE OF COLLABORATIVE SYSTEM DESIGN

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Abstract: This paper analyses the role of power in shaping participatory design (PD) processes in the case of a collaborative effort to design, develop and implement a hospital information system in the public health sector of a developing country. The paper discusses the process of making decisions (choices) within this PD based project, how these decisions enable or disable participation, with technology playing a mediating role shaping processes of participation. My empirical analysis studied through the conceptual lens of opportunity structure, agency, technology and participation, leads to the inference that participation and power play out through mechanisms of agenda control (what is discussed and who decides the themes), participants (who are invited in), scope (which solutions are possible) and resources (available time and people). Applying these arrangements makes the exercising of power less visible, because it is difficult to identify what is not on the agenda or which solutions (and problems) are not discussed as compared to what was explicitly stated as the agenda.

Keywords: Empowerment, Participation, Power Opportunity Structure, Agency, HIS

1. INTRODUCTION

The aim of this paper is to understand the role of participation in shaping the Information and Communication Technology (ICT) and empowerment relationship in the context of a south-south collaboration effort involving an Indian NGO (called INGO) engaged in the design, development and implementation of a hospital information system (called HospIS) for the Ministry of Health in an East African Country (called EAC). Taking the view that power is deeply implicated in this ICT-empowerment relationship, I analyse how shaping participation can both serve to exercise power, and also enable human agency to gain power from an existing position of disadvantage. Further, I seek to understand the role that ICTs play in enabling or constraining participation.

The paper seeks to contribute to the ICT4D literature in two ways. First, while participation has been a fundamental aspect of systems design and development in Western contexts (Bratteteig and Wagner 2012), its role in shaping systems in low and middle-income countries (LMICs) has remained largely unexplored (Puri 2007). I seek to understand better how processes of participation in such contexts play out through the framework of decisions and the role of power in shaping them (Bratteteig and Wagner 2012). Through this analysis, I try to expand my understanding of the ICT and empowerment relation, more specifically, the question of "how are processes of participation shaping the ICT and empowerment relation"? The specific research questions I seek to analyse in this paper include:

What are the dynamics of participation, including of inclusion and exclusion of voices, in three key decision areas of visioning, technological choices and implementation?

What is the role of ICTs in shaping dynamics of participation, and how these inform our broader understanding of the ICT and empowerment relation?

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

502

The rest of the paper is organized as follows. In the section 2 which follows, I discuss relevant literature, including relating to participatory design in IS projects in LMICs, leading up to the articulation of the conceptual perspective to guide my analysis; In section 3, I present briefly the methods employed, followed by the case study in section 4. After presenting the analysis in section 5, I provide brief conclusions.

2. RELEVANT LITERATURE AND CONCEPTUAL FRAMEWORK

This section has three parts. First, I discuss more broadly the literature of ICT and empowerment in LMICs, which provides the background of my analysis. Two, I look at the literature on participation in ICT4D projects through the lens of decisions and the role of power. Third, I develop a framework, which situates participation in the ICT and empowerment relation.

2.1. ICT and Empowerment

The term 'empowerment' is a widely contested and a complex notion.. In his framework of the capability approach, Sen (1999) defines development as the expansion of opportunities (capabilities) together with the expansion of process freedoms (agency). Empowerment is conceived as the expansion of agency (Ibrahim & Alkire, 2007). Alsop et al (2006) define empowerment as a process of enhancing capacity to make effective choices, and then to transform them into desired actions and outcomes. Samman et al (2009) add that empowerment is multidimensional, culturally grounded and relational.

Kabeer (2009) provides an interesting conceptualization relating power as the ability to make a 'choice', implying that to be disempowered is to be denied a 'choice'. Empowerment is inescapably bound up with the condition of disempowerment and refers to the processes by which those denied the ability to make a choice acquire such ability. Empowerment refers to a 'process of change'. Powerful people with access to a range of choices might not be 'empowered', because they were never disempowered.

'Increasing-power' and 'gaining choice' is as the result of the interaction between agency and opportunity structure. While agency is the ability to act on behalf of what we value, opportunity structure reflects the preconditions for exercising (or curtailing) effective agency. Empowerment is hence not only the expansion of agency but also of the "opportunity structure" (formal and informal) and their interaction enables or not empowerment (Alsop and Heinsohn 2005). Empowerment is thus seen as both a process and outcome, involving three varying degrees: i) whether a person has the opportunity to make a choice, 2) whether a person actually uses the opportunity to choose, and, 3) once this choice is made, whether it brings the desired outcome.

Kabeer's (2009) analysis of empowerment though the lens of power implies the possibilities of alternatives, the ability to have chosen otherwise. And second, agency, the ability to define one's goal, meaning that "people themselves must be significant actors in the process of change" involving not only decision-making and choice but also resistance, bargaining and negotiation, and reflection, their sense of agency or the 'power within'.

Samman et al (2009) calls agency and empowerment to be 'relational', implying that certain groups are empowered or disempowered in relation to others with whom they interact. Empowering people implies helping them to become more capable agents. Alkire (2007) classifies empowerment as a process in which people gain power over (resisting manipulation), power to (creating new possibilities), power with (acting in a group) and power from within (enhancing self-respect and self-acceptance). Kabeer (2009) points to both negative and positive meanings of agency with respect to power. 'Power to' refers to people's capacity to define their own life choices, while 'power over', refers to the capacity of an individual or a group to override agency of others. Power can also operate in absence of any agency, for instance norms and rules governing social behaviour which are not explicit but socially accepted.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

503

Sen defines 'functioning' as "beings and doings" of a person. A functioning is an achievement, whereas a capability is the ability to achieve (Sen 1987). He further discusses 'goods and services' as resources which can be leveraged to serve as means to achieve a person's potential functionings. The ability to leverage is enabled through three types of 'conversion factors': personal (e.g. metabolism, physical condition, reading skills, intelligence) which influence how a person can convert the characteristics of the commodity into a functioning; social (e.g. public policies, social norms); and, environmental factors (e.g. climate, geography).. The role of technology in this process of conversion has largely been under-explored, which I try to understand through the lens of decisions and power.

2.2. Participation of IS in LMICs: Understanding through Decisions and Power

I discuss this in two parts. Firstly, I provide a brief overview of how the literature has discussed participation in ICT4D projects. Following from this, I argue how the dynamics of participation can be understood through the lens of decisions and power.

Participation in IS projects in LMICs

Health system reform efforts across developing countries hinge more and more on technology. The use of ICTs has been expanding during the last decade or so in the developing world as well. Some donor agencies, like the World Bank, for example, have argued for much greater penetration and use of ICTs by developing countries to usher knowledge intensive societies for ensuring their economic survival in the current era of globalization (World Development Report 1999). By and large, in most of the western approaches, participation of intended users is seen as a precondition for good design and increases the likelihood of integrating the new system into the organization (Saarinen 1990). In the western context the focus of such participatory approaches is in organizational/corporate contexts. When related to community development programs the argument for participation is based on a more intuitive and ethical basis rather than on empirical grounds.

However, it also argued by some that models of participation cannot be adopted as it is in the developing countries. A special issue of The Information Society emphasized that IS from the "developed" world cannot be replicated in developing countries and addressed the question of how to adapt these IS in such a way to balance "… global solutions, technologies, and practices on one hand, and local requirements and institutional dynamics on the other" (Sahay and Avgerou 2002). Braa and Hedberg, in an article in this issue, (Braa and Hedberg 2002) examined the participatory prototyping of a health IS in South Africa emphasizing the link between systems development and participation.

Kensing and Blomberg (1998) have identified three main issues in participatory IS design, viz., the politics of design, the nature of participation, and the methods, tools and techniques for carrying out design projects. The term 'participation' has different meanings for different people. "The term has been used to build local capacity and self-reliance, but also to justify the extension of state control. It has been used to devolve power and decision making away from external agencies, but also to justify external decisions" (PLA Notes 1998, p.79). Puri et al (2004) also note that what is important in participation is who decides what data to collect, who collects it, who interprets the information and uses the finding and how participation can make decision-making a more democratic process. Participation in IS projects should be a social process of bringing people together to understand different views and share decision-making so a sustainable IS is designed that is culturally and locally specific.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

504

Power, decision making and participation

Power has been studied by various IS and organization studies researchers involving multiple definitions and approaches (Silva 1997). I take a more focussed view by examining power in relation to decision making and participation in systems development processes. For this discussion, I primarily draw upon Brattateig and Wagner (2012) who argue that systems design is about making decisions which represents making choices between possibilities towards the creation of an artefact, and selecting one of them, while eliminating some others. This implies that decision-making represents an exercise of power as it is bound up in questions of who takes the decision, whose opinions are solicited, and whose are not, and what kind of process is adopted to arrive at the decision.

Brattateig and Wagner (2012) also point out that a core ambition of participatory design in systems development is to empower users who should take part in all types of decisions, be given a voice, and enabled with the power to participate in decision-making. This requires decision makers to share their decision-making power with users who should accept to share this power and take required responsibility. Both giving and accepting of power can be difficult (Bjerknes & Bratteteig 1988). Braa and Sahay (2012) describe the core of the Scandinavian tradition in systems development was advocating workplace democracy where through legislation workers were given more power to participate in decisions involving the introduction of new technology in the workplace. This involved fundamentally a renegotiation of power relationship between the managers and workers.

Conceptualizing power

Max Weber (1964), conceptualized power as structuring dominance and order in organizations. Foucault though has a more dialectic notion of power, stressed that the exercise of power is 'not simply a relationship between partners, individual or collective; it is a way in which certain actions modify others' (1982, p. 788). In his analyses of power he has stressed the 'disciplining' of individuals (and societies) arguing for a transference to the self of 'the rules of law, the techniques of management, and also the ethics, the ethos, the practice of self, which would allow these games of power to be played with a minimum of domination' (1987, p. 18).

Giddens (1984) moves power away from dominance, equaling it with agency and 'transformative capacity': power is the capacity to achieve outcomes. He identifies four types of power in societies: authoritative (based on position, knowledge); allocative (based on economic and technical resources); signification (based on patterns of thinking and interpretations); and legitimization (based on belief systems or a vision, norms and values).

Power is a key concept in the literature on decision-making. Based on empirical studies of decision-making practices in systems development projects, Borum and Enderud (1981) look at conflicts and how different ways of structuring and controlling help avoid addressing these conflicts. The mechanisms they identified are: agenda control (what is discussed and who decides the themes), participants (who are invited in), scope (which solutions are possible – and hence, which problems are defined and seen as relevant and therefore addressed), and resources (available time and people). Applying these arrangements makes the exercising of power less visible, because it is more difficult to identify what is not on the agenda than what is. Bachrach and Baratz (1963) introduce the notion of non-decision-making as a strategy of silencing potentially controversial issues which are often presented in a 'biased' or ambiguous way.

Participation, seen from the perspective of decision making and power, represents both structural and behavioural conditions (Puri 2007). Structure concerns the existing arrangements for making decisions, for instance, a bureaucratic style typically followed in public sector organizations in LMICs, where seniority is key. A decision process involves the case details and relevant paper work being put in the file, and the relevant person puts his/her notings and opinions on the file and sends it to the next person to do the same. Finally a "decision" is taken or deferred by the senior officer, involving a process which may take months, not days to complete. These

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

505

structural conditions then define who participates and who does not, and the underlying conditions and expectations of action. . The behavioural conditions reflect attitudes of those taking the decisions (not concerned about time taken which can be defended by the institutional process) and those affected by it (resigned to the process). These attitudes shape processes of exercise of and giving up of power and with it the exercise of human agency. There is thus an intimate relationship between decision making, power and participation which I next present in the form of a conceptual perspective.

2.3 Building a conceptual perspective

In my conceptual perspective I relate notions of empowerment with those of power, decision making and participation, within the broader framework of opportunity structure and agency. Firstly, I understand empowerment as a process by which a person gains ability to make a choice, with a presumption that this ability was earlier denied. Empowerment represents an expansion of human agency that enhances 'choice', understood within the framework of agency and structure. Further, I seek to understand the interplay of power and disempowerment, as to be empowered you must have experienced disempowerment. I see power in relation to agency as 'power to' and 'power over'. Decision making provides an analytical lens to understand how this power to and power over dynamics play out in concrete situations where choices have to be made.

I draw upon Brattateig and Wagner's (2012) framework to understand the decision making and power relationship to study participation in systems design. They describe five types of decisions relevant to systems development projects: big and small; external and internal; and, non-decisions. Within each, they examine at different phases of the systems development project, issues of who decides and who is part or not, and the process of decision making followed. .

Further, my framework seeks to understand the role of ICTs in enabling or not processes of participation. Drawing from the work of Robeyns (2005), I build on the notion of 'conversion factor' to understand how certain conditions can help convert capabilities that individuals have to enhance functioning. The capability to effectively use CTs can serve as a 'conversion factor' as illustrated through this example:

We are not interested in a bicycle because it is an object made from certain materials with a specific shape and colour, but because it can take us to places where we want to go, and in a faster way than if we were walking. These characteristics are of a good to enable a functioning (Robeyns, 2005, 99).

In this example, the bicycle enables the functioning of mobility, to be able to move freely and more rapidly than walking. There are different functionings that individuals can value, such as to attain status or to fulfil the love for speed. While the bicycle provides the resources, the capacity to ride it provides a "conversion factor" to convert a capability to a desired functioning. In this way, ICTs serve as a mediating resource between opportunity structure and agency with implications on empowerment. Through the case in this paper, I analyse how ICT mediated participation may include or exclude certain people to participate which influences the choices made.

In summary, my conceptual framework includes the following points:

I.   A key focus is to understand the relationship between decision-making, power, and processes of participation which may be technology enabled.

II. This helps to understand better the relationship between technology and empowerment shaped by the agency-structure relationship.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

506

3. METHODS

I describe broadly the methods used in this study to be based on a case study approach within an action research framework. The analytical focus was on the system design, development and capacity building processes around HospIS for EAC. The development was carried out by INGO, and the interactions between the two groups were based on three face-to-face visits of INGO to EAC, and a number of online (Skype, email, and chats) mediated interactions.

Alongside with being a researcher, I have coordinated the project, as part of the INGO team, wherein I have actively participated (both through face-to-face meetings and ICT enabled) in various decisions concerned with systems design and development, gaining an insider view of how these decisions played out, and the power dynamics involved. As researcher, I have reflected on these experiences to understand on what works and what does not, to slowly infer more general principles on the different relationships studied. While these action research efforts have contributed practically to the development of the system, research outputs have included the theorization of the power and participation relationship, and the role of ICTs.

Data collection involved different modes of engagement with users in EAC – Ministry of Health, development partners, county government, hospital and facility users – including, requirement understanding meetings, training sessions, prototype demonstrations, workshops, letters notifications, documents, minutes of meeting, and conduct of capacity building sessions. These meetings took place both in a face to face mode, and emails, Skype sessions and chats mediated through ICTs.

My data analysis was guided by the decision-power-participation framework presented in the theory section. Based on the empirical case, I have identified certain key decisions at certain stages of the project, have analysed the dynamics of power and participation around them, and the role of ICTs in this process.

4. CASE OVERVIEW

In 2010, INGO initiated a process of design, development and implementation of an integrated hospital information system (called HospIS) based on open-source platform for the context of district hospitals in the public health system in India. The success of this project came to the notice of a senior official in the Ministry of Health, EAC, who visited India to see the system in practice and had discussions with the users and the INGO team. Impressed by what he saw, he recommended to his ministry to consider this system for EAC. After about a year of non-action, a senior staff from a development partner (called DP) based in EAC initiated a process of re-examination of the possibilities of HospIS and saw a Skype demo of it. This led to a formal request for proposal (RFP), developed by the DP's consultants, being advertised by the DP for the Electronic Health Record System (EHRS) envisaged to be deployed across multiple hospitals and primary health facilities in the country.

INGO responded to the RFP and their proposal was accepted. The agreed scope of work included in addition to the specific facility based requirements for HospIS the global vision of an information exchange which would enable interoperability of data from other systems (such as human resources, logistics and births and deaths) with HospIS. Additionally, the scope included enabling the development of a national 'community of practice' (CoP) in EAC to strengthen aspects of sustainability and local ownership. The suggested INGO approach was grounded in a socio-technical and deeply participatory methodology with users being seen key in defining their needs and the trajectory of the system, which resonated with the CoP vision proposed.

The project started with a four-member INGO team visiting the EAC for understanding system requirements over a two-week period. In the first meeting, the stakeholders to constitute the CoP were identified, including MoH officials, DP staff, consultants (hired by DP), users working in hospitals/facilities where the system was to be deployed, and other members from the donor

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

507

community. The initial discussions with senior MoH officials, based in the country capital, included developing a mutual understanding of the broader vision and expectations from the system. After this the INGO team moved to one of the counties (planned to be the pilot site) and visited different facility types, and worked with local users to understand workflows, practices, information and patient flows, and infrastructure needs. In the process of working with facility users, INGO team also tried to identify 'champions' for the CoP.

On return to India, INGO developed and submitted to EAC a detailed report summarizing the proposed approach to system design, development and capacity building. The report was approved by EAC and the project was initiated.

One of the big decisions in this project concerned the use of the existing HospIS built by INGO in India as the frame of reference for the EAC system. This decision was basically taken by DP, supported by their consultants, based on the INGO proposal. The MOH were not directly visible in this big decision as the existing design of HospIS provided to be a strong guiding frame, providing both constraints and opportunities, for the development of the new system.

Over the next six-nine months, two parallel processes on system design and capacity building ensued. Important was to define the different stakeholders who would participate as members of the CoP. While DP, MOH and the INGO team were key members, the consultants played an important role in enrolling other international partners legitimized by the argument of making the process more participatory. This increasing bias towards international partners contributed to a drop in participation of the local officials, and increasingly online sessions started to be driven by their perceptions where they parachuted into discussions with limited prior engagement and understanding of the requirements. Over time, the online capacity building sessions started to turn into briefing sessions for new members further contributing to a drop in MoH participation.

The prototype development process was discussed with this evolving CoP over various Skype meetings, feedback received and revisions incorporated. Similarly, for capacity building, session plans were made and online sessions on Skype were conducted, and later Moodle (an online training management tool) was introduced for audio-video sessions, competency tests, sharing of feedback forms and resource material. Shaping this online capacity building was the decision of scheduling time of when these sessions would start. For the EAC consultants, MOH officials and the INGO the time agreed of 10 am (EAC time, twice a week) was convenient, but was not convenient for the hospital staff for whom it was the peak OPD time. This led to a near exclusion of facility users in the capacity building sessions, and severely constrained user participation.

Another big decision concerned the selection of the county for deployment, with implications on assessment of hardware and user capacity building needs. The MOH had earlier selected two contrasting counties (called County1 and County2), with County1 having well developed infrastructure and was closer to the capital, and County2 the reverse on both. However, as a result of this choice, the users in County2 were excluded from the online capacity building processes because of their very poor access to internet. To circumvent this, INGO made a complete audio-visual training material package based on the Moodle platform which was then downloaded by the DP consultants and made into CDs and given manually to County2 for self-training. This disadvantaged the users there from actively engaging with the broader CoP in the making. While this process went on for about eight months, suddenly just a month before implementation, the MOH replaced County 2 with another (County3) who were caught completely unprepared with respect to readiness for the project. Their late entry meant they were not part of many important project decisions already taken.

A small-decision related to clinical standards to be used in the system. DP wanted to implement global standards for diagnosis ICD 10, something they had been advocating for long; while hospital clinicians wanted to follow the MoH standards for classification of diseases. This meant that the clinical modules capturing patient illness, diagnosis, and history had to be designed

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

508

based on this global design, rather than the local requirements which, had been part of the curriculum taught in EAC medical colleges. Hence, though the clinicians had participated in articulating requirements, these were overridden by these global standards and the power of the DP.

Another small decision was on prioritization of modules for development, which was primarily taken by INGO. The DP or MoH team were not consulted and only informed about the decision. Though the MoH team did give feedback on prioritization, the INGO decision held.

In conclusion, I have provided a curtailed account of the case study which is currently in progress, with a focus to highlight some key decision points, and analyse them from the perspective of participation and power. This is now presented.

5. CASE ANALYSIS

The case analysis is presented in two parts. In the first, I discuss four illustrative decisions to understand their dynamics and how they shaped the project. In the second, I extend the analysis to consider implications of these on participation, and the role of technology.

Four illustrative decisions

In this section on analysis, I discuss four key decisions which relate to the project. The first is on defining of the project vision, the second around a technological choice, the third on the adoption of clinical standards and the final one on module prioritization. Around each, I try to understand who participated and who did not, to help make inferences around power related issues. In the table below, I summarize these decisions and then discuss them.

Decision	Key characteristics of decision content	Who participated in the decision	Whose voices were silent
Defining the vision of the project	Openness to enable scalability to a national system based on health information exchange platform	DP driven by vision of an Integrated Architecture formulated by international consultants	The MOH and facility users
Making technological choices	Open source platform based on Indian system – reuse of code and build on something that works	INGO proposed the platform, accepted by DP	MoH and facility level users
Defining clinical standards to be implemented in the system	The use of global standards for nomenclature on cause of deaths and clinical practice	DP	The clinicians
Module prioritization	Prioritization of modules for development	INGO	MoH

Decision relating to defining the project vision: A key characteristic of this decision was to develop HospIS with an open and license-free platform to enable national level scaling. This vision was primarily driven DP informed by consultants who had prepared the RFP which reflected a global vision of a health information exchange. This exchange entailed an integrated system in which HospIS would be the hub and would also transfer data to the national level data warehouse. Such an integrated architecture is inherently complex and even not successfully achieved in various resource-rich environments. This state of art vision assumed various technical and institutional pre-conditions, which were largely absent in EAC. However, given

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

509

the dominant position of the DP and their consultants, this modernist and technical vision was inscribed in the system requirements.

Decision related to making of technological choices: Two elements were key. The first was to use the OpenMRS platform for the development, which was a global leader in this domain, and a key component of the health information exchange architecture. The second was to build upon the system developed by INGO for an Indian state, and customize and extend it further for the EAC context. The INGO proposal was in synch with the initial DP requirements document, which did not include explicit MoH inputs, though could be seen as having their tacit approval. INGO as technical experts of HospIS were the holders of the expert power and knowledge based on their prior implementation experience, while the MoH and facility staff were largely excluded from these evolving conversations.

Decision related to implementation of clinical standards: DP, for many years had advocated the use of global cause of death and clinical standards in the country, but had not been successful due to the manual and fragmented nature of the systems. The use of the OpenMRS platform however provided a vehicle for the same, and legitimized the requirements of adopting a health information exchange approach. The clinicians had for long resisted the use of these global standards as they had been schooled under a different paradigm that were specific to their country. However, though the clinicians participated in articulating requirements, they were overridden by the global standards, now facilitated through HospIS, and were forced to accept.

Decision related to prioritization of modules for development: The modules prioritization was based on a development logic defined by INGO. This decision did over-ride the MoH prioritization of the clinical and inpatient modules which they felt would gain a stronger buy-in. Though the project professed a 'participatory design' approach, in practice it did not consider key participatory inputs due to varying priorities of other stakeholders.

Next, I draw on Wagner and Brattateig's (2012) framework to discuss the implications of these decisions on participation and the role of technology and empowerment.

Implications of decisions on participation and the role of ICTs
Central to an understanding of 'design decisions' is the concept of power. I start with a brief introduction to the concept of power aiming at a more conceptual analysis of the design decisions.

Power related to the decision-makers
The DP head and INGO coordinator took the lead in the decisions on values and concepts of the system, based on their varying interests. The decision to use the open-source system came from DP head being grounded in research experience and prior knowledge of how global vendors locked African governments with proprietary systems. While his main strategy concerning decision-making was a mixture of influence oriented towards persuasion and 'creating mutual understanding', DP also used power by eliminating other alternative choices.

The INGO team was responsible for the technology development. The technical design decisions regarding the use and further development of the system was based on a mixture of influence and trust. Neither the MoH team nor the facility team could seriously contest decisions requiring specialized technical expertise; they could only challenge the outcomes of these decisions.

The decisions on values and openness of the system were clearly based on a vision of participation to enable scalability to a national system based on a health information exchange platform. Its acceptance was due to the mutual recognition of expertise. But different interpretations created conflicts such as over issues of prioritization of modules. Both the DP head and the INGO team used influence based on their expertise in these discussions, but aiming at having a mutual understanding, formulated in conditions of the contract. The DP and INGO used their respective powers eliminating alternative choices from the beginning, exercising agenda control and scope (Borum and Enderud 1981; Bachrach and Baratz 1962, 1963).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

510

The decisions on how to implement the vision were based on specific research interests in creating a national level CoP, enabled through technical tools like Skype, Moddle, and email. The decision to introduce larger groups of DPs and scheduling of the online sessions, was taken by the DP consultants, with the INGO team complying to these timings. While scheduling was based on finding a 'convenient' time for the MOH officials and the INGO team, it led to exclusion (even though unintended) of hospital/ facility users (who needed the sessions the most). As Bratteteig and Wagner discuss, these decisions were open to alternative solutions and turned out to have implications that were unclear at the time they were taken.

Finally, participation and power play out through the mechanisms of agenda control (what is discussed and who decides the themes), participants (who are invited in), scope (which solutions are possible) and resources (available time and people). Applying these arrangements makes the exercising of power less visible, because it is more difficult to identify what is not on the agenda or which solutions (and problems) are not discussed as compared to what was explicitly stated as the agenda. In summary, it can be argued that participation plays a key role in defining the IT and empowerment relationship, and decision making provides an important lens to study how this plays out.

6. CONCLUSION

The analysis of the relation between participation, power and decision making helps me to develop the following broader implications: deepening of my understanding of the IT and empowerment relationship; developing a more nuanced understanding of role of technology in enabling or disabling participation.

With respect to the first, participation can potentially enhance empowerment of users, by allowing them to express what they want with the system, including supporting clinical choices during patient care. However, sometimes their voices are not adequately expressed and heard.

While technology plays a key role in supporting or constraining participation, for example Skype would potentially allow people in remote facilities to participate in the CoP capacity development sessions, but actual participation was constrained by connectivity constraints and scheduling considerations. What technology is chosen also helps to define who holds the expert power, and whose knowledge gets suppressed. As Wagner and Brattateig's (2012) say, sharing power is not straightforward, as it is grounded in fundamental asymmetries. .

REFERENCES

Alop, R, & Heinsohn, N. (2005). Measuring empowerment in practice: Structuring analysis and framing indicators. Washington, DC: World Bank.

Alsop, Ruth, Mette Frost Bertelsen, and Jeremy Holland. Empowerment in practice: From analysis to implementation. World Bank Publications, 2006.

Bjerknes, G., & Bratteteig, T. (1988, January). The memoirs of two survivors: or the evaluation of a computer system for cooperative work. In Proceedings of the 1988 ACM conference on Computer-supported cooperative work (pp. 167-177). ACM

Braa, J., & Sahay, S. (2012). Participatory Design within the HISP network.Routledge International Handbook of Participatory Design, 235

Braa, J., and Hedberg, C. (2002) "The Struggle for District based Health Information Systems in South Africa," The Information Society (18:2), pp. 113-127.

Borum, F. & Enderud, H. (1981): Konflikter i organisationer, Nyt Nordisk Forlag Arnold Busck, Copenhagen

Bachrach, P. & Baratz, M.S. (1963): Decisions and Nondecisions: An Analytical Framework, in The American Political Science Review 57 (3), pp. 632-642

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

511

Ibrahim, S. & Alkire, S. (2007). Agency and Empowerment: A Proposal for Internationally Comparable Indicators. Oxford Development Studies Vol. 35, No. 4, December 2007

Kabeer, N (1999). Resources, agency, achievement: Measurement on Women's Empowerment. Development and Change

Kensing, A., and Blomberg, J. (1998) "Participatory Design: Issues and concerns," Computer Supported Cooperative Work (7), pp. 167-185

Puri, S. K. (2007). Integrating scientific with indigenous knowledge: Constructing knowledge alliances for land management in India. MIS Quarterly, 355-379.

PLA Notes (1998) A Brief Guide to the Principles of PLA (31:1), February

Puri, S. K., Byrne, E., Nhampossa, J. L., & Quraishi, Z. B. (2004, July). Contextuality of participation in IS design: a developing country perspective. InProceedings of the eighth conference on Participatory design: Artful integration: interweaving media, materials and practices-Volume 1 (pp. 42-52). ACM.

Robeyns, I. (2005). The capability approach: a theoretical survey. Journal of human development, 6(1), 93-117.

Sahay, S., and Avgerou, C. (2002) "Introducing the Special Issue on Information and Communication Technologies in Developing Countries," The Information Society (18:2), pp.73-76.

Samman, E., & Santos, M. E. (2009). Agency and Empowerment: A review of concepts, indicators and empirical evidence.

Sen, A. (1988). The standard of living. Cambridge University Press.

Sen, A. (1987). Gender and cooperative conflicts (p. 58). Helsinki: World Institute for Development Economics Research.

Sen, A. (1999). Development as Freedom. New York: Anchor Books.

Silva, L. (1997). Power and politics in the adoption of information systems by organisations: the case of a research centre in Latin America (Doctoral dissertation, University of London).

World Development Report, Knowledge for Development, published for the World Bank by Oxford University Press, 1999.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

512

mHEALTH DRIVERS FOR MATERNAL HEALTH OUTCOMES IN DEVELOPING COUNTRIES: A SYSTEMATIC REVIEW

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Abstract: The target of the Millennium Development Goal 5 (MDG5) is to improve maternal health. Most developing countries are lagging behind their targets and it is very unlikely that this target will be met. In an attempt to address the many challenges in maternal health, mobile technology in health (mHealth) is being considered among other interventions to improve maternal health outcomes in developing countries. Several studies have shown the potential of mHealth to improve health outcomes by highlighting the applications used and outcomes realised. This paper intends to provide an overview of the potential mechanisms contributing to maternal health outcomes for mHealth projects in developing countries. A systematic literature review of peer-reviewed articles on mHealth in maternal health, published between 2008 and 2014, was conducted. Five mHealth drivers were found to contribute to maternal health outcomes in developing countries: (i) accessibility to mobile communication; (ii) system usability and adaptation; (iii) service convenience; (iv) health institution resources; and (v) system integration. The results pave the way for understanding how mHealth interventions work in maternal health, and could be useful for policy formulation, programme planning, design, and implementation.

Keywords: mHealth, mHealth drivers, maternal health, developing countries

1. INTRODUCTION

Maternal health refers to the health of women during pregnancy, childbirth, and the postpartum period. One of the major concerns in maternal health is maternal mortality. WHO (2010, p.4) defines maternal mortality as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. About 800 women die every day from pregnancy and childbirth-related complications (WHO, 2012). Currently maternal mortality is unacceptably high, ranging from 210 000 to 358 000 every year; 99% of these deaths occur in developing countries (Hogan et al., 2010; WHO, 2010; WHO, 2012). Life time risk of maternal deaths in developing countries is high because of high mortality rates, coupled with high fertility rates (Ronsmans & Graham, 2006). Millennium Development Goal 5 (MDG 5) calls for a 75% reduction in maternal mortality rates (MMR) around the world by 2015, but most developing countries are lagging behind on their targets (Hogan et al., 2010).

Health systems in developing countries have deployed a number of technical interventions to improve maternal health outcomes including: emergency obstetric care, skilled attendance and management of unsafe abortion, focused antenatal care, and family planning services (Adam, 2005; Penn-Kekana & Blaauw, 2002). Three-quarters of maternal deaths could be prevented if the women had access to the interventions that manage pregnancy and birth complications, especially emergency obstetric care. However, most women do not have access to health services due to delay in: (i) recognising the need for medical attention and decision-making

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

513

process, (ii) arriving at a health facility, and (iii) receiving adequate and appropriate care at health facility (Hunt & Mesquita, 2008; Noordam et al., 2011). The main causes of the delays are lack of information, the position of women in society, distance to a health facility, weak health systems, poverty, lack of education, and cultural practices (Hunt & Mesquita, 2008; Noordam et al., 2011; Ronsmans & Graham, 2006; WHO, 2010).

With 89% penetration rate in the developing world (ITU, 2013), mobile phones are becoming an important ICT tool, even in remote and rural areas of developing countries. The attributes of mobile phones, such as ubiquitous power, low cost, and ease of use, qualify them as an appropriate and adaptable tool for development (Blake, 2008; Duncombe, 2011). The use of mobile technology for healthcare service delivery (mHealth) is gaining popularity in developing countries (Aranda-Jan, Mohutsiwa-Dibe, & Loukanova, 2014; Chib, van Velthoven, & Car, 2014; Chigona, Nyemba-Mudenda, & Metfula, 2012). The benefits attributed to mHealth include increased access to health information and health services delivery, and improved efficiencies in data management in health systems of developing countries (Aranda-Jan et al., 2014; Mechael et al., 2010). However, poor infrastructure, both in technology and the health system, i.e., poor network coverage and poor conditions of health facilities respectively, pose a challenge to implementation of mHealth initiatives in developing countries (Aranda-Jan et al., 2014; Krishna, Boren, & Balas, 2009).

In most developing countries, the use of mHealth in maternal health involves innovative ways to reduce the delay in recognising the need for medical intervention, reaching a point of care, and receiving timely adequate care (Noordam et al., 2011). mHealth use in maternal health has potential to improve health outcomes for the mothers, communication among health workers, and data management in health facilities.

Various studies have demonstrated the potential benefits of mHealth, and factors affecting mHealth implementation in developing countries (e.g. Aranda-Jan et al., 2014). To the authors' knowledge, there is no study that has focused on maternal health in particular. The reviews on mHealth in maternal health (Noordam et al., 2011; Tamrat & Kachnowski, 2012) have focused on application and benefits of the mobile technology, with little attention to the causes of the outcomes. This paper discusses the potential determining factors of mHealth outcomes in maternal health that can pave the way to understand how mHealth works (or does not) for maternal health in developing countries. Data for the study is drawn from peer-reviewed papers that have evaluated mHealth projects for maternal health in developing countries.

2. METHODS

The authors conducted an electronic literature review in June-July 2014, using Google Scholar and PubMed databases. The search was done using combined terms relating to: mHealth, maternal health, and mobile telecommunications such as 'mobile phone', 'cell phone', 'maternal healthcare', 'antenatal', 'health technolog*', 'informatics', and others. The papers selected for the study were limited to English publications of peer-reviewed articles between 2008 and 2014, which yielded 951 articles, as illustrated in Figure 1.
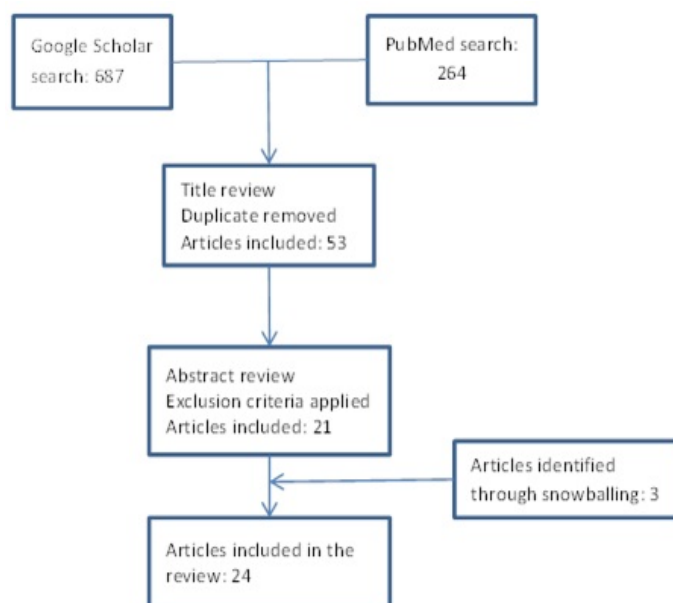
Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

514

Figure 1: Search and exclusion criteria for literature review

All potential abstracts were screened, and 24 studies were selected for full paper review after three were added to the corpus through snowballing. The exclusion criteria included: mHealth in maternal health studies in developed countries; studies not specific to maternal healthcare service delivery, i.e., fetal exposure to mobile phones; and studies on other related Information Communication Technologies (ICTs) such as eHealth and telemedicine, but not specific to mobile communication in maternal health. The 24 papers selected represented 19 mHealth projects; they focused on both: (i) Patients' use of mobile technology to access maternal healthcare, and (ii) Healthcare providers' use of mobile technology for management and provision of maternal healthcare. Almost half of the papers reviewed, 13, were from Africa, 10 from Asia, and one from Australia, Papua New Guinea.

The study employed the general inductive approach for analysing qualitative evaluation data, with the aim of unfolding the link between mHealth interventions and maternal health outcomes (Thomas, 2006). The authors familiarised themselves with the data by reading through the reviewed articles several times to identify themes; these themes were further grouped into categories, and then meaningful themes for determinants of mHealth outcomes in maternal health. The analysis was based on the following criteria: intervention type and objectives, the outcomes, and factors affecting mHealth implementation. The criteria gave us an understanding of the necessary conditions in mHealth interventions that could have led to the outcomes realised.

3. FINDINGS

3.1. mHealth interventions in maternal health

mHealth in maternal health is still burgeoning. All the studies reviewed focused on pilot projects, with the exception of one project from Rwanda that had a nationwide deployment (Ngabo et al., 2012). The review showed that mHealth projects aim at increasing access to maternal healthcare services and increasing health facility utilisation. Two systematic reviews on mHealth in maternal health, Noordam et al. (2011) and Tamrat and Kachnowski (2012), have shown that mobile phone technology is basically used for:

- – Demand generation for maternal healthcare services through health promotion and education

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

515

- Emergency obstetric referral, helping women access medical intervention on time

- Improving capacity of remote health workers through provision of point of care support, by connecting health personnel at different level facilities to transfer knowledge and share best practices

- Data collection and management, i.e. reporting and performance appraisal

The predominant mobile phone feature used in maternal health is SMS, which is used for disseminating health information (Datta, Ranganathan, & Sivakumar, 2014; Kaewkungwal et al., 2010; Lau et al., 2014); appointment reminders (Crawford et al., 2014; Lund et al., 2014a); and drug adherence (Ramachandran, Goswami, & Canny, 2010). Due to low literacy levels among women in developing countries, especially in remote areas, some projects (9 out of 19) used voice calls and voice messages where they deployed toll-free lines or provided credit to the users for patient consultation; linked health professionals of different levels and locations; and promoted health education and awareness (e.g. Crawford et al., 2014; Huq et al., 2014; Lund et al., 2012; MacLeod et al., 2012). Multimedia, in the form of audio and video combined with text messages, were used in one project in India to change what were considered harmful cultural beliefs and behaviour in pregnancy and childbirth through persuasion (Ramachandran et al., 2010). Some interventions used basic algorithms on mobile phones to improve data collection of health information and efficiencies in data management and reporting (Alam, Khanam, & Khan, 2010; Andreatta et al., 2011; Chib, 2010; Little et al., 2013; Vélez et al., 2014).

3.2. mHealth drivers

The analysis showed that the mHealth outcomes realised in maternal health in developing countries can be attributed to five key factors: (i) Accessibility to mobile communication; (ii) System usability and adaptation; (iii) Service convenience; (iv) Health institution resources; and (v) System integration. Table 1 summarises the factors identified, and shows the papers from which they were drawn.

Table 1: mHealth drivers in maternal health

mHealth drivers	Contributing factors	Studies
Accessibility to mobile communication	Low mobile phone ownership	Chib et al. (2008); Chib (2010); Alam et al. (2010); Huq et al. (2012, 2014); Oyeyemi and Wynn (2014); Crawford et al. (2014); Osborn (2013); MacLeod et al. (2012); Lund et al. (2012, 2014a, 2014b); Cole-Ceesay et al. (2010)
	Phone sharing	Datta et al. (2014); Lau et al. (2014); Huq et al. (2012, 2014); MacLeod et al. (2012); Crawford et al. (2014); Lund et al. (2012, 2014a, 2014b); Osborn (2013)
	Infrastructural barriers	Watson and Sabumei (2014); Ngabo et al. (2012); Cole-Ceesay et al. (2010); Osborn (2013); MacLeod et al. (2012); Crawford et al. (2014); Oyeyemi and Wynn (2014); Little et al. (2013); Chib et al. (2008)
	Cost of communication	All studies
System usability and adaptation	Ease of use	All studies

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

516

	Customisation to local realities	Ngabo et al. (2012); Little et al. (2013); Chib et al. (2008); Crawford et al. (2014); MacLeod et al. (2012); Watson and Sabumei (2014); Lund et al. (2012, 2014a, 2014b); Kaewkungwal et al. (2010); Huq et al. (2014); Osborn (2013)
Service convenience	Immediacy	All studies
	Interactivity (between patients and health workers, and among health workers)	MacLeod et al. (2012); Crawford et al. (2014); Ngabo et al. (2012); Watson and Sabumei (2014); Lund et al. (2012, 2014a, 2014b); Huq et al. (2012, 2014); Osborn (2013); Oyeyemi and Wynn (2014)
	Cost savings	Osborn (2013); Chib et al. (2008); Huq et al. (2012); Oyeyemi and Wynn (2014); Watson and Sabumei (2014); Little et al. (2013); Crawford et al. (2014)
	Confidentiality	Huq et al. (2012, 2014); Watson and Sabumei (2014); Osborn (2013)
	Reduced workload	Velez et al. (2014); Kaewkungwal et al. (2010); Alam et al. (2010); Chib (2010); Chib et al. 2008); Ngabo et al. (2012); Osborn (2013)
Health institution resources	Shortage of skilled workers	Cole-Ceesay et al. (2010); Watson and Sabumei (2014)
	Lack of medical resources and poor infrastructure	Watson and Sabumei (2014); Oyeyemi and Wynn (2014); Ramachandran et al. (2010); Cole-Ceesay et al. (2010)
System integration	Incorporation of mHealth into existing Health Information Systems (HIS)	Alam et al. (2010); Andreatta et al. (2011); Ngabo et al. (2012); Oyeyemi and Wynn (2014); Velez et al. (2014); Kaewkungwal et al. (2010); Huq et al. (2012, 2014); Little et al. (2013); Watson and Sabumei (2014);
	Involvement of health workers at different levels of healthcare	All studies with the exception of Lau et at. (2014); Crawford et al. (2014)

3.2.1. Accessibility to mobile communication

All the studies indicated that an initial step to mHealth is access to mobile phones. Despite the hype of increasing mobile phone penetration rates in developing countries, mobile phone ownership is still low, especially in remote areas (James & Versteeg, 2007; James, 2011). In a number of studies it was found that less than 50% of people in the local communities owned mobile phones. Most of these phones are owned by men or elders of the family. The unequal distribution of phones is mainly due to the high cost of telecommunications, and socio-cultural discrepancies that disadvantage women in developing countries, such as the low position of women in society (Huq et al., 2012; Lund et al., 2014b; MacLeod et al., 2012; Osborn, 2013). Thus, accessibility to a mobile phone for most women relied on sharing, which came with a number of challenges. A study in South Africa had a dropout rate of almost 50% for women who registered to receive educative text messages (Lau et al., 2014); one of the main reasons for this was shared phones. So even if messages were technically successfully delivered, some participants did not read them. Consequently, increase in health knowledge, intention to and actual behavioral change, were high in women using their own mobile phones (Crawford et al., 2014; Lau et al., 2014).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

517

Infrastructural barriers such as poor mobile network coverage and limited electricity access in remote areas were mentioned in about 75% of the studies as having adverse effects on the accessibility of mobile communication. In some projects in Malawi, Ghana, Nigeria, Bangladesh, and Papua New Guinea, SMS messages were often not delivered and calls were dropped, due to poor network; mobile phones were switched off or were out of power due to limited electricity for charging (Crawford et al., 2014; Huq et al., 2014; MacLeod et al., 2012; Oyeyemi & Wynn, 2014; Watson & Sabumei, 2014). In contrast, good technological infrastructure, as in the case of Rwanda, made it possible for remote areas to have good mobile phone network coverage; this enhanced accessibility, contributing to the success of mHealth as a nationwide initiative.

The majority of the studies alluded to the impact of the cost of communication on the adoption of mHealth as a technology. Free services were found enabling for the women and the health workers when using the interventions. Almost all of the studies concur that offering free mHealth services encouraged the uptake of intervention, because most people in the rural areas of developing countries, especially women, cannot afford the costs associated with mobile phone use, due to their low socio-economic status (Huq et al., 2014; Lund et al., 2014a; Oyeyemi & Wynn, 2014; Watson & Sabumei, 2014). In some cases communities would put money together for credit to continue accessing mHealth services, especially in emergency situations (Cole-Ceesay et al., 2010). Closed groups and a special free line have proved to be effective (Chib et al., 2008; Ngabo et al., 2012), as an open line could be misused and end up being costly for the project.

For community health workers (CHWs) and other health personnel, receiving free mobile phones was a motivation that boosted their engagement in the mHealth programmes (Andreatta et al., 2011; Chib et al., 2008; Huq et al., 2014; Little et al., 2013; Ngabo et al., 2012; Ramachandran et al., 2010; Vélez et al., 2014; Watson & Sabumei, 2014). The CHWs perceived as empowerment the fact that they could communicate with health facility staff while in the community and more still call an ambulance to fetch a woman from the village; this bestowed on them more respect and trust from the community, which they valued. Little et al. (2013) asserted that a sense of mobile phone ownership and empowerment act as a strong motivator for mobile phone use among health workers and, consequently, facilitate acceptability and accessibility of mHealth services.

3.2.2. System usability and adaptation

All the studies showed that mobile technology systems that adapt to local realities of communities in developing countries, along with ease of use, enhance mHealth acceptance and appropriation. Content, language, and mode of delivery were found to be crucial in a number of projects, particularly those dealing directly with women and CHWs (Crawford et al., 2014; Osborn, 2013). The health information disseminated needs to be locally generated content, in a language that the people understand, and be delivered in a way that they can comprehend (Huq et al., 2014; Lund et al., 2014a; MacLeod et al., 2012). The inability to read and comprehend text messages (most women were not literate) showed that SMS could fail to achieve desired outcomes (Crawford et al., 2014; Osborn, 2013).

To mitigate the literacy problem, some projects introduced voice calls and voice messages using the interactive voice response (IVR) system (Crawford et al., 2014; Huq et al., 2014; Osborn, 2013). In some cases users had challenges navigating the IVR system, and needed to be retrained. Most participants in several studies were familiar with a mobile phone. However, that did not translate to having knowledge of how to operate the devices. In a number of studies, participants needed to be shown how to operate a mobile phone at the beginning of the project, including health workers in some cases (Little et al., 2013; Ngabo et al., 2012; Vélez et al., 2014). For instance, in Liberia and Ghana, Traditional Birth Attendants (TBAs) were trained on how to use mobile phones for reporting maternal cases; the same had been done for midwives

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

518

and CHWs who used mobile phones for data collection and reporting (Andreatta et al., 2011; Chib, 2010; Munro et al., 2014). Chib (2010) and Chib et al. (2008) noted that to enhance usability among health workers, a system needed to be appropriated in daily practices and *"should be seen as a dynamic response system rather than a method of policing, i.e., collecting data from the lower levels as a form of marking attendance and ensuring compliance"* (Chib, 2010, p. 518).

3.2.3. Service convenience

mHealth services availed health information and services to the women anytime and anywhere; facilitated contact with health workers; reduced healthcare costs; reduced time response in emergencies; and reduced the workload of health workers in data management and reporting. These were all perceived to be useful to the participants. In almost all the studies, service convenience was hypothesised to impact patient satisfaction and healthcare utilisation for the mothers, by making it easier to acquire services (Cole-Ceesay et al., 2010; Lund et al., 2012; Oyeyemi & Wynn, 2014). It also impacted health service delivery by making it easier for health workers to report, organise, and manage data for decision making, planning, monitoring, and evaluation purposes (Chib, 2010; Jareethum et al., 2008; Little et al., 2013; Watson & Sabumei, 2014).

In the majority of the studies, the benefit of accessing health services at any time at the convenience of their communities was appreciated by the participants (Crawford et al., 2014; Datta et al., 2014; Oyeyemi & Wynn, 2014). This saved most of the women financial resources associated with transportation to a health facility (Huq et al., 2014; Lund et al., 2014a). mHealth services also increased contact with health workers, as women interacted with them frequently from home; this also gave the women confidence to go to the clinic, especially in Africa where negative attitudes of health workers is one of the barriers to women accessing healthcare (Lund et al., 2012). Confidentiality was another perceived advantage associated with talking to someone on the phone. Huq et al. (2012) found that the women were comfortable talking to someone they did not know and could not see, about sensitive problems they would rather not share in a face-to-face conversation, because no one in the community got to know about it. Some health workers found mobile phone communication private and confidential when discussing cases among health workers, compared to using high frequency radio systems (Watson & Sabumei, 2014).

The referrals to a health facility reduced time response to emergency cases, especially where the mobile phone system was linked to transport services of the health system (Cole-Ceesay et al., 2010; Oyeyemi & Wynn, 2014; Watson & Sabumei, 2014). Applications for data collection were associated with reduced workload for health workers, since they improved on the paper-based system if properly integrated in the health information system (Chib, 2010; Little et al., 2013; Ngabo et al., 2012; Vélez et al., 2014). This has also been found to enhance data management and real time reporting.

3.2.4. Health institution resources

ICTs such as mobile technology can enhance communication and processes for timely service delivery. However, community health programmes, complementary health facility resources, and infrastructure play a role in improving health outcomes. Poor health systems and infrastructure have adverse effects on the efficacy of mHealth in developing countries, and this was found to compromise health outcomes (Ngabo et al., 2012; Noordam et al., 2011; Tamrat & Kachnowski, 2012). A number of studies confirmed this hypothesis by showing that introducing mHealth intervention alone is not enough to improve health outcomes, and that mHealth effectiveness relies on the organisation of the health system (Ngabo et al., 2012; Oyeyemi & Wynn, 2014; Watson & Sabumei, 2014). Shortage of skilled health workers, lack of diagnosis and treatment resources, and poor logistics for emergency transport can adversely affect the

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

519

effectiveness of an efficacy mHealth intervention (Cole-Ceesay et al., 2010; Oyeyemi & Wynn, 2014; Watson & Sabumei, 2014).

To test the assertions that access to free mHealth services by pregnant mothers and improving services at health facilities are more likely to increase primary healthcare utilisation, three studies were undertaken. In Nigeria, Papua New Guinea, and Gambia, the health systems in rural areas were completely overhauled and used for assessing the effectiveness of mHealth in improving emergency responses and utilisation of primary healthcare (Cole-Ceesay et al., 2010; Oyeyemi & Wynn, 2014; Watson & Sabumei, 2014). Oyeyemi and Wynn (2014) indicated that in their project the health facilities were renovated, transport infrastructure was improved, and all other resources were provided. Further, closed group mobile phones were provided to the mothers, CHWs, and health personnel to improve communication, referrals, and point of care support. The study found that free mobile phone services are more likely to increase utilisation of health facilities and reduce maternal deaths when health facility infrastructures and services are upgraded (Oyeyemi & Wynn, 2014). However, in Gambia and Papua New Guinea, after the improvements to the health system, those concerned still faced problems of shortage of skilled staff and limited funding for emergency transportation (Cole-Ceesay et al., 2010; Watson & Sabumei, 2014).

3.2.5. System integration

Three quarters of the projects in   the reviewed studies had in one way or another integrated the mHealth intervention into the health system. System integration was twofold: the incorporation of the mHealth system into the existing health information system (HIS), whether electronic or paper-based; and the involvement of health workers in mHealth projects. Some projects worked in isolation without involving the health workers or incorporating the mHealth component into the existing HIS (e.g. Crawford et al., 2014; Lau et al., 2014). Such projects have problems in evaluating the impact of the intervention on health outcomes. Other projects involved health workers but the system ran in isolation (Jareethum et al., 2008; Ramachandran et al., 2010). The systems that were appropriated in the daily practices of health facilities and incorporated into HIS, in addition to involving health personnel, had the potential of realising maximum benefits from mHealth (Alam et al., 2010; Little et al., 2013; Ngabo et al., 2012; Vélez et al., 2014). With these two last models, the challenges encountered included health workers complaining of an additional workload to their busy schedule (Little et al., 2013; Vélez et al., 2014).

From the peer-reviewed articles, the only mHealth project that had been scaled nationwide was the RapidSMS in Rwanda (Ngabo et al., 2012). RapidSMS was fully integrated into the health system of Rwanda by deploying a two-way communication for action between the community, using CHWs, and the rest of the health system, for effective and timely maternal healthcare service. The system linkage included the transport system (ambulances), health facility staff, district hospital, and the central level through mobile phones. Further, the system provided a database for clinical record-keeping for easy monitoring of maternal cases and service delivery. According to Ngabo et al. (2012), the main reason for RapidSMS's success was that it leveraged the structured and strong community-based health programme of the Rwandan health system: CHWs were stationed in villages for the purpose of identifying pregnant women to monitor their pregnancy by making regular follow-ups during and after pregnancy, and making sure that they delivered at a health facility. The mHealth project simply enhanced the processes of the system that was already in place. Government commitment to innovation in healthcare made it easier to take ownership for scaling the programme nationwide after donor funds had run out (Ngabo et al., 2012).

In Zanzibar, the use of SMSs in monitoring pregnancy, coupled with mobile phone calls for emergency referrals and point of care support in health facilities which were fully integrated into the HIS, increased antenatal care (ANC) attendance and health facility delivery, and reduced

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

520

perinatal mortality[1], which is a sensitive indicator of MMR (Lund et al., 2012; 2014a; 2014b). This is one of the pioneering studies in mHealth that evaluated the effectiveness of the technology, based on the primary health outcome of reduced perinatal deaths (Lund et al., 2014b). Chib (2010); Chib et al. (2008); and Ngabo et al. (2012) also demonstrated the importance of grassroot health workers' access to higher level health personnel for consultation and guidance to serve the women better; this has a positive effect on the use of mobile phones to improve health outcomes.

System integration enhances engagement of health personnel in different levels of the health system; it further improves the skills of remote health workers, as it affords them an opportunity to learn from workers in higher levels, e.g., in hospitals (Chib, 2010; Little et al., 2013; Vélez et al., 2014; Watson & Sabumei, 2014).

4. DISCUSSION AND CONCLUSION

The review provides an overview of potential determinants of mHealth outcomes in maternal health in developing countries. The initial step to realising health outcomes using mHealth is accessibility to mobile communication. It was noted that women's access to mobile phones in developing countries is constrained by high cost of communication and the gender digital divide, which is aggravated by discrepancies in literacy, income status, and employment (Hilbert, 2011). Most women rely on shared mobile phones for communication, for which they have to seek permission from their husbands or elders. Involvement of key stakeholders in mHealth projects, especially at community level, i.e., people with authority over women's lives, may improve access, acceptance, and usage of mHealth services. In addition, government and the telecommunication industry involvement and support may mitigate the challenges of the high cost of communication in health, e.g., getting subsidised rates and network coverage in rural areas.

Similar to any technological innovation, ease of use and perceived usefulness are the key contributing factors to acceptance and adoption of mHealth. From the existing studies it can be concluded that the perception of usefulness is more often more important than ease of use (Chib, 2010; Huq et al., 2014; Vélez et al., 2014). The convenience of mHealth services for the women ranged from immediacy, interactivity, time and cost savings, and confidentiality. The women in maternal health find timely targeted information that they receive in the convenience of their homes/communities useful as it saves them unnecessary trips to a health facility. This yields economic benefits of saved time and money. Even though mHealth is reported to reduce the workload for the health workers, if not properly integrated and managed in the health information system (HIS), it can double the workload of the already overburdened staff. mHealth needs to be incorporated into the work practices and processes so as to enhance efficiencies. Adaptation to local realities was found to be one of the critical success factors for mHealth in maternal health, especially if it mitigates barriers of language, illiteracy, and culture – resulting in appropriation of mHealth services.

Poor access to health information is only one among many factors (e.g., shortage of staff) that has led to poor maternal health outcomes in developing countries (Hogan et al., 2010; Oyeyemi & Wynn, 2014). Therefore, improving access to health information is not, by itself, sufficient to significantly reduce maternal morbidity and mortality in developing countries. The review has shown that the use of mHealth can improve access to health information, data management, and service delivery; but it does not improve the poor conditions of health systems in developing countries that are in dire need of refurbishment. Improving services at health facilities and pregnant women's access to free mobile phone services have great potential to increase

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[1] Perinatal mortality refers to death around the time of delivery, including both fetal deaths (at least 20 weeks of gestation) and early infant (neonatal) deaths

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

521

utilisation of the primary healthcare system. With the poor conditions of health systems in developing countries, mHealth, just like other ICTs, fails to reflect any significant positive impact on health outcomes, especially when health indicators are used. Furthermore, integration of mHealth into the existing HIS and involvement of health workers at all levels of healthcare, facilitate efficiencies in the provision of care. The studies have shown that achieving a strong sense of ownership and empowerment among health workers is a prerequisite for the successful introduction of any mHealth programme (Little et al., 2013; Ngabo et al., 2012).

Accessibility and usability of mobile communications are necessary conditions for maternal health consumers and health workers to leverage mobile phones for maternal healthcare. The beliefs that mHealth users form about the technology, and the perceived advantages of the system/services, influence their acceptance and use. However, while these conditions are necessary, they are not sufficient to effect positive change in maternal health. Health institution resources and integrating mHealth interventions into existing health systems were found to be vital for provision of timely adequate care for the women. The literature is consistent that mHealth has potential to improve maternal health outcomes, but the success of mHealth interventions in maternal health does not only depend on technology acceptance, and adoption, but also on the organisation of the health system (Aranda-Jan et al., 2014; Chib et al., 2014; Krishna et al., 2009). System integration, if designed and implemented properly through collaboration with all key stakeholders, may enhance efficiencies in the health system and improve access to health information and services, as well as health worker consultation and guidance that can improve health outcomes in maternal health.

Findings of this study can help designers and developers of mHealth systems, implementers of mHealth interventions, policy makers, and researchers understand better the factors that affect the acceptance and use of mobile phone technology, and how mHealth contributes to maternal health outcomes. Positive factors can be incorporated in planning, design, and implementation of mHealth projects; while, for the negative ones, mitigation strategies can be taken into consideration. Even though the study focused on mHealth interventions in the domain of maternal health, the findings can be used to gain insights into mobile technology use in healthcare in general.

The study had two main limitations. First, only studies published in English were included; this excluded studies published in other languages. Second, the review considered peer-reviewed articles only, excluding the numerous reports on mHealth in maternal health in grey literature. This decision was made to ensure the quality of the articles being reviewed. However, we acknowledge that the articles excluded from the study could have added critical insights to the study. We also acknowledge that quantitative approaches could have added rigour and insight to the study.

5. REFERENCES AND CITATIONS

Adam, T. (2005). Cost effectiveness analysis of strategies for maternal and neonatal health in developing countries. *BMJ.British Medical Journal, 331*(7525), 1107.

Alam, M., Khanam, T., & Khan, R. (2010). Assessing the scope for use of mobile based solution to improve maternal and child health in Bangladesh: A case study. *In Proceedings of the 4th ACM/IEEE International Conference on Information and Communication Technologies and Development* (p. 3). ACM.

Andreatta, P., Debpuur, D., Danquah, A., & Perosky, J. (2011). Using cell phones to collect postpartum haemorrhage outcome data in rural Ghana. *International Journal of Gynaecology & Obstetrics, 113*(2), 148-151.

Aranda-Jan, C. B., Mohutsiwa-Dibe, N., & Loukanova, S. (2014). Systematic review on what works, what does not work and why of implementation of mobile health (mHealth) projects in Africa. *BMC Public Health, 14(*188), 1-15.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

522

Blake, H. (2008). Mobile phone technology in chronic disease management. *Nursing Standard, 23*(12), 43-46.

Chib, A. (2010). The Aceh Besar midwives with mobile phones project: Design and evaluation perspectives using the information and communication technologies for healthcare development model. *Journal of Computer-Mediated Communication, 15*(3), 500-525.

Chib, A., Lwin, M. O., Ang, J., Lin, H., & Santoso, F. (2008). Midwives and mobiles: Using ICTs to improve healthcare in Aceh Besar, Indonesia. *Asian Journal of Communication, 18*(4), 348-364.

Chib, A., van Velthoven, M., & Car, J. (2014). mHealth adoption in low-resource environments: A review of the use of mobile healthcare in developing countries. *Journal of Health Communication,* 1-53.

Chigona, W., Nyemba-Mudenda, M., & Metfula, A. (2012). A review on mHealth research in developing countries. *The Journal of Community Informatics, 9*(2). Retrieved from http://ci-journal.net/index.php/ciej/article/view/941/1011

Cole-Ceesay, R., Cherian, M., Sonko, A., Shivute, N., Cham, M., Davis, M., Southall, D. (2010). Strengthening the emergency healthcare system for mothers and children in the Gambia. *Reproductive Health, 7*(21)

Crawford, J., Larsen-Cooper, E., Jezman, Z., Cunningham, S. C., & Bancroft, E. (2014). SMS versus voice messaging to deliver MNCH communication in rural Malawi: Assessment of delivery success and user experience. *Global Health: Science and Practice, 2*(1), 35-46.

Datta, S., Ranganathan, P., & Sivakumar, K. (2014). A study to assess the feasibility of text messaging service in delivering maternal and child healthcare messages in a rural area of Tamil Nadu, India. *The Australasian Medical Journal, 7*(4), 175-180.

Duncombe, R. (2011). Researching impact of mobile phones for development: Concepts, methods and lessons for practice. *Information Technology for Development, 17*(4), 268-288.

Hilbert, M. (2011). Digital gender divide or technologically empowered women in developing countries? A typical case of lies, damned lies, and statistics. *Women's Studies International Forum, 34*(6), 479-489.

Hogan, M. C., Foreman, K. J., Naghavi, M., Ahn, S. Y., Wang, M., Makela, S. M., Murray, C. J. L. (2010). Maternal mortality for 181 countries, 1980–2008: A systematic analysis of progress towards millennium development goal 5. *The Lancet, 375*(9726), 1609-1623.

Hunt, P., & Mesquita, J. B. (2008). *Reducing maternal mortality: The contribution of the right to the highest attainable standard of health*. Retrieved from http://www.unfpa.org/webdav/site/global/shared/documents/publications/reducing_mm.pdf

Huq, N. L., Azmi, A. J., Quaiyum, M. A., & Hossain, S. (2014). Toll free mobile communication: Overcoming barriers in maternal and neonatal emergencies in rural Bangladesh. *Reproductive Health, 11*(52). 1-12.

Huq, N. L., Koehlmoos, T., Azmi, A. J., Quaiyum, M., Mahmud, A., & Hossain, S. (2012). Use of mobile phone: Communication barriers in maternal and neonatal emergencies in rural Bangladesh. *International Journal of Sociology and Anthropology, 4*(8), 226-237.

ITU (2013). *The world in 2013: ICT facts and figures 2013*. International Telecommunication Union. retrieved from http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2013-e.pdf

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

523

James, J. (2011). Sharing mobile phones in developing countries: Implications for the digital divide. *Technological Forecasting and Social Change, 78*(4), 729-735.

James, J., & Versteeg, M. (2007). Mobile phones in Africa: How much do we really know? *Social Indicators Research, 84*(1), 117-126.

Jareethum, R., Titapant, V., Tienthai, C., Viboonchart, S., Chuenwattana, P., & Chatchainoppakhun, J. (2008). Satisfaction of healthy pregnant women receiving short message service via mobile phone for prenatal support: A randomized controlled trial. *Medical Journal of the Medical Association of Thailand, 91*(4), 458.

Kaewkungwal, J., Singhasivanon, P., Khamsiriwatchara, A., Sawang, S., Meankaew, P., & Wechsart, A. (2010). Application of smart phone in "better border healthcare program": A module for mother and child care. *BMC Medical Informatics and Decision Making, 10*(1), 69.

Krishna, S., Boren, S. A., & Balas, E. A. (2009). Healthcare via cell phones: A systematic review. *Telemedicine and e-Health, 15*(3), 231-240.

Lau, Y., Cassidy, T., Hacking, D., Brittain, K., Haricharan, H., & Heap, M. (2014). Antenatal health promotion via short message service at a midwife obstetrics unit in South Africa: A mixed methods study. *BMC Pregnancy and Childbirth, 14*(1), 284.

Little, A., Medhanyie, A., Yebyo, H., Spigt, M., Dinant, G., & Blanco, R. (2013). Meeting community health worker needs for maternal healthcare service delivery using appropriate mobile technologies in ethiopia. *PloS One, 8*(10).

Lund, S., Hemed, M., Nielsen, B. B., Said, A., Said, K., Makungu, M. H., & Rasch, V. (2012). Mobile phones as a health communication tool to improve skilled attendance at delivery in Zanzibar: A cluster-randomised controlled trial. *An International Journal of Obstetrics & Gynaecology, 119*(10), 1256-1264.

Lund, S., Nielsen, B., Hemed, M., Boas, I., Said, A., Said, K., Rasch, V. (2014a). Mobile phones improve antenatal care attendance in Zanzibar: A cluster randomized controlled trial. *BMC Pregnancy and Childbirth, 14*(1), 29.

Lund, S., Rasch, V., Hemed, M., Boas, I., Said, A., Said, K., Nielsen, B. (2014b). Mobile phone intervention reduces perinatal mortality in Zanzibar: Secondary outcomes of a cluster randomized controlled trial. *Journal of Medical Internet Research, 16*(3).

MacLeod, B., Phillips, J., Stone, A., Walji, A., & Awoonor-Williams, J. (2012). The architecture of a software system for supporting community-based primary healthcare with mobile technology: The mobile technology for community health (MoTeCH) initiative in Ghana. *Online Journal of Public Health Informatics, 4*(1).

Mechael, P., Batavia, H., Kaonga, N., Searle, S., Kwan, A., Goldberger, A., Ossman, J. (2010). *Barriers and gaps affecting mHealth in low and middle income countries: Policy white paper.* Columbia University: Earth Institute & mHealth Alliance.

Munro, M. L., Lori, J. R., Boyd, C. J., & Andreatta, P. (2014). Knowledge and skill retention of a mobile phone data collection protocol in rural Liberia. *Journal of Midwifery & Women's Health, 59*(2), 176-183.

Ngabo, F., Nguimfack, J., Nwaigwe, F., Mugeni, C., Muhoza, D., Wilson, D., Binagwaho, A. (2012). Designing and implementing an innovative SMS-based alert system (RapidSMS-MCH) to monitor pregnancy and reduce maternal and child deaths in Rwanda. *The Pan African Medical Journal, 13*(31)

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

524

Noordam, A. C., Kuepper, B. M., Stekelenburg, J., & Milen, A. (2011). Improvement of maternal health services through the use of mobile phones. *Tropical Medicine & International Health, 16*(5), 622-626.

Osborn, J. (2013). MOTECH. In J. Donner, & P. Mechael (Eds.), *mHealth in practice: Mobile technology for health promotion in the developing world* (pp. 100-118). London: Bloomsbury Academic: A&C Black.

Oyeyemi, S. O., & Wynn, R. (2014). Giving cell phones to pregnant women and improving services may increase primary health facility utilization: A case-control study of a Nigerian project. *Reproductive Health, 11*(1), 1-8.

Penn-Kekana, L., & Blaauw, D. (2002). *A rapid appraisal of maternal health services in South Africa: A health systems approach.* (). UK: DFID. Retrieved from http://www.dfid.gov.uk/r4d/PDF/Outputs/HealthSysDev_KP/01-02_south_africa.pdf

Ramachandran, D., Goswami, V., & Canny, J. (2010). Research and reality: Using mobile messages to promote maternal health in rural india. *Proceedings of the 4th ACM/IEEE International Conference on Information and Communication Technologies and Development,* London.

Ronsmans, C., & Graham, W. J. (2006). Maternal mortality: Who, when, where, and why. *Lancet, 368*(9542), 1189-1200.

Tamrat, T., & Kachnowski, S. (2012). Special delivery: An analysis of mHealth in maternal and newborn health programs and their outcomes around the world. *Maternal and Child Health Journal, 16*(5), 1092-1101.

Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. *American Journal of Evaluation, 27*(2), 237-246.

Vélez, O., Okyere, P., Kanter, A., & Bakken, S. (2014). A usability study of a mobile health application for rural Ghanaian midwives. *Journal of Midwifery & Women's Health, 59*(2), 184-191.

Watson, A., & Sabumei, G. (2014). Maternal health phone line: Analysis of first phase results. *Contemporary PNG Studies: DWU Research Journal,* (19), 23.

WHO. (2010). *Trends in maternal mortality: 1990-2008.*World Health Organisation. Retrieved from http://whqlibdoc.who.int/publications/2010/9789241500265_eng.pdf

WHO. (2012). *Trends in maternal mortality: 1990-2010.* World Health Organisation. Retrieved from http://whqlibdoc.who.int/publications/2012/9789241503631_eng.pdf?ua=1

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

525

INFLUENCE OF 'SOFT' CONSTRUCTS ON THE OUTCOME OF COMMUNITY ICT INITIATIVES

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Abstract: This paper applies the design-reality gap archetype framework as an analytical tool to evaluate the Community Information Centre (CIC) initiative in Ghana. It critically examines how the interaction of soft gaps (politics, culture, emotions, and people), partnerships and context influenced the outcome of the initiative. In doing so, the paper contributes to the ICT4D evaluation literature in two ways. First, it identifies some design-reality gaps that need to be addressed to improve the success of CIC initiative. Second, the findings have implications for the implementation of telecentre projects in similar developing country contexts. The study demonstrates the usefulness of the design-reality gap archetype framework as an analytical tool for the evaluation of telecentres.

1. INTRODUCTION

The provision and effective use of ICT facilities have the potential to improve the well-being of poor and marginalised citizens particularly when such facilities are made readily available (Clement & Shade, 2000). Several assumptions about the benefits of ICT facilities to poor or deprived people put forward include their abilities to promote the growth of local economies, improve standards of living, increase business revenues and eventually alleviate poverty in such environments (Qureshi, 2005). Such assumptions represent a somewhat technologically deterministic view of universal access to ICTs to leapfrog sequences normally associated with traditional developmental stages. Such may be the case with the adoption of the telecentres concept (Krishna & Walsham, 2005).

In developing countries, telecentres have often become the only source to internet and ICT facilities (Middleton, 2003). Despite their potential, however, evaluation studies on telecentres in developing countries have reported mixed results. For example in North Eastern India, accelerated use of IT in rural areas bridged existing access gaps between the North East and the rest of the country and also brought about marginal increases in income levels of telecentre patrons (Chaudhri & Dash, 2007). On the contrary, Krishna & Walsham (2005) opine that there are more failures than success stories. Developing countries face many challenges in implementing telecentres. For instance, Best & Kumar (2008) report widespread non-use of facilities established at enormous cost (32 out of 36 telecentres closed). Similarly, Vannini *et al.* (2013) identified deficiencies of venues, resource constraints and relevance as major militating factors for non-use of facilities.

However, evaluation of ICT initiatives such as that of the Community Information Centre (CIC) in Ghana and the northern sector, in particular, appears to be limited. The CICs are a government of Ghana initiative implemented countrywide from 2005 with the aim of providing rural and deprived communities access to ICT facilities at minimal cost. They are meant to provide access

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

526

to Internet-enabled computers, facsimile (fax) facilities, photocopying, telephone, radio and television, library facilities, training in basic computer skills, entrepreneurship and business services for small and medium enterprises. Investigations into the CIC initiative have tended to delve into the factors that hindered adoption of the government led pro-poor ICT intervention and the alternate technology that could foster better ICT diffusion (mobile telephony) (Oppong-Tawiah & Boateng, 2011; Awotwi & Owusu, 2010). Their unit of investigation mainly hinged on the ICT artefact. There has however not been a systematic analysis of the role of 'Soft' constructs on sustainability of Ghana's CICs. This study uses the term 'Soft' to denote all militating factors other than 'hard technology' such as IT infrastructure, equipment and accommodation. This study therefore critically addresses the following question:

What role do 'soft' constructs play in shaping the outcome of the CIC initiative?

The rest of the paper proceeds as follows. In the next section, related research on the evaluation of telecentres is discussed. This is followed by the description of the design-reality gap archetype framework and a discussion of the case study context. Then, the research methodology is presented, after which the findings are presented and analysed using the design-reality gap archetype framework. Finally, the conclusion gives a brief summary and critique of the findings and the limitations of the study.

2. RELATED RESEARCH

Discussion of telecentre implementations is widespread in the literature. There have been scores of discourses of the long-term sustainability issues of these centres to achieve their stated objectives to beneficiary communities (Madon, 2005b). The dominant view is that these facilities touted as the ultimate tools to lift the majority of underprivileged communities out of poverty must be opened long enough for users to get the best out of them (Harris, Kumar & Balaji, 2003). Sustainability issues surround financial/economic, political and social sustainability. However, the majority have tended to deal with the financial viability of the centres (Ibrahim, Yasin & Dahalin, 2010). The issue of sustainability has arisen because although it is recognised that telecentres play a significant role in granting access to ICT facilities, more and more are closing down in developing countries where they are needed most. Despite the hype of their importance and developmental ability, little impact has been observed. The lack of positive results can be likened to other development-oriented initiatives instigated by similar agencies behind such efforts, particularly in Ghana. An example is the instance of the Structural Adjustment Programmes (SAPs) initiated by the Bretton Woods Institutions where countries in financial crisis were given funding to solve their economic woes. However, research has shown that recipient countries rather steeped further in poverty because of the conditions attached to the funds they received (Noorbakhsh & Paloni, 1999; Riddell, 1992), exacerbating the very problems such interventions were to ameliorate.

Like these adjustment programmes, there has been an increased interest in the evaluation of telecentres to determine their impact. Researchers have approached the assessment of telecentres from different perspectives. The evaluation approach is often influenced by the metrics of evaluation. For instance, Holmes (1999) studied how gender dynamics affect how centres are run and argue's that an integration of gender constructs in the evaluation process will give a better understanding of impact with regards to women's access to services. Madon (2005a) and Dada (2006) also maintain that available resources, skill levels, lack of training and change management impact project failure. Additionally, Mutula (2005) in his assessment of ICTs in sub-Sahara Africa suggests that though there are several technology-related causes for the widening ICT access gap, the real concern in developing countries lies more with people-related factors that need sufficient attention. In this light, Harris (1999) states that assessments of the impact should not always be based on technical requirements, but should concentrate on evaluation outcomes, for it is in these intangible outcomes that impacts are realised. This view is supported by Gomez & Pather (2011) and Baron & Gomez (2013) when they conclude that most

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

527

evaluation metrics measures tangible benefits instead of placing equal, if not greater, emphasis on intangible benefits such as social capital, empowerment, self-esteem and social cohesion (Walsham, 1993).

It has been noted that further evaluation of telecenters is needed (Madon *et al.*, 2009). Independent studies evaluating telecentre impact in Ghana are scarce. Awotwi & Owusu (2010) investigated the CIC project in the light of how the centres had aided government-to-citizen (G2C) engagement. They concluded that mobile telephony was a better option at bridging the access gap in Ghana than the continuous establishment of CICs. Likewise, Oppong-Tawiah & Boateng (2011) proffer that mobile phones are a more viable strategy for alleviating poverty in poor regions than fixed infrastructure.

It is important to evaluate ICT initiatives because the cost implication of failure is enormous especially to poor countries like Ghana. Heeks (2003) argues that irrespective of the high cost of failure, most governments are unfazed. Most do not see the need to stop and ponder the implications of failure. This lack of appreciation is due in part to the intangible nature of cost and also because some might be benefitting from the status quo (Krishna & Walsham, 2005).

3. ANALYTICAL FRAMEWORK

Heeks's (2000) conceptualisation of gaps and his subsequent identification of archetypes (Heeks, 2003), provides a suitable model/framework for analysing the findings of this study. He proposed three categories of design-reality gaps that affect the success of ICT4D initiatives: Hard-soft gaps, private-public gaps, and country context gaps. He refers to these three categories as 'Gap Archetypes'. The core argument of this framework is that these constructs invariably hinder the practical implementation of IS in most developing economies. Thus the capacity of ICTs to fulfil developmental mandates is constrained by the inability to manage these constructs successfully. They are seen as obstacles that must be overcome to achieve desired goals. These constraints referred to as gaps often occur at the same time in a given project and thus should not be viewed as isolated occurrences affecting ICT implementations.
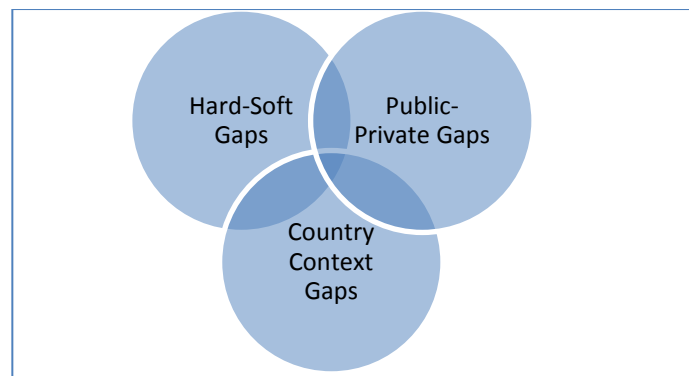
Figure 1: Gap Archetypes illustrating their interconnected relationships

3.1. Hard-Soft Gaps

Often in the implementation of projects much emphasis is placed on the ICT artefact and the various components that ensure its success. Most of these components are predictable and, therefore, their functions can be rationally and objectively benchmarked. However in reality, these functions are influenced and dominated by 'soft' factors (people, politics, emotions and culture) which are usually subjective and unpredictable. For instance, although an ICT initiative can have the full complements of equipment and necessary staff to ensures its success, it can fail because politicians influenced the siting of such projects at locations that might not yield the best utility possible to beneficiaries. The notion is that information systems fail when there is a mismatch between the 'hard' and 'soft' factors.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

528

3.2. Private-Public Gaps

This is the situation where systems designed for the private sector are transferred and implemented in the public sector without any variation in design. The design of information systems is system and situation specific. As such designed inscriptions take into consideration the organisational culture of the institution. The inability to deconstruct and adapt to meet new conditions will lead to substantial implementation incongruity.

3.3 Country Context Gaps

This gap exists when an information system designed for a developed country is implemented in a developing country. In a desperate attempt to reap the benefits of technology, systems are adopted from one context and implanted in another without taking necessary steps to ensure that the new system is aligned with contextual factors. A system designed for one context might not necessarily be suitable for another.

4. CASE AND CONTEXT

According to the 2010 Population and Housing Census, Northern, Upper East and Upper West regions are the most deprived, underserved and impoverished among the ten (10) regions of Ghana (Ghana Statistical Services (GSS), 2013). These Regions are also the least urbanised in the country with about 21.0 % of the population living in urban communities (GSS, 2013).

The demographics of these regions are illustrative of people who may not readily have access to ICTs at home and thus would need public access to ICTs. For instance, the three northern regions recorded a significantly small proportion of mobile phone penetration (2.5% on average) and the lowest proportions of households with computers (1.46%) (GSS, 2013). The trend is the same for internet penetration. It is for this reason that the availability of public facilities in these areas is crucial if the country is to achieve universal access to ICTs.

The three regions have similar community dynamics (technological, social, political and economic conditions). The Upper East (UE) was purposively selected as the study area. It has one of the highest population densities (118.1 persons per sq. km) in the country. However, about 79% of the population live in rural areas where the availability of ICT facilities is generally scarce (GSS, 2013). A compelling factor for selection was that the region has some of the oldest and operational CICs. Their experiences over the years could yield useful information on some of the major challenges CICs have had to overcome over the years and thus the possible reasons for which some have closed. This was partly influenced by the fact that researchers had access to stakeholders, and so it was relatively easy to gather the required data in time. A deep understanding of socio-economic, political and cultural dynamics of UE region by one of the researchers would enhance the study. As a result of resource constraints, all three regions could not be captured in the study and so researchers did not want to compromise quality by spreading too thin to a wider research area which might yield insignificant results. There has also been very limited research at this level of concentration in this context (UE, Ghana).

King and Behrman (2009) contend that the timing of the evaluation of social interventions is vital in unravelling impact on beneficiary communities since the behaviour of both service providers and users of systems varies over time. Making an assessment too early or too late into the project under study has a significant influence on the outcome of the results. De' (2009) describes matured projects as initiatives that have been "sustained for more than five years" (p.44). Similarly, Bhatnagar & Singh (2010) described matured projects as having been in operation "from three to eight years" (p.115). The first CIC in the study area started operation in 2005 (a little over 8yrs). The timing is adequate because it is not too early where the underlying characteristics necessary for an efficient evaluation would not have emerged, neither is it too late since all dynamics necessary for an effective evaluation are still present. The CICs in Ghana and specifically those in the Upper East Region have not been systematically investigated to

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

529

determine their viability since their establishment. Therefore, it is an opportune time for an evaluation to be carried out.

5. METHODOLOGY

A qualitative case study approach (Yin, 1994) was adopted in this research in order to understand how the dimensions of the framework interact and influence the status of a given project and how these constructs determine the gap that exist between design expectations and reality in the social context. Emphasis was therefore placed on the design expectations as stated in the Ministry of Communications (2004) document and the resultant context reality emerging out of the interaction of beneficiaries with the centre and its management.

5.1. Data Collection

Data was drawn from multiple sources (stakeholders) comprising of Municipal/District Assembly Officials (owners of CIC), Centre Managers, International Institute for Communication and Development (IICD) Official and Users of the facility. The involvement of different stakeholders provided for the triangulation of perspectives and the opportunity to contrast their perceptions of the phenomenon.

The analytical framework informed to some extent the structure of the various data collection instruments. In-depth interviews were conducted with Centre Managers and owners of the Centre (Municipal/District Assembly). Interviews were used to allow participants to express their thoughts and experiences in an unconstrained manner. Personal history conversations (Gomez & Baron-Porras, 2011) about individual experiences of users of the facility were conducted. Although the study was mainly an interpretive study, some observational techniques were employed to corroborate findings and to provide a basis for assessment. Documents also proved to be useful in the research process. Both public and private documents were sourced and used.

Seven (7) centres constituting the total number of CICs in the Upper East Region of Ghana formed the case study. Some stakeholders (Assembly officials, Managers, IICD officials, Project Implementers) were purposefully sampled because they could give an insightful and detailed understanding (Creswell, 2012) of the CIC phenomenon. The Snowball Approach (Browne, 2005) was also used to get some of the 'Personal History' respondents to interview after the initial number identified by centre managers. Project implementers were to give an insight into how the initiative was conceived, funded and implemented and the support they provide. IICD official interviewed shed light on their activities when they provided support for most of the centres. Although the centres under study were seven, we were able to interview an additional four former centre managers. We were interested in knowing what had motivated their departure as centre managers.

Stakeholders	Number of Interviews
Centre Managers	11
Personal History/Conversations with users	20
Assembly Officials	6
Project Implementers	2
IICD Official	1

Table 1: Summary of Interviews

5.2. Analysis of data

The benchmark for comparison between design expectations and actual reality as at the time of the study was derived from the CIC project objectives stipulated in the CIC Blueprint (Ministry of Communications, 2004). In order to give an appropriate description in support of the analysis

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

530

of data gathered, the design-reality gaps archetypes framework (Heeks, 2003) discussed in section three was adopted as an analytical tool. This framework has been used in previous studies to determine the gap mismatch that exist between design expectations and context reality (Heeks, Mundy & Salazar, 2000; Heeks, 2006).

6. FINDINGS

6.1. Hard-Soft Gaps

Political Influence – this factor occurred in two dimensions. In the first instance, politicians used their influence to site the project at locations that favoured their political ambitions. In this way, they intended to use the facility to gain political capital in the event of an election. This occurs in the background where it is the norm for individuals in political office to often promise electorates that upon electing them they will site developmental projects in their communities (Lindberg, 2003; Hanusch & Keefer, 2011). This phenomenon is widespread. Hence, it is not uncommon to find that such individuals will go to all lengths to ensure that a project such as the CIC is sited at particular locations as pertained in the study area. This could be a contributory factor for the low uptake at some of the centres (probably because they were wrongly located). An official at the implementing agency (IA) confirms this act and suggests that with the establishment of the latest batch of 50 restructured CICs, some politicians had influenced their siting contrary to the locations identified through feasibility studies.

"Some politicians have used their clout to influence the location of some of these centres in their constituencies even though they have CICs. As a result, needy communities are neglected" (IA Official)

The second dimension occurred on the recruitment of centre staff. The findings of the study clearly depict a picture of political interference in the administration of the facilities. There were instances where centre managers and district assembly officials' interviewed intimated that such interference was partly to blame for the non-performance of the centres. In one case, some District Assembly staff said they were powerless at administering control over the centre because some "powerful" political figures were protecting a nonperforming centre manager. Apparently, they were ordered to employ the said manager and so had no direct control over the manager.

"He goes about doing what he wants without even accounting to us". (Assembly Official)

Some centre managers complained they were hounded out of their positions because they were branded as belonging to an opposition party. The departure of such a manager means the centre is shut for some weeks or months until a 'favourable' person is appointed. Frequent replacements prevent continuity of programmes and the loss of skilled manpower. By the time the new person gets the basic training and skills to run the centre, another government might be taking over. The cycle is then repeated. The following quote illustrates this point:

"… along the line when there was a change in government new people came in and for whatever reason recruited new managers, so these people would come in fresh with no skill and no experience and it is like you are starting again from scratch. So we come back to the human resource problem."(IICD Official)

People Issues - The absence of participation of some stakeholders in the design and implementation of the project could also be cited for its current status. According to the district assembly officials, their contribution prior to the implementations was to select a site for the facilities to be built. It would be observed that almost all the centres in the study area are located a few metres from the district assembly premises. This is indicative of the fact that decisions were probably done in a hurry and as such the nearest and easily accessible land was made available. The project implementation document indicated that stakeholder participation was conducted. However, interviews with some stakeholders revealed otherwise. How then is it

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

531

possible to ensure that what is written in project implementation documents reflects what is really on the 'field'? This ties in with the issue of staff attrition due to poor conditions of service and remuneration. IICD official had this to say with regards to staff attrition:

"… we train the managers all right but the assembly refuses to pay the manager then the manager will not be committed although he is knowledgeable, skilled and has the equipment to support him he simply cannot devote all his time to the centre when he is not paid. I know of a situation where a manager was not paid for 17 straight months and he complained a lot and we came in to help to talk. They paid him three months and he had to wait another five months for the next salary to come."

A major people issue identified by this research is the lack of public education on the services available at these centres. It is interesting to note that most respondents interviewed indicated lack of user awareness of the function of the facility amongst members of even the immediate community. This was observed first hand during a visit to one of the facilities when a couple of individuals walked in and asked what the purpose of the facility was. This facility had no signboard to inform potential users what services were available. Most respondents said they discovered and used the centre by chance. One of the patrons of the centre who lives 50 metres away from the CIC said:

"… not many people here know that there are services here. Sometimes people passing by will ask me what is going on in that building. It means people do not know what is going on there."

A disturbing trend was the observation of apathy by several community members towards the use of the centres, similar to reports of other studies (Johansson, 2011). The anticipated enthusiasm expected by implementers of the initiative had diminished soon after implementation and the fanfare.

Cultural barriers - Content provision from a cultural perspective alienated most community members. Apart the fact that there was little or no local content, what was available was invariably in a language that few patrons could adequately utilise. Most of the centres were established to service communities that had a high incidence of illiteracy. Hence, the language of content was the barrier to access for a majority of users in the study area.

6.2. Private-Public Gaps

The findings are presented from a different perspective unlike that which is described by Heeks (2003). Contrary to the negative notion of private-public gaps, a good blend of the two (in terms of a governance structure) fosters progress and subsequently, success in failing programmes. In our study, this was absent. The majority of centre managers and assembly officials stated they needed partnership to operate efficiently. Since it was not possible for owners of the centres to effectively manage them, private support could be sought to guarantee the sustainability of the centres. All DCEs indicated they were willing and open to proposals from private partners in an attempt to keep the facilities open for surrounding communities to benefit from services they offer. An alliance will benefit from mutual reinforcement in terms of capital/finance, equipment and managerial skills. The importance of this type of collaboration was evident from the accounts of some managers and district assemblies when IICD (Donor agency) partnered five centres in the region in a project they run from 2008-2010. This was confirmed by the IICD consultant interviewed. The vision of IICD then was to build capacity and to change the mindset of the district assemblies or the immediate people who were overseeing the running of the CICs. Later, IICD supported with equipment and further training. Over a period of three (3) years, IICD provided training and equipment to beneficiary facilities. However, the consultant added that there was a constant struggle in managing the relationship between the centre managers, centre owners and IICD. Reports from both centre managers and District Assembly officials indicated that while they received support from IICD, the centres were doing very well until the latter parts of 2010 when the project ended.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

532

Another issue of relevance was the remuneration of centre managers and volunteers. Some of these managers attested to the fact that some of those who left were being paid better in private establishments than they were receiving. This often demoralised them considering that it took several months before they could be paid. This was even compounded when they realise that some trainees from the centres had gotten better remunerated jobs as a result of the skills acquired from centre training programmes. Low morale and lack of enthusiasm had a significant effect on the running of the centres.

Gaps can arise due to differences in working cultures between public and private entities. It was visible when IICD managed some of the CICs. Reports from managers and assembly officials exhibited a sense of responsible work ethic where managers were made to account for whatever decisions they took and presented regular reports of their activities to be assessed by the consultant in charge. This work ethic however lapsed in the period following their departure.

6.3. Country Context Gaps

It was difficult to determine the origins of the CIC concept with regards to the model the Ghanaian government implemented. The implementing agency could not give a definite response as to where they adopted/adapted this concept. However, we could assume that they had some support in the form of a blueprint from the Indian government. The CIC blueprint document states that the first 26 centres were established with the support of the Indian government (Ministry of Communications, 2004). Is it, therefore, possible that the Ghanaian government transferred a 'working concept' from India and implanted it in Ghana?

Mutula (2005) observed that the language of content provided to users of facilities was the biggest hindrance to the effective use of ICTs. Since very little, by the way of content, is generated in-house, it is obvious centre managers just pass on what they can glean from elsewhere, mostly foreign material. Most often than not, these come with local inscriptions of the originating milieus and hence often not useful to users unless special efforts are made by managers to synthesize what they have gleaned and then make them available to users. The majority of centre managers lacked the skill to perform these functions resulting in the marginalisation of a wider section of the community.

7. DISCUSSION

Prior studies have reported that "ICT intermediaries" are necessary for the success of ICT initiatives in developing countries (Cecchini & Raina, 2002; Harris, 2001), which is counter to the hitherto disintermediation argument of the role of ICTs. The ideal intermediary "should have good entrepreneur abilities, ICT skills and understand the potential of ICT for social change […] in order to respond to requests from members of the community for information or for help in solving some problems that might yield to an internet enquiry" (Gopakumar, 2006). Gomez, Fawcett & Turner (2012) argue that intermediaries contribute to human development by facilitating access to a broad range of information and services that enable a positive social, economic and community impact. The political interference in the recruitment of "infomediaries" reflects the norm in the public sector of Ghana (Asamoah, Osei-Kojo & Yeboah-Assiamah, 2013; Ayee, 2007).

Also, the conspicuous absence of "ICT champions" (De`, 2009) at the micro level of the telecentre implementation process has significantly affected its survival. After the national champions forcefully pushed for the need for such an important initiative, they became unperturbed. The most important aspect of cultivating enthusiastic lifelong local champions at the micro level was neglected. These local champions have the potential to revive an interest and morale in the initiative if the need arises. It might be difficult to get people who are not genuinely interested in ICTs to develop the liking for such initiatives. However, it is possible for the implementing agency (in this instance government) to include the sustainability of the CICs as part of the performance indicators of District Chief Executives. Once it forms part of their

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

533

appraisal, there is a greater likelihood of the assembly devoting resources to ensure the survival of CICs.

The absence of participation of some stakeholders in the design and implementation of the project could also be cited for its current status (Bryson, 2004; Kanungo, 2004). Neglecting to involve stakeholders will mean that some obvious stakeholder requirements will be missed (Siefer, 2013). If beneficiaries or the assemblies were not consulted in the requirements gathering phase, how then did the project implementers inscribe their requirements in the project? Assuming requirements for the project instead of doing in-depth studies to obtain them will lead to costly failures as witnessed in these projects. If it were not even possible to allow users to participate in the design process, it would have been prudent to involve beneficiary District Assembly officials to make an input. Participatory approach (Cooke, 2003) does not only foster ownership but also allows users to make an input on crucial matters such as local content (Oestmann & Dymond, 2001). The lack of participation by users also meant their views and opinions were not inscribed into the system design, hence affecting the implementation process. Cecchini & Raina (2004) are of the view that it is prudent to establish the information and service needs of clients by involving beneficiaries if a project is to succeed. They warn that neglecting to seek the views of actors in the implementation of projects has dire consequences to project survival. Participation in project design and implementation fosters collective ownership and the desire in beneficiaries to ensure the system works (Colle, 2000; Siefer, 2013). Alienating them will let them see such an initiative as an imposition and consequently the indifference at safeguarding its success.

Delgadillo, Gómez & Stoll (2002) contend "if people in the community feel themselves empowered by the telecentre, they will be more active in seeking ways to keep it running." Perhaps the people of the upper east region do not see the CIC as empowering. They go seeking information for their daily existence that is not provided. They seek information about symptoms of cholera outbreaks or tourism destinations but are turned away because the centre has no such information. Once the basic informational needs are not met, the likelihood of apathy will be very high thus leading to the dwindling patronage of the centres and consequently, their closure. Most of what is on the internet or in public documents is mainly in English. This could have been reduced into useful formats readily accessible to local users. The unavailability of local content militated against its frequent use. The level of illiteracy, gender disparities and low levels of education amongst community members makes them less enthusiastic and hinders the use of ICTs (Cecchini & Raina, 2002). They argue that the provision of content in local language and formats that inure to the benefit of poor people is not enough to ensure high patronage of centre services. Hence, success is predicated on the prior existence of conducive factors such as an appreciable level of literacy, adequate ICT skills, community and institutional structures (Mutula, 2005; Warschauer, 2002).

The constant struggle between the facility owners, managers, and IICD officials could be attributable to the fact that centre owners were ignorant about the contribution centres played in the developmental effort of the community especially in the development of human capital and capacity building.

The willingness of the district assemblies to embrace partners will be a congenial ground for public-private partnerships, which in this instance is highly essential for the survival of the CICs. This willingness to change focus and policy direction towards the management of the facilities if strategically adopted will improve their position to grant better access to beneficiaries. If public-private is however not strategic, the alliance might further lead to the disenfranchisement of the few who hitherto had access though in a limited capacity. The private partner might come in with a commercial motive and will be looking to protect its investment thus pricing out potential users. Therefore, policy issues with regards to affordability should from the onset take into consideration the fact that these are social interventions whose sole object is to advance digital inclusiveness of the poor. The alternative is for government to provide a regulatory framework

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

534

that will provide incentives for the private sector to participate in the provision of such social interventions to marginalised communities probably in the form of tax holidays or exemptions. The Ghana government took rapid steps by first signing into law the Ghana ICT4D policy document in 2003 which eventually gave legal backing for the establishment of the CICs as a component of its rural ICT diffusion policy. This paved the way for the National Information Technology Act (Act 771) and the Electronic Transactions Act (Act 772) to be passed into law in 2008 clearing all the "potential" barriers to ICT diffusion. The rural communities are however yet to benefit from these policies by way of private participation in the provision of pro-poor ICT facilities.

It is evident from the findings and the following discussions the value of the soft constructs (gap archetypes framework) in teasing out the reasons for the lack of sustainability and successful scaling of the CIC initiative in Ghana.

8. CONCLUSIONS

A few questions come to mind following the above findings and discussions. Are practitioners/policymakers not learning from project evaluations? Why are projects still failing while the extant literature is replete with solutions to problems faced in similar projects albeit different context? These issues remain largely unexamined. There have been a considerable number of published telecentre evaluation reports (Johansson, 2011; Harris, Kumar & Balaji, 2003; Rajapakse, 2012; Madon, 2005b). Lessons could have been learned from the experience of the reported evaluations. However, more recent evaluations such as reported in this paper lend credence to 'history repeating itself'. This probably is due to the little or no synthesised evidence-informed knowledge (Tranfield, Denyer & Smart, 2003). Consequently, there is the need for a systematic synthesis with the object of augmenting the knowledge base and informing policymaking and practice.

The fact that internet cafes (private entities) are striving is an indication that public access to computing services is essential. As a result of the reliance on the 'technological deterministic rhetoric', there has been too much emphasis on sustainability to an extent where the realities that exist in these communities are neglected. As observed by Mutula (2008), beneficiaries will not hasten to patronise the most modern and fully equipped ICT facility merely because they view other necessities (electricity, potable water, toilets and health services) as more important to improving their wellbeing. Perhaps the time has come for telecentres in Ghana to be community-led and built based on participatory budgeting process instead of the current state. This way they become owned by the community with the support of agencies/NGOs. Community ownership allows centres to evolve and meet the changing needs of the users. In so doing, communities will be able to embed their specifications that will give them the opportunity to find a way to fulfil their needs. The community-based participatory approach to the design and development of information systems is, therefore, the way to go in implementing new systems (Gregory, 2003). Top-down implementation approach is inappropriate. Until Information Systems are perceived as socio-technical phenomena, and not as implanted artefacts that will 'mysteriously' transform societies, the risk of failure will continue to escalate.

The limitation of this paper is its exclusive look at only government funded telecentres. Future research could be expanded to include other public access centres such as libraries and internet cafes to determine whether they are influenced by similar factors and how they are dealing with them.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

535

9. REFERENCES AND CITATIONS

Asamoah, K., Osei-Kojo, A., & Yeboah-Assiamah, E. (2013). Enhancing public sector productivity in Ghana: A qualitative study. *Journal of Public Administration and Governance, 3*(3), Pages 22-34.

Awotwi, J. E., & Owusu, G. (2010). Ghana community information centers (CiCs) e-governance success or mirage? *Journal of E-Governance, 33*(3), 157-167.

Ayee, J. R. (2007). *Ghana at 50: Government, politics, and development* Dept. of Political Science, University of Ghana.

Baron, L. F., & Gomez, R. (2013). Relationships and connectedness: Weak ties that help social inclusion through public access computing. *Information Technology for Development,* (ahead-of-print), 1-25.

Best, M. L., & Kumar, R. (2008). Sustainability failures of rural telecenters: Challenges from the sustainable access in rural india (sari) project. *Information Technologies and International Development, 4*(4), 31-45.

Bhatnagar, S. C., & Singh, N. (2010). Assessing the impact of E-government: A study of projects in india. *Information Technologies & International Development, 6*(2), pp. 109-127.

Browne, K. (2005). Snowball sampling: Using social networks to research non-heterosexual women. *International Journal of Social Research Methodology, 8*(1), 47-60.

Bryson, J. M. (2004). What to do when stakeholders matter: Stakeholder identification and analysis techniques. *Public Management Review, 6*(1), 21-53.

Cecchini, S., & Raina, M. (2002). Warana: The case of an indian rural community adopting ICT. *Information Technology in Developing Countries, Volume 12*(No. 1)

Cecchini, S., & Raina, M. (2004). Electronic government and the rural poor: The case of gyandoot. *Information Technologies and International Development, 2*(2), 65-76.

Chaudhri, N., & Dash, S. S. (2007). Community information centers: E-governance at subdistrict level: A case study. *Proceedings of the 1st International Conference on Theory and Practice of Electronic Governance,* 366-369.

Clement, A., & Shade, L. R. (2000). The access rainbow: Conceptualizing universal access to the information/communications infrastructure. *Community Informatics: Enabling Communities with Information and Communications Technologies, ,* 32-51.

Colle, R. (2000). Communication shops and telecenters in developing nations. *Community Informatics: Enabling Communities with Information and Communications Technologies, Idea Group Press, Hershey, PA,*

Cooke, B. (2003). A new continuity with colonial administration: Participation in development management. *Third World Quarterly, 24*(1), 47-61.

Creswell, J. W.,. (2012). *Educational research : Planning, conducting, and evaluating quantitative and qualitative research*. Boston: Pearson.

Dada, D. (2006). The failure of e-government in developing countries: A literature review. *The Electronic Journal of Information Systems in Developing Countries, 26*

De', R. (2009). Caste structures and e-governance in a developing country. *Electronic Government: 8th International Conference, EGOV 2009, Linz, Austria, August 31-September 3, 2009. Proceedings,* 40-53.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

536

Delgadillo, K., Gómez, R., & Stoll, K. (2002). *Community telecentres for development: Lessons from community telecentres in latin america and the caribbean* (First Edition ed.). Ottawa: IDRC Canada.

Gomez, R., & Baron-Porras, L. F. (2011). Does public access computing really contribute to community development? lessons from libraries, telecenters and cybercafés in colombia. *The Electronic Journal of Information Systems in Developing Countries, 49*

Gomez, R., Fawcett, P., & Turner, J. (2012). Lending a visible hand an analysis of infomediary behavior in colombian public access computing venues. *Information Development, 28*(2), 117-131.

Gomez, R., & Pather, S. (2011). ICT evaluation: Are we asking the right questions? *The Electronic Journal of Information Systems in Developing Countries, 50*

Gopakumar, K. (2006). E-governance services through telecentres-role of human intermediary and issues of trust. *Information and Communication Technologies and Development, 2006. ICTD'06. International Conference on,* 131-142.

Gregory, J. (2003). Scandinavian approaches to participatory design. *International Journal of Engineering Education, 19*(1), 62-74.

Hanusch, M., & Keefer, P. (2011). Promises, promises: Vote-buying, institutionalized political parties and political budget cycles. *15th Annual Conference of the International Society for New Institutional Economics, Stanford University: Palo Alto, CA,*

Harris, R. W. (1999). Evaluating telecentres within national policies for ICTs in developing countries. In Ricardo Gómez and Patrik Hunt (Ed.), *Telecentre evaluation - A global perspective. report on an international meeting on telecentre evaluation* (pp. 129-136). Quebec, Canada: IDRC.

Harris, R. (2001). Telecentres in rural asia: Towards a success model. *Europe, 40*(23.4), 13.7.

Harris, R., Kumar, A., & Balaji, V. (2003). Sustainable telecentres? two cases from india. *The Digital Challenge: Information Technology in the Development Context, 8*, 124-135.

Heeks, R. (2003). *Most eGovernment-for-development projects fail: How can risks be reduced?* Institute for Development Policy and Management, University of Manchester Manchester.

Heeks, R. (2006). Health information systems: Failure, success and improvisation. *International Journal of Medical Informatics, 75*(2), 125-137.

Heeks, R. (2008). eGov risk assessment: Design-reality gaps. *EGovernment for Development Portal, ,* 15 January 2013.

Heeks, R., Mundy, D., & Salazar, A. (2000). Understanding success and failure of health care information systems. *Healthcare Information Systems: Challenges of the New Millennium, ,* 96-128.

Holmes, R. (1999). Gender analysis of telecentre evaluation methodology. In Ricardo Gómez and Patrik Hunt (Ed.), *Telecentre evaluation: A global perspective. report of an international meeting on telecentre evaluation* (pp. 137-146). QUEBEC, CANADA: IDRC.

Ibrahim, H., Yasin, A., & Dahalin, Z. M. (2010). Financial sustainability issues in Malaysia's telecentres. *Computer and Information Science, 3*(2), P235.

Johansson Hedberg, L. (2011). Telecentre for community development: Evaluation of the tunjang telecentre, malaysia. *The Journal of Community Informatics, 6*(2)

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

537

Kanungo, S. (2004). On the emancipatory role of rural information systems. *Information Technology & People, 17*(4), 407-422.

King, E. M., & Behrman, J. R. (2009). Timing and duration of exposure in evaluations of social programs. *The World Bank Research Observer*, 24(1), 55-82.

Krishna, S., & Walsham, G. (2005). Implementing public information systems in developing countries: Learning from a success story. *Information Technology for Development, 11*(2), 123-140.

Lindberg, S. I. (2003). 'It's our time to" chop"': Do elections in africa feed neo-patrimonialism rather than counter-act it? *Democratization, 10*(2), 121-140.

Madon, S. (2005a). Evaluating the developmental impact of e-governance initiatives: An exploratory framework. *The Electronic Journal of Information Systems in Developing Countries, 20*

Madon, S. (2005b). Governance lessons from the experience of telecentres in kerala. *European Journal of Information Systems, 14*(4), 401-416.

Madon, S., Reinhard, N., Roode, D., & Walsham, G. (2009). Digital inclusion projects in developing countries: Processes of institutionalization. *Information Technology for Development, 15*(2), 95-107.

Middleton, C. A. (2003). Broadband internet usage outside the home: Insights from a study of toronto internet cafes. *International Telecommunications Society Asia-Australasian Regional Conference, Perth, Australia,*

Ministry of Communications. (2004). Community information centres (cics) in the age of ICT: Ghana's blueprint for action. Retrieved from http://www.researchictafrica.net/countries/ghana/CICs_in_the_Age_of_ICTs_-_Blueprint_2004.pdf

Mutula, S. M. (2005). Peculiarities of the digital divide in sub-saharan africa. *Program: Electronic Library and Information Systems, 39*(2), 122-138.

Mutula, S. M. (2008). Digital divide and economic development: Case study of sub-saharan africa. *Electronic Library, the, 26*(4), 468-489.

Noorbakhsh, F., & Paloni, A. (1999). Structural adjustment programs and industry in sub-saharan africa: Restructuring or de-industrialization? *The Journal of Developing Areas, 33*(4), 549-580.

Oestmann, S., & Dymond, A. C. (2001). Telecentres—Experiences, lessons and trends. *Telecentres: Case Studies and Key Issues, *, 1.

Oppong-Tawiah, D., & Boateng, R. (2011). ICT and bridging the digital divide in ghana: A culture, policy & technology approach. *Proceedings of the Africa Digital Week,* Accra. 26-54.

Qureshi, S. (2005). How does information technology effect development? integrating theory and practice into a process model.

Rajapakse, J. (2012). Impact of telecentres on sri lankan society. *Computing and Networking Technology (ICCNT), 2012 8th International Conference on,* 281-286.

Riddell, J. B. (1992). Things fall apart again: Structural adjustment programmes in sub-saharan africa. *The Journal of Modern African Studies, 30*(1), 53-68.

Siefer, A. (2013). Engaging stakeholders: The first step to increasing digital inclusion abstract. *The Journal of Community Informatics, 10*(1)

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

538

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management, 14*(3), 207-222.

Vannini, S., Rega, I., Sala, S., & and Cantoni, L. (2013). Motivations of non-use of telecentres: A qualitative study from mozambique . *2013 Pre-ICIS Workshop of the AIS SIG on ICT & GlobDev,* Milan, Italy.

Walsham, G. (1993). *Interpreting information systems in organizations* John Wiley & Sons, Inc.

Warschauer, M. (2002). Reconceptualizing the digital divide. *First Monday, 7*(7)

Yin, R. K. (1994). *Case study research: Design and methods* Sage Publications.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

539

HEALTH INFORMATION SYSTEM ARCHITECTURES

540

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Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

540

FEDERATED ARCHITECTING IN WEST AFRICA

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Abstract: We describe an effort to build an information system in West Africa, spanning the 15 countries of the West African Health Organization (WAHO). This is an environment where there is no central authority, and we have labeled these efforts as federated architecting. For this regional health information system to function, standards and routines need to be agreed upon by all countries in areas such as disease definitions, meta-data synchronizing, and reporting of data. Our research aims to explain how such common understanding can be achieved in a federated information system. We argue that a key element in allowing meta-data harmonization without enforcement is not only to allow for, but also to depend on, flexibility. A layered model of standards, where the federated database of WAHO can be seen as the top level, enables integration and sharing of data while allowing countries to implement their own standards for domestic use.

Keywords: health information systems, architecture, architecting

1. INTRODUCTION

Health Information Systems (HIS) architecture has become an important research and policy area in recent years (Stansfield et al. 2008; Mwanyika et al. 2011; Moodley, Pillay, and Seebregts 2012), as both international agencies and national governments have pushed for integration of systems in an acknowledged complex domain. The promise of increased availability and usability of health information is sought fulfilled through integrating and making interoperable previously independent HIS. This process shapes the relationship and roles between the various systems, either by conscious design, or, more probably, by constant negotiation between differing agendas. Such processes has been labeled architecting (Poppe, Sæbø, and Nielsen 2014; Aanestad, Sæbø, and Grünfeld 2014).

For the specific case of Health Management Information Systems (HMIS), both system and software architecting have received extensive research attention. This paper foregrounds a special aspect which has not seen such attention; the nature of architecting in federal environments. While a single country's public sector may consist of several more or less autonomous actors, this paper looks at truly autonomous agencies; ministries of health in 15 independent countries. We examine the case of the West African Health Organization (WAHO) and its efforts to create a regional HMIS incorporating data from Cape Verde in the West to Nigeria in the East. WAHO is a specialized agency of the Economic Community of West African States (ECOWAS), and has as one of its key objectives to collect and disseminate health information from across the region in order to guide health interventions and policy development. However, collection and management of data from the 15 member states has historically been problematic, and the development of a regional data warehouse is an effort to improve this situation. The ongoing crisis of the Ebola virus disease has to a tragic extent shown the great practical importance of regional cooperation on disease surveillance.

WAHO has mostly normative, and little legal, authority over its member countries. However, for this regional HMIS to function, several standards and routines need to be agreed upon by all

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

541

countries. This includes standards on disease definitions, routines for synchronizing meta-data between the 15 national and the one regional HMIS, and routines and responsibilities of reporting of data. Our research aim is thus to find how such common understanding can be achieved in a federated information system, in which no one holds central authority.

In this paper we argue that the management of meta-data across a federated architecture should be prioritized, and that it can follow the principle of a hierarchy of standards. While this principle has earlier been applied to a single country's health information system, a federated environment is a further challenge to coherence of standards. The West African region, which is studied in this paper, should take regional initiative to standardize a core set of health indicators, and beyond this core allow for the flexibility required in such a diverse area as health.

The rest of the paper is organized as follows: First we look at relevant literature, both pertaining to IS architecture and Health Information Systems. Then we present our research approach and data collection methods, followed by an extensive case description from West Africa where both national and regional HIS projects are ongoing. The following discussion will focus on architectural challenges, especially considerations of roles and responsibilities in a federal environment. Lastly, we sum up our main contributions.

2. RELEVANT LITERATURE

Our study aims to look at the evolution of roles and responsibilities of disparate information systems, more specifically in a situation without a central authority. We term this the process of architecting in a federated context.

2.1. Architecting as a Process

The concept of architecture of information systems is not applied in a uniform way in the current literature (Vassilakopoulou and Grisot 2013). We subscribe to the idea of it describing an information system rather than software components, and of being a process rather than an ideal-state drawing (Poppe, Sæbø, and Nielsen 2014; Aanestad, Sæbø, and Grünfeld 2014). Especially the process-orientation is important, as the negotiation of relationships between various components of an information system is, and has to be, dynamic. We therefore see this work as architecting, using the verb rather than the noun.

2.2. Federation and Autonomy

Federated information system is a concept with some historic application, usually applied for loosely coupled database systems that share and exchange information (Heimbigner and McLeod 1985, Busse et al. 1999). A central trade-off is thus to keep autonomy while allowing data sharing. Autonomy can be seen as held in relation to a component's design, to which other components it communicates, and its independence in executing incoming requests. In particular, the latter of these is regarded as almost impossible to retain if global transaction management is involved (Busse et al. 1999).

While federated information systems literature predominately deals with technical and semantic issues, the related concept of interorganizational systems (IOS) has a stronger focus on the organizational level. IOS has grown out of work on supply-chain systems, where different consumers and suppliers need to share information. It has been occupied with a similar trade-off, namely of flexibility versus standardization (Raymond et al. 2014). Martin (2012) is looking at architectural processes in such contexts, and argues that this is especially difficult. The challenges stem from systems extending beyond the border of organizations, and the complex coordination of these largely autonomous organizations. As one strategy, he cites The Open Group (2009) in proposing modularization into sub-architectures. This proposal assumed that different segments of the federation provides different business operations, and thus can more easily be isolated and loosely coupled, but it is a potential strategy also for more tightly coupled segments. The conclusion of this study is interesting in that it provides a reason why an ideal-

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

542

state architecture is hard to reach and maintain. Marin argues that architectural principles may be traded for organizational agreement: "In an organization with strong distribution of power, architectural purity can become a secondary concern to organizational acceptability" (2012, 144).

We will in this study use the notion of federated in terms of a combined system connecting various autonomous components. In our case, an information system residing with WAHO, but relating to and receiving input from up to 15 countries, is an interorganizational system with relatively high heterogeneity in terms of data formats and technologies.

2.3. Negotiating Flexibility and Standardization

In federated systems, the dual goal of autonomy and sharing is sought by balancing flexibility and standardization, which has seen extensive research in the IS field. There is not necessarily a trade-off between the two, for example standardization can lead to more flexibility to freely exchange, add or remove components (Raymond 2014). However, tensions between the two include the potential rigidities introduced by standards, as well as the risk of path-dependencies of the selected standards related to costs of changing them later (Zhu et al. 2006).

In relation to health information systems, a relatively successful concept is that of a hierarchy of standards (Braa and Hedberg 2002), originating in the differing needs of data detail at different levels in the health sector. The hierarchy of standards holds that all entities should report on the required format to their superior entities, while being given the flexibility to collect additional data themselves. This ensures that coherence to standards is achieved while there is flexibility in how this is achieved. For instance, a doctor may collect any information he or she finds pertinent about a specific medical case, as long as the required reporting of this case to the superior is following the standard set. Related to the hierarchy of standards is later work from the same project, calling for flexible standards (Braa et al. 2007). Flexibility in standards is achieved through simplification and layering, treating standards as layered components as in traditional system design. From this perspective, a federated organizational structure may be seen as a layered architecture, where vertical modularization of standards allows flexibility at each level.

Following the above principles it is possible to achieve both loose and tight coupling between federated entities. Tight coupling rests with the shared standards that bind the entities together, while loose coupling is achieved by allowing any atomization of these standards within entities. As an example, a health indicator such as "Confirmed Malaria Cases" is strictly defined (such as excluding suspected cases), but can be built from a range of possible dimensions, such as gender, various age groups, target populations, or as related to urban/rural divisions.

3. METHODS

The research described in this paper has taken place within a large international action research program called the Health Information Systems Program, HISP. HISP has been on-going since the mid-nineties, doing research, development, and implementation of health information systems related activities (Braa, Monteiro, and Sahay 2004). In this paper we discuss the conceptualization and implementation of a regional HIS for the West African Health Organization, in which the authors have been actively involved.

This study spans several sub-projects and several years, without a clearly defined overall research design. However, the practical work has followed a cyclical approach of planning, implementation, evaluation, and dissemination, which are key characteristics of action research (Susman and Evered 1978; Baskerville 1997; Checkland and Holwell 1998). Planning and evaluation of activities have taken place in cycles of various lengths: in day-to-day work, evaluation has been continuous, while longer evaluation cycles typically have centered around fieldwork and workshops. In the longer term, planning and evaluation have been carried out in relation to yearly events organized by WAHO.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

543

Activities related to the project have taken place at various locations throughout the region, and at the authors' home institution. The work at home has typically involved database design, evaluation, and re-design, including analysis of all sorts of existing requirements as formalized in indicator lists, data collection forms, and the like. The work in the field has included a range of different activities around health information system strengthening, of both technical and organizational nature. The articulation and dissemination of knowledge has been documented by several scientific publications (Sæbø et al. 2011; Kossi et al. 2012; Poppe, Sæbø, and Nielsen 2014), policy opinions (Braa 2005), and official recommendations to other actors in the field of HIS (Braa et al. 2012).

One of the authors was primarily involved in the early stages of working with WAHO from 2010, after having worked with similar issues in the region for some years prior to this. His main interaction with WAHO was in participating at early workshops to assess the status of HIS in the region, and advising on the role of WAHO to strengthen HIS across the member countries. Included in this was advising how WAHO should develop their own HIS capacity as well as a regional data warehouse for public access. As such, the author was mostly involved with policy work and less with the practical and technical implementation of the data warehouse. Empirical data was collected from this work through taking notes at the workshops, studying WAHO documents such as vision statements and indicator lists, and email correspondence related to the practical work.

The other author has been involved in country-level HIS work in the region since 2011 and with the regional data warehouse project since 2013. This has included workshops and meetings at the regional level and with individual countries, interviews and meetings with key informants in WAHO, and practical work in the planning and design of the regional data warehouse. The main data collection methods have been field notes, notes from interviews, minutes from meetings and workshops, email correspondence, and participation in the database design. At meetings and workshops where none of the authors participated, colleagues from our research group participated and have been our informants.

3.1. Data Analysis

Both authors have been involved in the regional data warehouse project for an extended period of time, but in different activities at different points in time. As a consequence, our empirical backgrounds are diverse and largely complimentary, which we have found to be a strength. In seminars and ad-hoc meetings, the authors have presented and discussed their empirical material with each other, and those elements that were seen as relevant for our understanding of the architectural process in a federated environment were identified.

The data analysis has focused on describing architectural characteristics of the implementation, using a loose definition of architecture as components and the relationships between them. From this, we have sought to understand how these processes of architecting are being influenced by the federal organization of WAHO.

3.2. Context

A Health Information System comprises the routines and procedures for collecting, analyzing and presenting health information in a way that supports management and monitoring of health activities (Lwanga, Tye, Cho-Yook, and Ayeni, O. 1999). This ranges from individual patient management in the health facilities, up through the hierarchy of the health system, to use of information for policy development and resource allocation at the national and even international level. It is made up not only of the physical artifacts such as patient records, reporting forms and computerized management systems, but also related routines, procedures and practices. This paper focuses more specifically on Health Management Information Systems (HMIS). Though often used interchangeably with HIS, HMIS denotes a subsystem dealing with routine aggregate data to support health system management. An HMIS supports decision

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

544

making in relation to allocating resources at all levels, from the most peripheral clinic to national budgeting.

The overall structure of national HMIS in West Africa, and on the African continent in general, is largely similar. Data is produced at the facility level, where at the end of each month or quarter patient registers are tallied, and the figures are filled into routine reporting forms. These forms are sent to the next level in the health system hierarchy, typically the district. Here, district reports are compiled based on the summarized facility data, before the district aggregates are sent to the next level, and the process is repeated until the data reaches the national level.

There are a number of complicating factors that have resulted in most national HMIS performing rather poorly. One major problem is the fragmented nature of the health system in many developing countries caused by donor-driven health programs working within specific areas such as Malaria, HIV/AIDS or immunization. This has led to the emergence of parallel reporting systems, often with overlapping data, which result in an overwhelming reporting burden on health facility staff. Another consequence of this has been disinvestment and deterioration of the national HMIS, as resources are channeled into the parallel systems. There is thus a vicious cycle, where the poor performance of the national HMIS results in parallel systems being developed, and the existence of the parallel systems further reduce the quality of the HMIS. The end result is a situation in most countries where there is no central repository of essential health information, but rather a number of disjoint "silos".

It was in the context of trying to break this vicious cycle that one of the authors first became involved in the region in 2007, as part of an effort to strengthen the HMIS of Sierra Leone by integrating all the parallel reporting systems into the national HMIS. Central to this effort was the introduction of the DHIS 2 platform in the country. DHIS 2 is an open source, web-based software for collection, aggregation and analysis of health information, developed by the HISP network. The implementation in Sierra Leone spurred interest in DHIS 2 in other countries in the region, and at the time of writing a large majority of the countries in the West African region are either using DHIS 2, or are planning to implement it.

4. CASE

In late 2010, WAHO co-hosted a workshop for interoperable health information systems. The motivation behind this interoperability work, which was also supported by World Health Organization (WHO), was improving their system for regional health monitoring and policymaking. Several countries were in the process of implementing DHIS 2 at that time, and WAHO became interested in these processes. Their vision was to develop a regional data warehouse serving the region with essential health data from all countries through an online repository, with high quality and frequent updates. WAHO was already working on its own solution for this, but had limited resources to take it to the sophistication envisioned, and a new online repository based on DHIS 2 would thus replace this.

In the following years, several related activities took place around health information systems strengthening and the development of the regional data warehouse. An assessments of country HIS in the region was done in 2011-12, and based on this a HIS policy document was developed and finally approved at a ministerial meeting in 2013. The policy included guidelines for HIS strengthening across the region, and reaffirmed the vision for a regional data warehouse based in WAHO.

A workshop was held with participants from West African countries, WAHO, and HISP to identify core indicators to be included in the regional data warehouse. A set of about 80 indicators in different areas and with different frequencies of reporting was defined, covering demographics, disease burden, health service utilization, health financing, human resources and epidemic diseases. WAHO proposed that the regional data warehouse should hold data aggregated by districts for each country. This was a challenge in a region with huge differences

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

545

in the size and structure of the countries. While all countries have administrative units corresponding to what World Health Organization has labeled a "district" to administer primary health care (World Health Organization 1978), there are variations in the size of these districts and in how many administrative levels exist above and below them in the health system hierarchy. To deal with this, each country would define two sub-national administrative levels to include in the regional data warehouse as they saw fit.

With an indicator set defined and a solution for the organizational hierarchy developed it was decided to pilot in five of the fifteen countries. Four of the countries chosen were already using the DHIS 2 software nationally at that time, whilst the fifth was included in order to gain insights on how to proceed in countries where DHIS 2 was not used. The initial work with the pilot countries revealed large variations in what data was available in each country, at what frequency it was collected, whether it was available in a central HIS database or in separate data "silos" run by disease-specific programs, and in what format the data was stored. Even in the countries where DHIS 2 was used as a national data warehouse, only a sub-set of the essential indicators were available in the national HIS databases.

At the same time, work began on developing mechanisms for transferring metadata and data from countries to WAHO. The focus was on data transfer from national DHIS 2 instances to WAHO, since developing procedures for the other countries would require more in-country work and thus also more resources. The data transfer mechanism and procedure had to take into account the federal structure of the system. To ensure timeliness and completeness of reporting, a system where data could be pulled from the national level without any human interaction would be preferable. This was also seen as an easier solution technically, as the data transfer mechanisms could be installed in the central data warehouse rather than in every country. On the other hand, the countries are autonomous and are not obliged to give WAHO access to their data.

The compromise developed was that WAHO would be given access to transfer the essential indicator data directly from the country DHIS 2 databases. However, the data could not be published until the countries had verified and approved it through a data approval mechanism built into the regional data warehouse. At any time the countries could revoke WAHO's access to the national database. Only the approval step required any human intervention, and this was seen as an advantage in terms of ensuring the timeliness of reporting.

In October 2013, the project was presented at the annual HIS conference organized by WAHO, where representatives from all member states and various development partners were present. Here, it was stressed that additional funding was needed in order for the project to succeed. In response, representatives from the World Bank suggested that parts of the implementation could be financed as part of the three-year West African Regional Disease Surveillance Capacity Strengthening (WARDS) project, which was set to start in 2014. Because of the project's disease surveillance focus, the roadmap for the data warehouse project changed: instead of starting with the full list of indicators for some pilot countries, the initial phase would focus on reporting only disease surveillance indicators from *all* countries.

For disease surveillance there was already a reporting structure in place, where countries were supposed to send epidemiological reports to WAHO every week. However, an analysis of the reporting that had been done in 2013 revealed that the timeliness and completeness of reporting was quite poor, countries sent data with different definitions and levels of details, and in different electronic formats. In all, therefore, not much of this existing reporting system could be re-used for the regional data warehouse project.

The initial planning for the project had put the HIS unit at the center at the national level, as the custodians of the national data warehouses. However, this changed with the shift of focus to epidemic diseases. In general, the disease surveillance programs at the national level were not integrated with the national HIS, and in fact there was very little cooperation in many countries.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

546

The new plan thus required WAHO to work with a new actor in each country, and that the focused shifted from interoperability between with the national HIS and the WAHO data warehouse to finding ways to for disease programs to submit weekly reports more or less manually.

A workshop was organized in the first half of 2014 with disease surveillance programs from all countries in the region. Here, the project and revised implementation plan was presented and discussed, but the meeting also included a more practical component where country participants entered data into the regional data warehouse. This essentially kick started the reporting, and at the same time made it possible to demonstrate the usefulness of making data from the region available in one system for example by producing maps spanning border areas of several countries. In the months after the workshop, joint teams from HISP and WAHO have visited a majority of the countries to provide further training in reporting and analysis of the data. Figure 1 shows a timeline of key events in the implementation of the regional data warehouse.
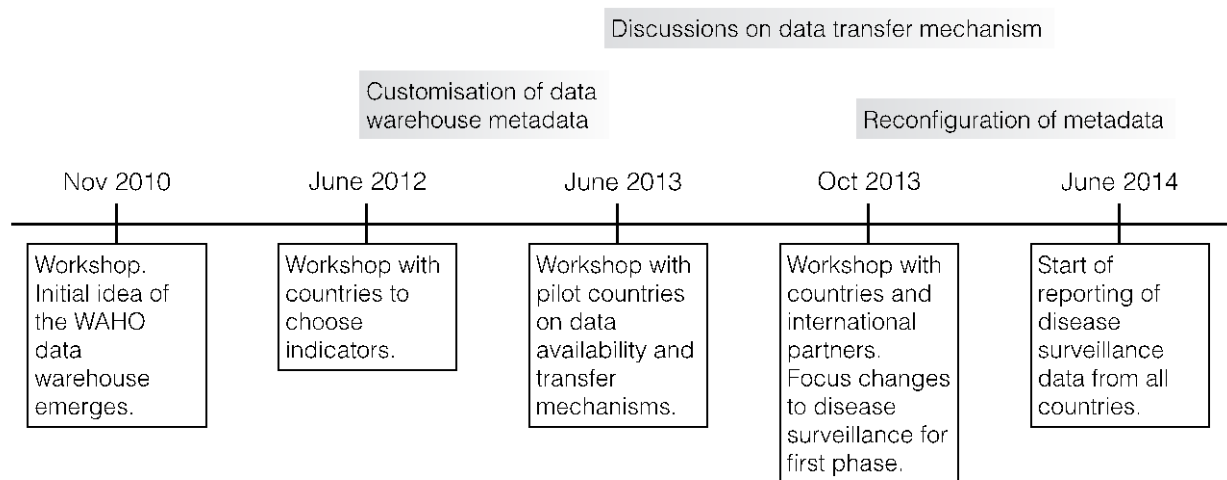
Figure 1. Timeline with key events in the implementation of the WAHO data warehouse.

5. DISCUSSION

In this section we will discuss key experiences and challenges from the case. While we only look at the development and linking together of health information systems, the backdrop is regional integration in a much wider sense. Like the European Union, closer economic and political integration has been the main motivation behind past efforts, while health is acknowledged as an important area due to the cross-border nature of communicable diseases. This has lately been exemplified by the horrors of Ebola virus disease, and the need to tackle this regionally and not country by country.

With this backdrop, we focus the discussion on themes of roles and responsibilities, and architectural implications.

5.1. Roles and Responsibilities

The federated nature of the emerging West African "ecology" of HIS highlights the importance of roles and responsibilities for the architecture. A figure of boxes and arrows can represent the various parts of the system, but backgrounds the negotiations around who defines and who updates the content. The content can broadly be classified as data and meta-data, where the latter defines the data to be collected (which diseases or health events), from where it is reported (country, province), and which time period it represents. Despite efforts of organizations like World Health Organization, there is no international consensus around these definitions, and meta-data tend to differ slightly from country to country even if they cover the same health event.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

547

In the different member countries of WAHO (except Nigeria, which is itself a federation), meta-data is subject to national administration and enforcement. Meta-data integrity can be achieved universally by decree, even though the institutional reality of the health sector often results in in-country discrepancies nonetheless. However, in a federated structure like the WAHO system represents, meta-data is not easily coordinated. Meta-data is changed often enough that this is a recurring issue; organizational boundaries within countries change, new diseases like Ebola emerge, or countries decide to collect less details about other diseases.

While health data that the WAHO system will cover is itself reported at regular intervals, though not necessarily the same interval across countries, the meta-data change irregularly. Routines for updating must be agreed upon. Who will implement the changes for WAHO when a member country for example merges two districts? How does one make sure that the same data is collected in the same way across the entire West African region? The integrity of meta-data, we argue, is a particular challenging area in a federated information system. There is no "one" central authority, and the WAHO regional database is of second importance to the countries involved, after their own national health information systems. This has been pointed out by Martin (2012), quoting Weill and Ross (2013, 61) that "the federal model is undoubtedly the most difficult archetype for decision making."

5.2. Architectural Considerations

As Martin (2012) argues, architectural considerations may be trumped by organizational ones in a federated system. Modularization, standardization, tight and loose coupling, etc. may not be applied according to text book examples of best practices. A federated system will not allow a "perfect architecture", but that is seldom the case anyway. The balance needs to be found between architectural efficiency and organizational agreement. Measures that can minimize friction between the autonomous organizations, while promoting meta-data integrity across them, need to be applied.

The concepts of a hierarchy of standards (Braa and Hedberg 2002) and flexible standards (Braa et al. 2007) are especially useful in a federal architecture. The hierarchy of standards was used to allow lower level health administrations in South Africa to collect additional data that was important for them, as long as they reported what was needed to the level above. This flexibility was dependent on making the technology configurable and having lower-level staff capable of implementing the additional data collection tools they needed. Later studies have found that lack of such flexibility in the official reporting structures has given rise to unofficial, and thus un-standardized, extra reporting structures (Sahay et al. 2010).

Use of flexible standards can also be an important enabler of data sharing in a federated system. In the case of West Africa, each country autonomously defines its own information needs, and this cannot be overridden by WAHO. The challenge is thus to make sure what the countries collect can be aggregated and transformed to the format of the regional database, and flexible standards at the regional level facilitates this. Using wide definitions of indicators, such as "malaria cases" rather than "malaria cases in male children 0-4 years", makes it more likely that countries can share data with WAHO without changing their national reporting system.

In this federal architecture, the concepts of a hierarchy of standards and flexible standards are not only nice features to allow local customization and prioritization, but prerequisites to have an overarching information system receiving data from 15 autonomous countries, each with their own peculiarities in history, institutions, health system, disease burden, and priorities.

6. CONCLUSION

We have described efforts to build an information system spanning 15 countries, where there is no central authority. We have labeled these efforts as federated architecting.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

548

The key element in allowing meta-data harmonization without enforcement is not only to allow for, but also to depend on, flexibility. A layered model of standards, where the federated database of WAHO can be seen as the top level, allows the countries to implement their own standards for domestic use. Furthermore, given the wide variation of domestic standards, the standards chosen for the WAHO meta-data should be wide, to increase the likelihood that domestic data definitions add up, regardless of their possible divisions into age groups and socio-economic subsets. Flexible standards thus enable sharing of data in this federated information system of autonomous countries.

Since weekly reporting of disease surveillance data started in the second half of 2014, an interesting pattern has emerged: the countries with the longest-running national DHIS 2 system are lagging behind most other countries in terms of completeness of reporting (see Figure 2). This is an area where further research is required. One possible explanation is that this is related to path dependencies, as disease surveillance data is generally not integrated into the national DHIS 2 databases of these countries.
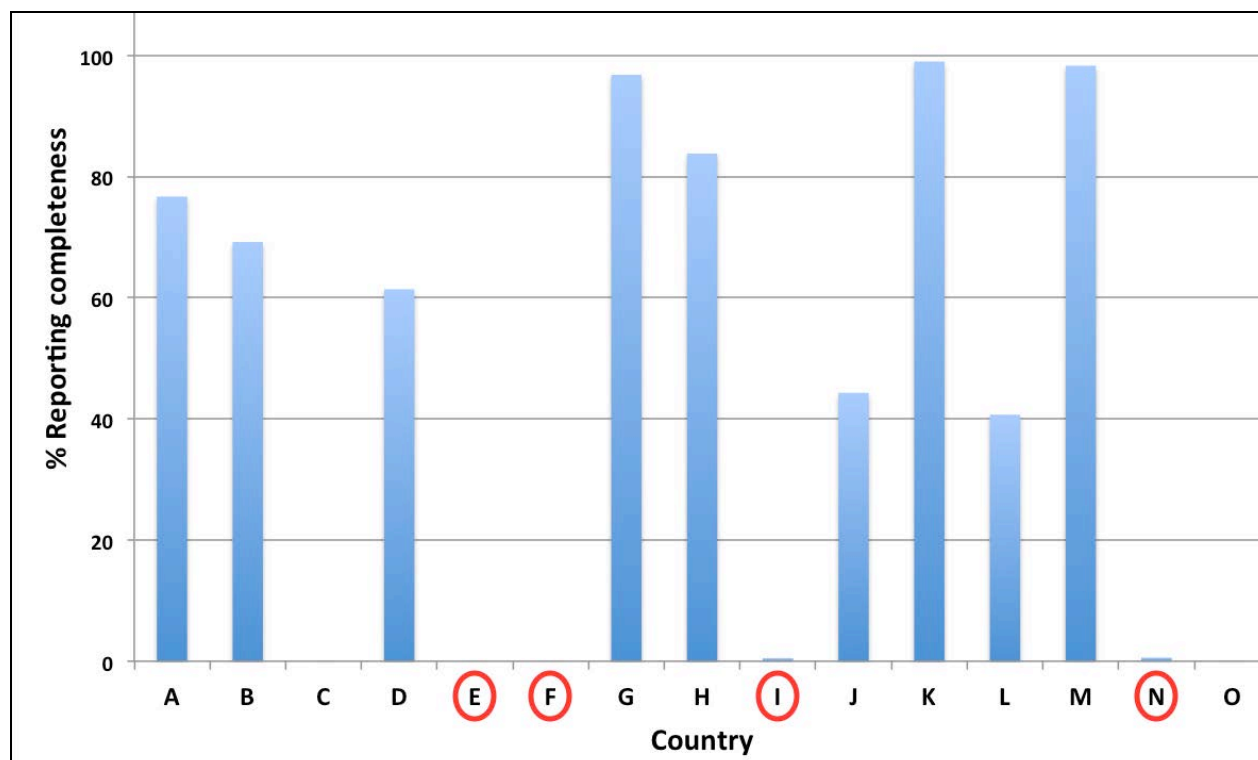
Figure 2. Reporting completeness to WAHO in the last quarter of 2014. Countries names have been replaced with letters. Circled labels indicate countries with long-running national DHIS 2 implementations.

REFERENCES

Aanestad, Margunn, Johan Sæbø, and Thomas Grünfeld. 2014. "Towards a Processual Perspective on Architecture. Building an Information Infrastructure for Personalized Medicine." *NOKBIT 22 (1).*

Baskerville, Richard L. 1997. "Distinguishing Action Research from Participative Case Studies." *Journal of Systems and Information Technology* 1 (1): 24–43.

Braa, Jørn. 2005. "A Data Warehouse Approach Can Manage Multiple Data Sets: Round Table Discussion." *International Journal of Public Health* 83(8): 638-639.

Braa, Jørn, Ole Hanseth, Arthur Heywood, Woinshet Mohammed, and Vincent Shaw. 2007. "Developing Health Information Systems in Developing Countries: The Flexible Standards Strategy." *MIS Quarterly*, 381–402.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

549

Braa, Jørn, and Calle Hedberg. 2002. "The Struggle for District-Based Health Information Systems in South Africa." *The Information Society* 18 (2): 113–27.

Braa, Jørn, Eric Monteiro, and Sundeep Sahay. 2004. "Networks of Action: Sustainable Health Information Systems across Developing Countries." *MIS Quarterly*, 337–62.

Braa, Jørn, Sundeep Sahay, Edem Kwame Kossi, and Peter Mbondji. 2012. *ECOWAS Health Information Systems Policy and Strategy Document*. West African Health Organization.

Busse, Susanne, Ralf-Detlef Kutsche, Ulf Leser, and Herbert Weber. 1999. *Federated Information Systems: Concepts, Terminology and Architectures*. Berlin: Technische Universität.

Checkland, Peter, and Sue Holwell. 1998. "Action Research: Its Nature and Validity." *Systemic Practice and Action Research* 11 (1): 9–21.

Heimbigner, Dennis, and Dennis McLeod. 1985. "A Federated Architecture for Information Management." *ACM Transactions on Information Systems*.3 (3): 253–78.

Kossi, Edem Kwame, Johan Ivar Sæbø, Jørn Braa, Mohamed Mumeneeh Jalloh, and Ayub Manya. 2012. "Developing Decentralised Health Information Systems in Developing Countries –cases from Sierra Leone and Kenya." *The Journal of Community Informatics* 9 (2).

Lwanga, S. K., Tye, Cho-Yook, and Ayeni, O. 1999. *Teaching Health Statistics: Lesson and Seminar Outlines*. Second Edition. 2nd ed. Geneva: World Health Organization.

Martin, Andrew. 2012. "Enterprise IT Architecture in Large Federated Organizations: The Art of the Possible." *Information Systems Management* 29 (2): 137–47. doi:10.1080/10580530.2012.662103.

Moodley, Deshendran, Anban W. Pillay, and Christopher J. Seebregts. 2012. "Position Paper: Researching and Developing Open Architectures for National Health Information Systems in Developing African Countries." In *Foundations of Health Informatics Engineering and Systems*, 129–39. Springer.

Mwanyika, Henry, David Lubinski, Richard Anderson, Kelley Chester, Mohamed Makame, Matt Steele, and Don de Savigny. 2011. "Rational Systems Design for Health Information Systems in Low-Income Countries: An Enterprise Architecture Approach." *Journal of Enterprise Architecture* 7 (4): 60–69.

Poppe, Olav, Johan Sæbø, and Petter Nielsen. 2014. "Architecting in Large and Complex Information Infrastructures." In *Nordic Contributions in IS Research*, edited by TrineHald Commisso, Jacob Nørbjerg, and Jan Pries-Heje, 186:90–104. Springer International Publishing.

Raymond, Myriam, Frantz Rowe, and Nicolas Antheaume. 2004. "Inter Organizational System Flexibility and Standardization in Innovative Services: Complementarity, Opposition or Independence?" *ICIS 2014 Proceedings*.

Sæbø, Johan Ivar, Edem Kwame Kossi, Ola Hodne Titlestad, Romain Rolland Tohouri, and Jørn Braa. 2011. "Comparing Strategies to Integrate Health Information Systems Following a Data Warehouse Approach in Four Countries." *Information Technology for Development 17 (1): 42–60.*

Sahay, Sundeep, Johan Ivar Sæbø, Selamawit Molla Mekonnen, and Abyot Asalefew Gizaw. 2010. "Interplay of Institutional Logics and Implications for Deinstitutionalization: Case Study of HMIS Implementation in Tajikistan." *Information Technologies & International Development 6 (3): pp – 19.*

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

550

Stansfield, Sally, Nosa Orobaton, David Lubinski, Steven Uggowitzer, and Henry Mwanyika. 2008. "The Case for a National Health Information System Architecture; a Missing Link to Guiding National Development and Implementation." *Making the eHealth Connection, Bellagio.*

Susman, Gerald I., and Roger D. Evered. 1978. "An Assessment of the Scientific Merits of Action Research." *Administrative Science Quarterly* 23 (4): 582–603.

The Open Group. 2009. TOGAF 9: The Open Group Architecture Framework.

Vassilakopoulou, Polyxeni, and Miria Grisot. 2013. "Exploring the Concept of Architecture in Technology and Organization Studies." *IRIS 36.*

Weill, Peter, and Jeanne W. Ross. 2013. *IT Governance: How Top Performers Manage IT Decision Rights for Superior Results*. Harvard Business Press.

World Health Organization. 1978. *Declaration of Alma-Ata*. Available at http://www.sciencedirect.com/science/article/pii/S0140673679906226.

Zhu, Kevin, Kenneth L. Kraemer, Vijay Gurbaxani, and Sean Xin Xu. 2006. "Migration to Open-Standard Interorganizational Systems: Network Effects, Switching Costs, and Path Dependency." *MIS Quarterl*y 30: 515–39.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

551

THE USE OF SOCIAL LEARNING SYSTEMS IN IMPLEMENTING A WEB-BASED ROUTINE HEALTH INFORMATION SYSTEM IN KENYA

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Abstract: Many countries have adopted the state of the art Information and Communications Technology (ICT) in their health information systems. Kenya adopted the use of District Health Information System (DHIS2), a web based system to manage aggregate routine health information data in 2010. The software was installed on a central server using cloud based infrastructure. National roll out of the system required lots of training. This was initially done through the workshops (face to face) and on-job training. Due to logistical and financial constraints, it was not possible to maintain this approach of training throughout the project implementation. The introduction of messaging functionality in the system enabled social learning through a community of practice. Members of this community posted questions on the system and received answers from colleagues with varying knowledge and experience through the same forum. We document how the messaging functionality, imbedded in the software evolved into social learning through communities of practice, effectively supporting the implementation of the project. This paper shows that when well-managed, communities of practice can augment traditional learning methods in the implementation of complex systems.

Keywords: boundaries, communities of practice, Health information system, social learning systems

1. INTRODUCTION

Globally, there is increase in demand for better data to facilitate evidence based decision making in health departments. The World Health Organization's framework of action (2007) emphasizes the importance of reliable health information systems as part of the six pillars for strengthening health systems (WHO, 2007). Data from these systems are essential in identifying gaps for interventions to reduce mortality, improve quality of care, determine the extent of coverage and track progress of various interventions (AbouZahr & Boerma, 2005). In order to improve her health information system, Kenya adopted the use District Health Information Software (DHIS2) as a tool for data management, replacing the excel-based File Transfer Protocol (FTP) in 2010 (Manya, *et al.*, 2012).

Like the implementation of any new system, user training was a key component of the DHIS2 project. The initial training approaches involved workshops and on-job training sessions. Due to the rapid evolution of the system, and considering the involvement of large numbers of stakeholders, other forms of learning including social learning through communities of practice (Wenger, 2004) emerged. This paper evaluates the contribution of social learning in the implementation of DHIS2. It shows that when well-managed, communities of practice can augment traditional learning methods in the implementation of complex systems. This section will focus on the background of the Kenyan health information system, the evolution of the messaging functionality into social learning and the theoretical aspects of communities of practice.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

552

1.1. Background and Overview of the Kenyan Health Information System

In Kenya, the activities of health information systems are imbedded in the Strategic Plan for Health Information Systems (Ministry of Health, 2009). The strategic plan envisions the administrative department of Health Information System as "a centre of excellence for quality health and health related data and information for use by all" (HIS Strategic Plan 2009-2014, p.10). One of the strategic objectives in the plan is strengthening the use and application of Information and Communication Technology (ICT) in data management (HIS Strategic Plan 2009-2014, p.12). Functions of the health information systems are also guided by the health information system policy (Ministry of Health, 2010).

A major improvement of the Kenyan health information system was the adoption of the District Health Information Software (DHIS2) in 2010 (Manya, *et al.*, 2012). A number of factors influenced the change of the health information system. Various reviews of the health information system had shown that the country was not doing well in routine health information systems and needed improvements (Ministry of Health, 2008). The DHIS2 was chosen for several reasons: first, the software was free and open source, eliminating the issues of proprietary software and their challenges. Second, it was designed to allow data collection and use at the facility and district levels, encouraging data-use for decision making at the lowest level. Third, the DHIS2 supported a full Web-API which gave access to all of the functions of the software through a web interface allowing data entry or reporting interfaces on mobile devices and desktops. Furthermore, the software had a strong support from a worldwide network of users and developers (Dhis2.org).

During the early stages of the DHIS2 project implementation, the Ministry of Health formed a national DHIS2 core team comprising public health specialists, health records and information officers, Information and Technology (IT) specialists and general administrators to oversee the overall implementation of the project. At the same time, the Government, through development partners, hired consultants from the University of Oslo, Norway, to provide technical assistance during the process of customization, training, piloting and countrywide roll out. The consultants from the University of Oslo were selected because these were the main developers of the software. Besides training the Kenyan DHIS2 core team on key aspects of DHIS2 the consultants also participated in the stakeholders' meetings, providing the necessary answers to questions raised about the software. After extensive stakeholder consultations, the Kenyan DHIS was installed on a central server using cloud computing.

A key component of the national roll out the DHIS2 was user training. This utilized a Trainer of Trainees (ToT) approach, through residential workshops. A team of ToTs were first trained and later facilitated to cascade the training to the lower levels. Training sessions comprised a combination of theoretical lectures and hands-on practice on relevant topics including data entry, data quality, data analysis and data presentation options (graphs, charts and maps). Participants were kept to a manageable number depending on the facilities and number of trainers available. Another training approach was on-job training. This involved visits to districts with the aim of offering coaching and mentorship services. The advantage of this approach was that users got individualized attention within their home working environments. With this approach, it was possible to involve more members of the district management team and address local issues related to computers (both software and hardware). Common computer problems solved during such visits included; installation of the software, provision of power back up systems, installation of mobile telephone modems and updates on computer antiviruses. Despite the logistical challenges in terms of organizing workshop venues, trainers, participants, equipment and hardware, all the targeted stakeholders were trained during the countrywide roll out of DHIS2 (Manya, *et al*., 2012).

As a growing organism the DHIS2 needed to be maintained and constantly extended. In addition to new reporting tools being added, new versions of the system continued being released

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

553

requiring more learning. An important challenge that required massive training was the devolution of health services to counties. In August 2010, Kenya adopted a new constitution that had far reaching provisions for democratization including the devolution of Government to 47 counties. As a governance tool, devolution was based on the principle of subsidiarity, which assigned specific functions hitherto conducted by the central level to lower levels (Nyanjom, 2010).While a number of clauses in the new constitution were implemented in 2010, devolution of the health system commenced after the general elections of March 2013. The change of the governance therefore required more training. At the same time, there was a change of funding agency in 2012 from one donor to the other, causing disruptions in planned activities. Due to financial constraints and big numbers of people that required training, it was very difficult to continue with organized training sessions as before. This called for other forms of learning, including using telephone calls, short messages (sms) and sending messages through the DHIS2. Collectively, these formed a community of practice, which proved very useful in the continuous education in support of the software.

1.2. Evolution of Messaging Functionality into Communities of Practice

After the initial roll out, the national DHIS2 core team continued handling users' questions by phone and emails. On realizing that this was taking a lot of time, and bearing in mind that some of the questions were similar, the idea of having a messaging functionality in DHIS2 was suggested and implemented in 2011. At the time of its development, the main function of the messaging functionality was to pass messages from the national DHIS2 core team and system developers from the University of Oslo to the rest of the users, notifying them of any new functionality in the software. Users would read the messages using their personal DHIS2 accounts and act as advised. Further developments in the messaging functionality allowed users to send out feedback messages to all users in DHIS2 including the national DHIS2 core team and the system developers. In the initial stages, the feedback messages were seen and acted upon by the national team and the system developers from the University of Oslo. With time, other users of the system began solving problems raised by their colleagues without waiting for responses from either the national team or the developers, thus creating a community of users with knowledge on DHIS2. This effectively reduced the burden on the national team and created a new learning process through a community of practice. Figure 1 below shows a print screen of an example of a massage in the DHIS2.
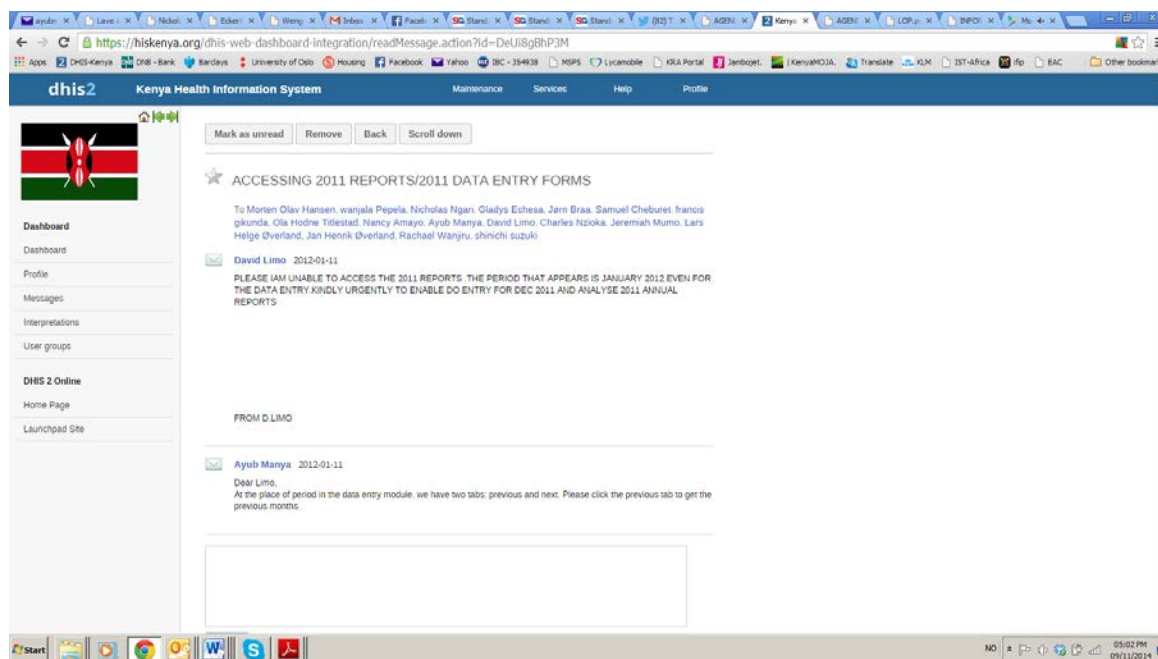

Figure 1: An Example of a Message in the DHIS2

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

554

1.3. Theoretical Background of Community of Practice

The idea that learning involves a deepening process of participation in a community of practice has gained significant ground in recent years. Etienne Wenger (2004) describes Communities of practice as groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly (Wenger, 2004). This aspect of learning is quite different from the classroom type that we are accustomed to. Wenger (1998) posits that most people assume that learning "has a beginning and an end; that it is best separated from the rest of our activities; and that it is the result of teaching" (Wenger, 1998, p. 3). It has however been proposed that learning is social and comes largely from our experience of participating in daily life. Jean Lave and Etienne Wenger (2013) came up with a learning model that proposed that learning involved a process of engagement in a community of practice (Lava & Wenger, 2013; Lave & Wenger, 1991).

The basic argument made by Jean Lave and Etienne Wenger was that communities of practice are everywhere and that people are involved in a number of them - whether at work, school, home, or in civic and leisure interests. They propose that in some communities of practice groups, some members assume core membership while others remain more at margins. According to these authors, a community of practice involves much more than the technical knowledge or skill associated with undertaking some task. Members are involved in a set of relationships over time (Lave and Wenger 1991: 98) and communities develop around things that matter to people (Wenger, 1998). The fact that they are organizing around some particular area of knowledge and activity gives members a sense of joint enterprise and identity. For a community of practice to function it needs to generate and appropriate a shared repertoire of ideas, commitments and memories. It also needs to develop various resources such as tools, documents, routines, vocabulary and symbols that in some way carry the accumulated knowledge of the community. In other words, it involves practice; ways of doing and approaching things that are shared to some significant extent among members.

2. METHODOLOGY

The objective of this study was to determine if the messaging functionality in the DHIS2 contributed to social learning through a community of practice. An exploratory analysis of all messages in the Kenyan DHIS2 from 2011 to 2014 was done. The analysis was done using the community of practice theoretical lens. We analyzed the messages by exploring knowledge sharing in Lave and Wenger's (1991) theory of communities of practice (Lave & Wenger, 1991) and investigating how messaging may translate into social learning. The features of communities of practice that were evaluated were: a) the domain (an identity defined by a shared domain of interest), b) the community (members engaging in joint activities and discussions, helping each other and sharing information) and c) the practice (having a shared practice) (Wenger, 2004).

Messages were downloaded and classified according to following criteria: sender, topic of message and the date the message was sent. The category of those who sent the messages (senders) was further sub divided into three main categories: National DHIS2 core team, University of Oslo team and other users. The national and the Oslo teams were basically the system administrators while the rest of the users had different user roles in the system. Analysis was then done along these classifications.

The next step in the analysis was the classification of the messages according to the message content or the topic of discussion. For instance messages that appeared to pass information from one group of users to another were classified as communication. Communication messages were typically sent from a higher administrative office and were meant to direct employees to perform a particular task, for example data entry. The messages were normally replied with short acknowledgments such as "yes". The following message classified as communication was sent by a DHIS2 core team member on 2012-01-11: *"New release of DHIS2 2.4 offline data entry:*

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

555

Dear all, we do encourage districts to use offline data entry. This will greatly reduce a lot of airtime during data entry." We also had some messages classified as general; most of these were messages discussing other issues not related to the system or just passing general message to specific users as seen in the following message from a user on 2013-10-10: "I think I forgot my cellphone in your car. It must have fallen under the seat. Please help me get it."

We classified messages which were requesting information on how to use specific functionalities in the system as "use". We also had some message questioning the quality of data and others requesting for new features in the system. All the messages were analyzed along these classifications and presented in graphs and tables.

2. RESULTS

A total of 1267 messages were evaluated. This section gives the results of frequency of messages by time, analysis of messages according to the main user categories

3.1. Trend of messages over time

All the messages were tabulated according to the date they were sent. The results show that the peak of the messages was reached in 2012. Thereafter there was an observed downward trend with yearly peaks as shown in figure 2 below.
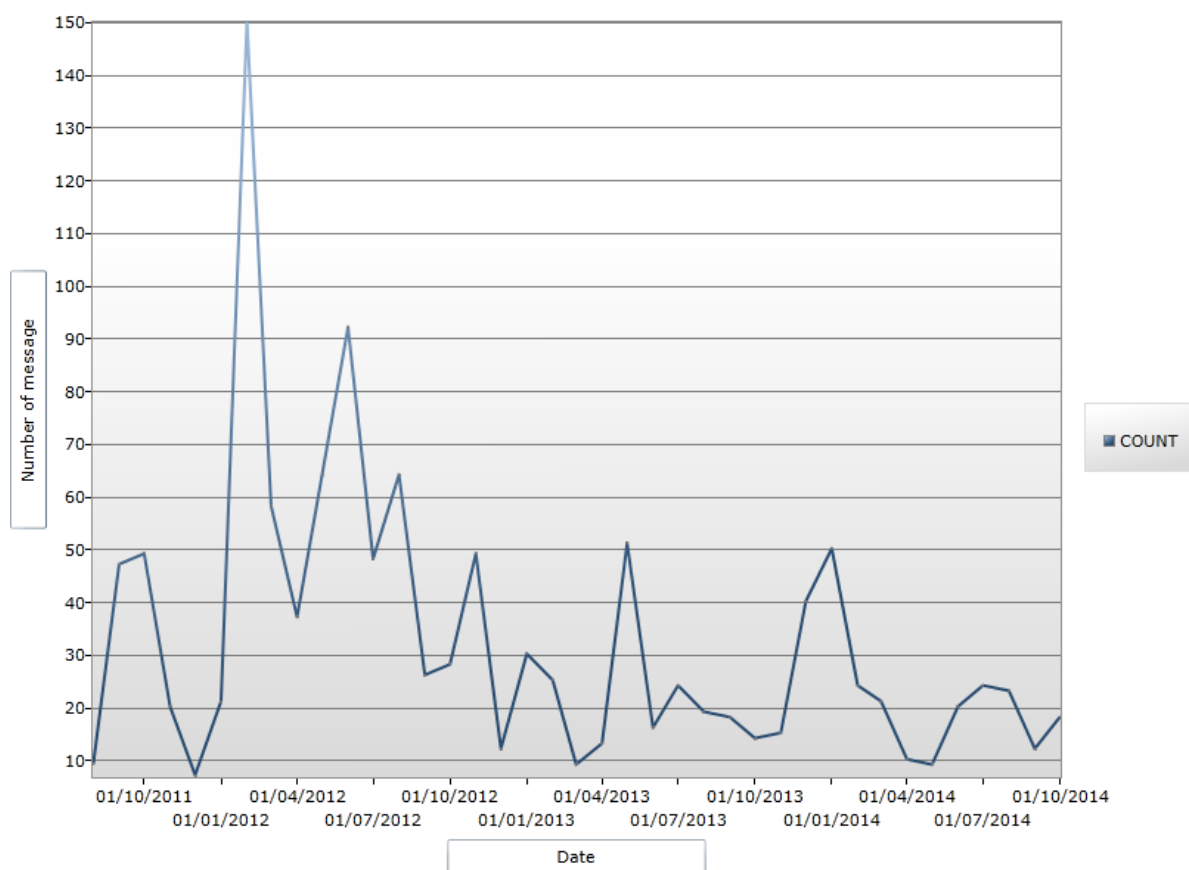
Figure 2: Line Graph Showing the Frequency of Message from 2011 To 2014

3.2   Analysis of Messages according to the Main User Categories

The messages were analyzed according to the main user categories of the DHIS2 core team, Oslo university team and all the other users. The graph shows that initially most messages emanated from the DHIS2 core team and the Oslo team. By the year 2012, the other users had started responding to questions in the system. As the number of messages from the other users started rising, contributions from the DHIS team and the Oslo team started going down. From

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

556

2013 most of the contributions were from other groups. By 2014, the contribution from the Oslo team was totally out, as shown in figure 3 below.
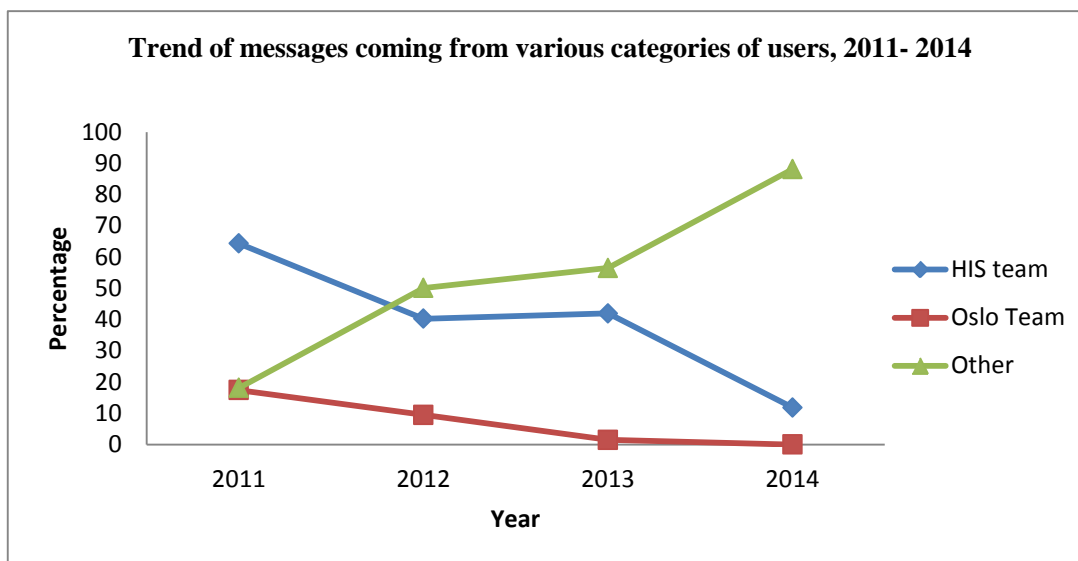
Figure 3: Trend of Messages Coming from Various categories of Users, 2011-2014

3.3. Analysis of type of messages compared to the sending group

Further analysis showed that new functionalities in the system were mostly requested by other users apart from the HIS team and the Oslo team. The same group (Other) also raised most of the data quality and general issues. HIS team handled most of the messages on communication shown in table 1 below.

Message Type	HIS team	Oslo Team	Other	Total
Use	46.0%	7.6%	46.4%	100.0%
Communication	52.1%	12.7%	35.2%	100.0%
Quality	31.7%	2.4%	65.9%	100.0%
New requests	5.3%	5.3%	89.5%	100.0%
General	29.7%	9.0%	61.3%	100.0%

Table 1: Proportion of Message Types Disaggregated By User Groups

3.4. Analysis by the type of Messages being sent

The leading topic in messages being sent was on the use of the system while the least topic was the one demanding new features in the system. It has also been noticed that apart from primarily solving use related issues, some messages were purely general, thus using the system as a communication tool. The quality of data in the system was also a concern of the community of practice group as seen by the proportion of messages concerning data quality. This is shown in figure 4 below.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

557

Figure 4: Proportion of Messages Based on the Communication Topic

4. DISCUSSION

The initial function of the messaging functionality in the DHIS2 was for passing messages from the DHIS managers at the national level to end users in provinces and districts. With time, the end users also started writing feedback messages to higher levels and also among themselves, effectively reducing the need for the national team members to respond to every issue. The first team whose contribution reduced drastically was the Oslo team. While it could be attributed to the fact that the local team had mastered the art of handling the DHIS2, the reduction could also mean that the Oslo team was busy implementing the DHIS2 in other countries.

Assuming that the national DHIS2 core team and the Oslo team were the experts of DHIS2, we argue that the other users formed the community of practice that supported the social learning in DHIS2. Further analysis showed that there was a sharp reduction of the national and Oslo team in 2013, coinciding with the devolution of health services in Kenya. However this did not affect t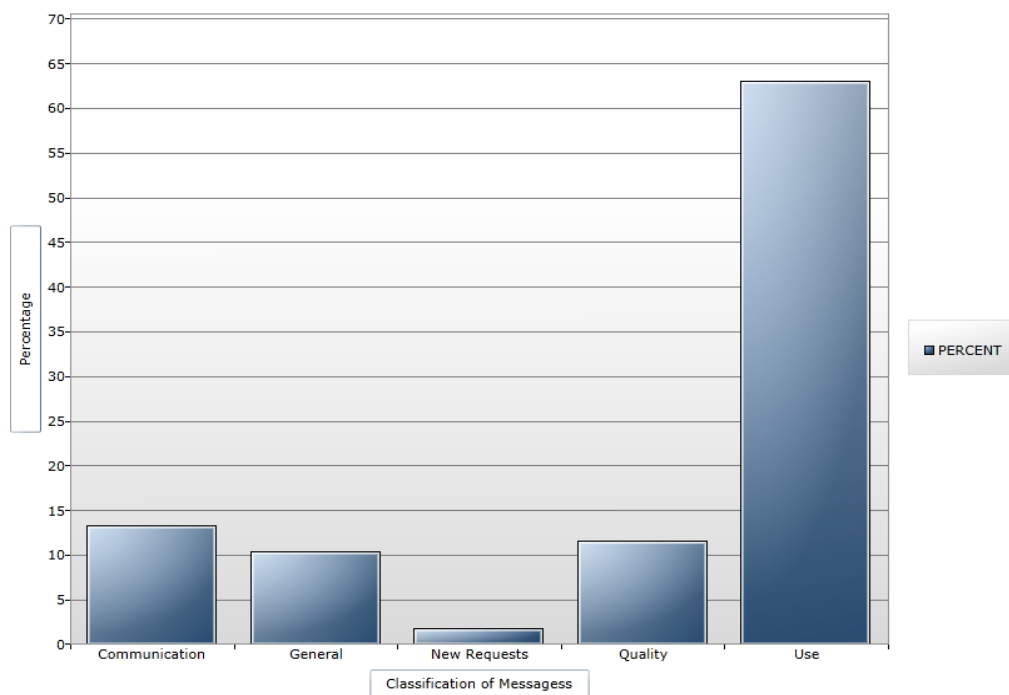he other users, whose activities continued to rise despite the fact that there was that no formal training during this transition state. The main boundary object for those participating in the social learning was the possession of user rights to the system. The user rights ranged from those with administrative rights to guests who only viewed data.

Careful analysis of the messages showed that the messages were very many in the beginning, with major reductions being seen in subsequent years. This could also be attributed to the fact that the team had mastered most of the issues or that there were no new versions of the DHIS2 being adopted by the country. Since most of the messages concentrated on the use of DHIS2, it can be argued that this team had a common focus. The results also show that the team had interest in the quality of data going by messages attributed to data quality. This further confirms that the team had a common interest of improving the health information system. Considering that the theme of the messages was largely aimed at supporting the software, it can be concluded that this team had a common practice, supporting the formation of a community of practice.

In conclusion, the messaging functionality met all the three characteristics of a community of service (domain, community and practice). The community of practice played a big role in improving the teaching of DHIS2 through enabling members to integrate diverse disciplinary perspectives and exchange of ideas. The key factors that made our communities effective and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

558

durable were the freedom of expression and a willingness to learn from peers. The fact that the Kenyan DHIS2 implementation continued with minimal classroom type of training, we conclude that suitably designed and resourced, social learning systems can support the implementation of big information systems like the DHIS2.

REFERENCES

AbouZahr, C., & Boerma, T. (2005). *Health information systems: the foundations of public health* (pp. 83:578-583). Bulletin of the World Health Organization. Retrieved from http://www.who.int/bulletin/volumes/83/8/578.pdf

Dhis2.org,. *DHIS 2 Overview*. Retrieved 26.02.2015, from https://www.dhis2.org/overview

Hildreth, P., Kimble, C., & Wright, P. (2000). Communities of practice in the distributed international environment. *Journal Of Knowledge Management*,*4*(1), 27-38. doi:10.1108/13673270010315920

Lava, J., & Wenger, E. (2013). *communities of practice*. *infed.org*. Retrieved 10 March 2015, from http://infed.org/mobi/jean-lave-etienne-wenger-and-communities-of-practice/

Lave, J., & Wenger, E. (1991). *Situated learning*. Cambridge [England]: Cambridge University Press.

Manya, A., Braa, J., Overland, L., Titlestad, O., & Mumo, J. (2012). National Roll out of District Health Information Software (DHIS2) in Kenya, 2011- Central Server and Cloud based Infrastructure. IST-Africa 2012 Conference Proceedings, Paul Cunningham and Miriam Cunningham (Eds), IIMC International Information Management Corporation, 2012, ISBN: 978-1-905824-34-2 1.

Ministry of Health, (2008). *Health sector Report for the Assessment of the Health Information System of Kenya*. Nairobi.

Ministry of Health, (2009). *Health Sector Strategic Plan for Health Information System 2009-2014*. Nairobi.

Ministry of Health, (2010). *Health Information System Policy 2010-2030*. Nairobi.

Nyanjom, O. (2010). *Devolution in Kenya's new Constitution*. Retrieved 19 March 2015, from http://www.sidint.net/sites/www.sidint.net/files/docs/WP4.pdf

Pharo, E., Davison, A., McGregor, H., Warr, K., & Brown, P. (2013). Using communities of practice to enhance interdisciplinary teaching: lessons from four Australian institutions. *Higher Education Research & Development*,*33*(2), 341-354. doi:10.1080/07294360.2013.832168

Wenger, E. (1998). *Communities of practice*. Cambridge, U.K.: Cambridge University Press.

Wenger, E. (1998). *Communities of practice, Learning as a social system. Co-i-l.com*. Retrieved 10 March 2015, from http://www.co-i-l.com/coil/knowledge-garden/cop/lss.shtml

Wenger, E. (2000). Communities of Practice and Social Learning Systems. *Organization*, *7*(2), 225-246. doi:10.1177/135050840072002

Wenger, E. (2004). *Communities of practice- a brief introduction*. Retrieved 19 March 2015, from Wenger, E. (2004). Communities of practice- a brief introduction. Scholarsbank.uoregon.edu. Retrieved 02.03.2015, from https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/11736/A%20brief%20introduction%20to%20CoP.pdf?sequence=1

WHO'S Framework for Action, (2007). *Strengthening Health Systems to Improve Health Outcomes*. Retrieved 05.03.2015, from

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

559

http://www.who.int/healthsystems/strategy/everybodys_business.pdf

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

560

DATA SPECIFICATION FOR INFORMATION SYSTEMS FOR THE IMMUNIZATION COLD CHAIN

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Abstract: In this paper, we present work on developing information systems for immunization logistics in developing countries. We developed multiple systems for managing Cold Chain Equipment Inventories (CCEI) that facilitate a country's management and planning of their immunization programs. In addition, we led an effort to create a data standard for CCEI to facilitate the process of moving between different implementations, and to allow for visualization and analysis tools that are independent of the platform for inventory. A broader contribution of this work is as a case study of how the information needs of a vertical program fit into an overall Health Information System (HIS). It is not unusual for health data to exist simultaneously in spreadsheet applications, standalone PC applications, and database applications. There are situations where each one of these is the appropriate architectural choice. We argue for the development of data standards as a mechanism for migration between these different approaches.

Keywords: Cold Chain Inventory, Immunization, Vaccine Supply, Health Information Systems, Developing Countries, and Data Standards.

1. INTRODUCTION

Health information systems are critical for strengthening public health in developing countries (Ammenwerth 2003)(Panir 2011). Accurate and up-to-date information supports management and decision-making, and allows resources to be directed to where they may have the most impact. The health information system collects data through the health hierarchy and the data is maintained centrally. Reports and analysis from the data can be generated either at the national level or in a distributed manner. The health information system often supports multiple health domains, where each health domain is a programmatic area around a disease, intervention or service.

However, countries face many challenges in deploying effective health information systems. Many reports are still submitted on paper forms, with the resulting information stored in standalone databases or spreadsheets. Network infrastructure, although improving rapidly, still can be unreliable, especially at the periphery. The software environment for a health system is often complex. In addition, organizational issues may make change difficult since some groups may lose control over data and new working relationships need to be established. IT resources are also often limited, making it difficult to maintain and support systems. Finally, decisions on the adoption of health systems software can be highly political (Sahay 2009).

Recognizing the complexity of existing information systems and organizations, how does a country successfully implement a modern health information system? To explore how information system needs for a health vertical tie into the overall health information system, we look at one particular domain, immunization and the vaccine cold chain. We want to understand how addressing programmatic needs for use of data can align with centralizing information

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

561

services. In this paper we describe work that we have done to support over a dozen countries in building information systems for their vaccine cold chains, and then draw some general lessons to inform work in other program areas. One of our main findings is that data standards are needed to provide a bridge between the multiple implementation options, as well as providing a link between the software applications and practitioners.

Literature in standardization argues that standards emerge through use rather than consensus (David 1986). Given the rapidly growing complexity around the standards makes achieving a consensus very difficult. This is mainly because of the bureaucratic processes of standardization bodies are too slow (David and Shurmer 1996). Informal bodies can contribute tremendously in shaping the standards in today's complex space (Shapiro et al. 2001). Shared standards can be successful and largely adopted if enough actors are convinced (Kossi 2009). If the standards are simple and flexible to changes then it can be adopted in complex health information systems (Braa et al 2007).

We argue that a standard can emerge through consensus if the community is specific. In cold chain domain, the consensus is achievable since the programs are fairly uniform. The standard need to define backbone of the cold chain space and have flexibility to extend for specific implementations. This is not only to incorporate future expansions but also to reach an agreement within the community of cold chain experts.

2. IMMUNIZATION

Immunization is recognized as one of the most successful public health interventions in history. Vaccines save millions of lives every year from preventable diseases. An example of the success of immunization is the near eradication of polio. The number of cases per year has declined from an estimated 400,000 in 1980 to just 413 reported cases in 2013 (Polio 2014). There are robust global organizations supporting immunization, both in terms of donor funding, as well as in global governance and coordination. In almost all developing countries, routine immunization is part of the public health system and is administered centrally by a separate department inside the Ministry of Health. Vaccines are distributed nationally and are available for free or at low cost in public health facilities. Vaccines are imported into the country to the national vaccine store, and are then distributed through a hierarchy of vaccine stores until they reach health facilities. At health facilities, vaccines are stored for immunization use or are sent on to secondary facilities. To ensure that the vaccines remain viable, it is critical that they are kept at appropriate temperatures during transit, storage and use. This is done with refrigerators and freezers at storage locations, and refrigerated trucks and cold boxes for transit, which are collectively referred to as the "vaccine cold chain" (Maurice 2009).

Immunization logistics is concerned with the distribution of vaccines. Essential problems include maintaining adequate stock levels and ensuring that vaccines maintain safe temperatures. A logistics information system manages information about vaccine shipments, vaccine use, and the fixed assets in the system. In this work, we focus just on the information systems associated with the physical cold chain, which consists of an inventory of the cold chain storage equipment along with associated information about the health and storage facilities. Even though this basic equipment and facility information is fundamental, it is often unavailable or out of date.

Perhaps the most basic question about a country's vaccine cold chain is whether or not it has sufficient capacity to store the required vaccines. However, in many countries, the answer to this question is not known, as the Ministry of Health does not know how much cold storage equipment is available for vaccines. This question becomes especially important with the introduction of new vaccines such as the rotavirus and pneumococcal vaccines. These new vaccines take up more space, and are more expensive and more sensitive to heat than older vaccines, which increase the importance of having sufficient capacity in the cold chain. It is also important to understand the quality of the cold chain, including the working condition and age of

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

562

equipment. Since many health facilities do not have access to regular grid electricity, there are vaccine refrigerators with other power sources including gas, kerosene, and solar power. Knowing the distribution of power sources of equipment is critical for estimating overall costs (for example, gas and kerosene can be ten times as expensive as grid electricity) and planning for upgrades. Information about the cold chain is also important for management of existing equipment, and acquisition and allocation of new equipment, which often takes place at an intermediate level, such as at the district level.

3. COLD CHAIN INFORMATION SYSTEMS

A cold chain equipment inventory (CCEI) is a data set consisting of information about vaccine storage devices (refrigerators, freezers, cold rooms, freezer rooms, cold boxes and vaccine carriers) along with information about the health facilities. Basic information about the cold chain equipment includes age, model, working condition, and the health facility it is located in. We discuss the data fields in more detail below. When we talk about a cold chain equipment inventory we generally are referring to a national inventory, although in some large countries, such as India, inventories might be done by state. The inventory generally focuses on facilities in the public health system as in most low and middle-income countries vaccines are distributed through the public system.

We now present a number of use cases for the cold chain equipment inventory. In this discussion, it is important to consider the stakeholders, which we divide into three broad categories: Global: donors and intergovernmental organizations such as UNICEF and WHO; Implementers: NGO's, consultants, and academics; and Country Staff: Ministry of Health (MOH), National Immunization Program (NIP), and logisticians. Although all of these stakeholders are aligned on the goal of strengthening immunization systems, they have differences in priorities and emphasis.

Cold chain equipment inventories are used to support all of the following activities:

- Assessment: Evaluation of the vaccine cold chain to determine if there is sufficient working storage capacity to ensure that vaccines are kept safe until they are used. One of the important areas for assessment is when new vaccines, such as pneumococcal and rotavirus vaccines. New vaccines often have large packaging requirements, which can overwhelm existing storage capacity.

- Quantification of need: Determine how many new refrigerators are needed to meet storage demands for vaccines. This quantification can be based on scenarios such are addition of new vaccines and retirement of different types of refrigerators. This may be expressed as a multi year plan that identifies needs over several years.

- Re-engineering supply chains: There is interest reorganizing how vaccines are distributed within countries by doing things such as removing intermediate levels of storage and changing delivery timings. Estimating the cost requires having the underlying cold chain inventory data, and possibly applying sophisticated computer modeling with systems such as Hermes (Lee 2011).

- Market shaping: Cold chain inventory data provides important information to estimate the global demand for different classes of vaccine refrigerators, such as solar powered refrigerators. One application of this is to demonstrate sufficient demand so that manufacturers will be able produce and market certain models.

- Cold chain management: The cold chain inventory support many tasks on managing equipment from allocation of refrigerators to health facilities, to planning equipment upgrades, and tracking maintenance.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

563

- Immunization information systems: The cold chain inventory can be a component of other information systems for immunization to support other activities such as managing vaccines in a logistics management information system.

These use cases impose different requirements on a cold chain equipment inventory, and are motivated by the different stakeholders. For example, assessment is a use case that is driven at the global level, and may be a requirement before funding is released to support vaccine introduction. Management on the other hand is activity at the country level, where information is used to make decisions about individual pieces of equipment, and is not a direct concern to the external stakeholders.

4. SOFTWARE CONTEXT AND CHALLENGES

Wide ranges of systems are used to manage cold chain inventories. The context differs between countries, so it is natural to see a range of approaches taken. Inventories are sometimes managed by a standalone, local application without web support, and other times are part of a larger database or a component of an application for another purpose. In this section we give an overview of various approaches for maintaining cold chain inventories. One thing to note is that the cold chain inventories fall into a common pattern of health domain software systems where there are simultaneously spreadsheet tools, single machine database tools, and web-based database tools

4.1. Spreadsheet Solutions

The most common and basic approach to representing a cold chain inventory is to track the information using spreadsheets. There are advantages to this approach: spreadsheets are simple to use and software is widely available. However, spreadsheets are generally single-user documents and there are challenges in maintaining multiple versions. Further, the functionality of spreadsheets is limited with respect to analysis of the data. A prime concern about spreadsheets, raised to us by a World Health Organization (WHO) official, is the difficulty in linking information across spreadsheets (e.g. associating refrigerators with health facilities).

There is a range of spreadsheet approaches used for cold chain inventories that can be modeled using a hierarchy:

1. Simple spreadsheets. The most basic approach is to maintain the information as lists. We have seen many different ways this information is stored. For example, in Laos, separate spreadsheets existed (in different formats) for each manufacturer of equipment, in additional to extra sheets for facility information and populations

2. Inventory spreadsheets. The next level up the hierarchy is spreadsheets that are designed specifically for a cold chain equipment inventory. An example we have worked with is an inventory for three states in India that consists of seven separate spreadsheets for equipment from different types of facilities, along with another two spreadsheets for vaccine logistics for these facilities. The ID numbers from the original inventory forms are used to link equipment to facilities. Due to the complexity of the survey forms, the spreadsheets were quite large, with some having over 300 columns.

3. Excel-based cold chain tools. At the top of the list are a group of cold chain analysis tools built in Excel. WHO maintains a group of tools for national and regional immunization managers that support activities such as tracking immunization coverage and managing stock levels. Some of these tools, such as District Vaccine Data Management Tool (DVD-MT) provide sheets for an inventory of cold chain equipment. The DVD-MT tool provides a well-structured inventory that includes many of the fields we recommend in our own data model (discussed further below).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

564

4.2. Single Machine Applications

Moving up from spreadsheets are applications using local storage, frequently implemented using Microsoft Access. The most widely used cold chain equipment inventory application is CCEM (Anderson 2012), which was developed by PATH in collaboration with UNICEF, WHO, and USAID. CCEM is a Microsoft Access application with the following functionality:

1. Equipment Inventory. As an Access application, the database is represented with a set of interlinked tables. The main tables are for health facilities, refrigerators, the administrative hierarchy and refrigerator types.

2. Report Generation. This is the key functionality for users, with domain specific reports and charts.

3. Modeling. CCEM was designed to support the development of multi year equipment acquisition plans. CCEM has a simple modeling engine that determines an equipment allocation to satisfy requirements, and allow schedules for adding or removing equipment over several years.

4. Inventory process support. By presenting a clearly defined data model, CCEM has provided an entry point for countries to begin monitoring their cold chain inventories. This schema in turn makes it easy to generate forms from the data model to facilitate the collection of useful inventory information. Together these features have made creating and maintaining a cold chain inventory a more tractable problem, which has been one of the contributions of CCEM.

4.3. Web Based Applications

The basic requirements for an inventory tool are to allow updates and generation of reports from multiple sites. This suggests a web-accessible database. There are many possible ways to implement this. Generally speaking, the sizes of the databases involved are modest, so this is not an inherently difficult problem. The only web-based cold chain inventory tool of which we are aware was developed by UNICEF for use in India. It is currently undergoing pilot use in several states of India. The system tracks cold chain equipment at the facility level, and also maintains information about human resources and training.

Multiple other applications support logistics and the immunization system. These systems frequently maintain information about the cold chain, even though this is not the main purpose of the application. Pakistan's Vaccines Logistic Management Information System (vLMIS) is a web-based national system designed to give latest data on key vaccine logistics and cold chain indicators essential for better decision-making. The system is designed with access to users from federal, provincial, and district levels with responsibilities varying from data entry to analysis and decision-making. This project is designed and developed by USAID Deliver project and John Snow, Inc. (JSI). Currently, it is running in 54 polio endemic and adjacent districts, with multi-year expansion plan to reach reporting from all districts. Other examples are the logistics management system OpenLMIS (VillageReach 2012) and the vaccine stock management system VSSM (PAHO 2010). Both of these applications track limited information about the vaccine cold chain. Currently, the cold chain inventory applications are completely separate from these logistics management systems, but there are obvious synergies when interoperability issues are addressed.

An alternative to building a custom inventory system is to build on top of a more general platform. DHIS2 is an open source health indicator reporting system developed by the Health Information Systems Program (HISP) and used in roughly 30 countries. HISP has been active since 1994 in developing health information systems with the goal of making health data useful at all levels of the health system (Braa 2012)(Braa 2004).The motivation behind developing DHIS2 was to improve the quality of health data and use information for action based on

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

565

different tools (Miscione 2007). DHIS2 is a three-tier application that uses Hibernate to manage the data layer, allowing multiple database implementations to be used, including PostgreSQL and MySQL. The service layer uses the Spring framework, and the web presentation layer uses Struts 2, which includes Jasper Reports, a GIS module, and JQuery.

DHIS2 allows system administrators to design the reporting units, indicators, validation rules, and data entry forms. This is significant since it makes DHIS2 a generic tool that can be easily adopted for countries implementing their health information system. The core data model for DHIS2 is designed around abstract data sets, data values and date elements associated with organizational units. The organizational units are then organized into an organizational unit hierarchy.

The facility model for CCEM matched the organizational units for DHIS2, so the facility data could be handled by the existing mechanisms. The extension that was necessary was for assets, where a collection of assets was associated with each organizational unit and had their individual properties. Instead of directly implementing the cold chain assets types such as refrigerators or cold rooms, generic equipment types and equipment attributes were used. The asset model also relies on catalogs so that fixed properties of a type of equipment could be represented separately from the instance. To handle this generically, catalog types and catalog type attributes were included. This level of indirection allows new types of assets to be added by the system administrator without updating the DHIS2 code. For example, diagnostic equipment could be added to an instance of the inventory module just by adding appropriate equipment and catalog items.

With the completion of the asset module for DHIS2, we have a version of the cold chain tool running on a web-based system. We used one of our existing country data sets for the test version, and implemented reporting for 30-day temperature alarms and recorded equipment maintenance. The base module can be used for cold chain inventories for other countries and it is possible to extend the system to handle other data associated with the cold chain such as automatically collected temperature data (Chaudhri 2010).

4.4. Challenges

There are several challenges with cold chain equipment inventories. The logistical challenge to build an initial cold chain inventory can be enormous, since this is often done by having trained teams of workers visit all the health facilities in the country to collect information. Since countries typically have about one health facility for every 10,000 people, the number of health facilities is large, for example, Kenya has over 5,000 health facilities for a population of 44 million. Travel to all facilities is expensive and time consuming due to difficult roads.

After an inventory is constructed, the main challenge is keeping it up to date. This is, in fact, the major criticism of cold chain inventories: they are generally not kept up to date, and so the investment is squandered. We know of several countries (for example, Malawi, Nicaragua, and Uganda) that have kept inventories updated by maintaining a standalone database and having updates done centrally. However, in many other countries that we are familiar with, the inventory remains static after it has been collected. One of the arguments for a web-based implementation of a cold chain inventory system is that it should be easier to maintain the latest state by allowing distributed updates. Some PC based implementations of inventories approach the update problem with a "feed forward files" to allow the merging of updates from multiples versions of the database for different regions.

The challenges surrounding implementation of an inventory model include maintaining data quality and allowing the system to be easily updated. Ensuring that the data is accurate can be extremely difficult, especially if the data is recorded passively and is not being used to provide feedback to people involved in the immunization system. Finding some means to keep the information up-to-date is the biggest challenge around inventory implementation. This relates

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

566

both to the technology and the procedures that are in place for updates to be received and processed. The updating process is further complicated if the inventory is not managed centrally and is instead represented by disconnected data sources.

Inconsistent data models introduce a huge barrier in merging the inventories for better analysis. These issues start from a basic problem of merging separately maintained datasets on health facility logistic details and cold chain details. This makes a simple query of looking up available refrigerators with vaccines required a daunting and challenging task. Inconsistent data models also makes it challenging to feed the data to generic modeling and planning tools for better decision making.

Several organizations, including PATH, CHAI, Village Reach, JSI and local governments, are working on improving the data reporting for immunization. These efforts occur at regional or country level in various parts of the world. Most of these projects are running independently, which makes it harder to expand them at later stages and merge with other efforts. Major difficulties arise from mismatch in data being collected or the data format being used in various technologies supporting these projects.

We propose that with the appropriate technology, the opportunity exists to have cold chain inventory data promptly updated to reflect changes, as well as to incorporate additional information gained through routine reporting. Analysis and visualization tools at all levels could support planning and management tasks to ensure that appropriate equipment is acquired and that the cold chain is of sufficient quality and capacity for immunization programs. Further, the cold chain inventory system could be tied to other information systems, such as those used for stock management, and could also serve as a backend for new applications that support features such as automatic temperature monitoring.

5. DATA STANDARDS

Through our work on multiple tools and country deployments, we became convinced that a major gap was a lack of common data standards for Cold Chain Equipment Inventories (or CCEI). This was reflected by difficulties in building country inventories based on available data, the fragmented tools used to work with inventories, and the confusion that people had between the inventory and the tool used to store it. Our hope was that the existence of a data standard would:

1. Regularize the process of data collection for cold chain equipment inventories, including making it easier to generate data collection tools,

2. Provide a mechanism for cold chain data to be shared between applications and allow applications to interoperate,

3. Give a basis for common analysis tools to be used across cold chain data sets

4. Support the structured representation of inventory data, thus increasing quality of the data.

The CCEI data model was developed in a collaborative manner. The initial model and data definitions were based upon those inside CCEM. Since the CCEM tool had been developed through a series of stakeholder workshops in Uganda and Panama, and in consultation with UNICEF and WHO, its definitions were already in close agreement with the data reporting supported by WHO. The model was refined over a period of 18 months through multiple rounds of review. An initial review was conducted by members of UNICEF Cold Chain Logistics group. Based on that effort, a more formal set of definitions was developed that was then circulated individually to about 15 immunization cold chain experts from UNICEF, WHO, and NGOs including PATH (PATH 2014) and CHAI (CHAI 2014), who provided very detailed feedback that was incorporated into a final version. The project built upon existing standards where possible, such as using the WHO Performance, Quality and Safety (PQS)/Product

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

567

Information Sheets (PIS) catalogs and defining several of the fields with respect to ISO standards.

The CCEI standard was established with a core to represent information about health facilities and refrigeration equipment. It is expected that the standard will be extended to include additional modules. Examples of modules that are under consideration, and are of interest to different stakeholders are transportation, equipment maintenance, and temperature monitoring.

One of the requirements for CCEI was to include sufficient information to assess the quality and capacity of a national cold chain, and to be a basis for estimates of the equipment that would be necessary to upgrade the cold chain for introduction of new vaccines. This requirement influenced the selection of indicators associated with the health facilities, such as recording the population associated with a health facility, and identifying the energy sources available for refrigerators. Since many of the assets in the cold chain are standard equipment, the inventory also includes an official catalog of models of equipment available. This means that a refrigerator can be represented by just a model name, and information for the refrigerator (such as capacity) can be pulled from the model database.

The data model is a set of facilities and a set of assets. Assets come from a group of predefined types (such as refrigerators and cold rooms) and there is a reference catalog that gives the properties of specific models of equipment. The most detailed information is associated with facilities, where location information, including position in the country's administrative hierarchy, is stored along with information on the population served by the facility, the power infrastructure, and process of vaccine distribution. In addition to specifying the basic inventory models, the CCEI data model includes standards for the administrative hierarchy and country localization.

Although we consider the outcome to have been a success, there were multiple challenges faced in constructing the standard. As with any standards efforts, there were disagreements over details of data elements and a balance between completeness and not complicating the standard. One of the challenges throughout the process was conveying to the stakeholders what a data standard was and distinguishing between the process of specifying the data definitions, and their use in various applications. Scoping the data definition was also problematic, as there were many suggestions of other components of the immunization system that could potentially be included. One solution to this was to state that in the future, extensions to the standard could be consider with the inclusion of additional modules. Finally, there is potential overlap of aspects of this standard, with other efforts, such as work on facility registries.

6. DISCUSSION

We now present a number of observations from our experience with cold chain equipment inventories.

We believe that there is a need for multiple architectural approaches in the implementation of cold chain equipment inventories based on different contexts in countries. We consider a web based system utilizing a database for the cold chain inventory as the "obvious" architectural choice for many reasons, including reliability and the ability to support distributed updates. However, we has seen a continual demand for our stand alone Microsoft access tool, where it has been used in countries including Philippines, Indonesia, Pakistan, and Georgia for inventories. We came to understand that the autonomy that a PC application allows, so that it can be used without needing to engage a larger organization, is an important feature in some situations. Tasks such as creating a cold chain inventory can be managed by a small group of health officials, so being able to use laptops, without engaging IT staff removes an institutional obstacle.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

568

It is important to be able to support the migration between inventory systems. This was one of the motivations for the development of the data standard – so that applications could import from / export to a specific format to migrate data. We used an excel representation of the CCEI model for this. We have used this to move data from multiple CCEM inventories, including Malawi, Kenya, and Ghana to DHIS2 systems, with other countries, such as Uganda, also interested in moving from CCEM to their national DHIS2 system. One of the successes in developing the data standard is that it has allowed other organizations to build tools with cold chain inventories and include the data from existing CCEM deployments.

Pakistan Cold Chain Equipment Inventory maintenance effort was started by UNICEF at small scale by targeting 55 polio high-risk districts in the country. They initiated the project by using CCEM as their primary tool that provided them the convenience to run it on their local PC or laptop. They collected data on paper forms from 2083 health facilities and then entered the data on local machines without the need of Internet. This database was then incorporated in a web-based national Vaccine Logistic Management Information System (vLMIS), developed by John Snow Inc at a later stage. vLMIS has scripts to extract data from CCEM files and add it to this online system.

The starting point for building a cold chain equipment inventory is almost always an existing dataset represented in excel - so there is a migration from an excel based inventory to one of the other tools - which again is accomplished by representing a standard form in a sheet. There are multiple challenges to doing this with difficulties around the structure of data (such as the choice of fields) as well as the quality of data, including issues such as having to deal with a wide range of spellings of the same terms. The representation of names of facilities can be a particular challenge.

Cold chain equipment inventory is a small yet critical dataset in immunization and health domains that is easily ignored. We expect any data collection system in this space will eventually be consumed by wide scoped national health information systems. Hence it is important that an agreed upon data standard exist so that data can be prepackaged and moved into popular information systems. Given that all the small scale and intermediate tools in this domain also support this standard, the interoperability of these individual systems and scaling-up will be a much easier and smooth task.

7. CONCLUSION

The underlying goal of this effort is to make cold chain equipment inventories more useful to the management of country immunization programs. A major gap was the lack of a common model for inventories, leading to ad hoc representations, difficulties in moving between inventory tools, and the confusion between the actual inventory and the software that was used to represent it. We developed a data model, which has been shared with the relevant technical communities, and has been used to align a collection of existing software tools. We have the aspiration to see this evolve into an 'open data standard', but recognize that it is not at that level yet. The validation of the standard will be through its use in multiple tools and if it becomes a common representation used for by countries when storing and sharing their inventory data - in other words, if it becomes a de facto standard. Formalization of the model into a true open standard will require an organization that hosts the standard and a structure for community agreement in updates to the standard.

We have discussed multiple use cases that we encountered while working in this space where a data standard could play a critical role. These use-cases include spreadsheet to database data migration and coexistence of single machine and web-server applications. We also discussed some future work in standardizing analysis tools that can be achieved given the data standards are deployed in information systems.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

569

8. REFERENCES AND CITATIONS

Ammenwerth, E., Gräber, S., Herrmann, G., Bürkle, T., & König, J. (2003). Evaluation of health information systems problems and challenges. *International Journal of Medical Informatics*, 71 (2-3): 2-3

Anderson, R., Lloyd, J., & Newland, S. (2012). Software for national level vaccine cold chain management. *International Conference on Information and Communication Technologies and Development (ICTD)*, ACM, New York, NY, USA, 190-199

Braa, J., & Hedberg, C. (2012). The struggle for developing district health information systems in South Africa. *Information Society*, 2002;18(3):113–127

Braa, J., Monteiro, E., & Sahay, S. (2004). Networks of action: sustainable health information systems across developing countries. *MIS Quarterly*, 28(3), 337-362

Braa, J., & Sahay, S. (2012). Integrated Health Information Archtitecture: Power to the Users. *Matrix Publishers*, New Delhi.

Braa, J., Hanseth, O., Heywood, A., Mohammed, W., & Shaw, V. (2007). Developing health information systems in developing countries: the flexible standards strategy. *Mis Quarterly*, 381-402.

Brunette, W., Sudar, S., Worden, N., Price, D., Anderson, R., & Borriello, G. (2013). ODK tables: building easily customizable information applications on Android devices. *ACM Symposium on Computing for Development (DEV).*

CCEI (2014). *Cold Chain Equipment Inventory data definition -* https://github.com/fahadp/CCEI

CHAI (2014). *Clinton Health Access Initiative -* http://www.clintonhealthaccess.org/

Chaudhri, R., O'Rourke, E., Borriello, G., Anderson, R., & McGuire, S. (2010). FoneAstra: Enabling Remote Monitoring of Vaccine Cold-Chains Using Commodity Mobile Phones. *The 1st Annual Symposium on Computing for Development*

David, P. (1986). Understanding the Economics of QWERTY: The Necessity of History. *Economic History and the Modern Economist*, W. N. Parker (ed.) Basil Blackwell, Oxford, UK, pp 30-49.

David, P. A., & Shurmer, M. (1996). Formal Standards-Setting for Global Telecommunications and Information Services. *Telecommunications Policy* (20), 1996, pp. 789-815.

Kossi, E. K., Sæbo, J. I., Titlestad, O. H., Tohouri, R. R., & Braa, J. (2009). Comparing strategies to integrate health information systems following a data warehouse approach in four countries. In *Proceedings of the 10th Annual International Conference on Social Implications of Computers in Developing Countries,* Dubai, UAE.

Lee, B., et al. (2011). Maintaining vaccine delivery following the introduction of the rotavirus and pneumococcal vaccines in Thailand. *PloS one*, 6.9: e24673.

Maurice, J., & Davey, S. (2009). State of the World's Vaccines and Immunization. *3rd Ed. Geneva*, World Health Organization.

Miscione, G., & Sahay, S. (2007). Scalability as Institutionalization-Practicing District Health Information System in an Indian State Health Organization. *Taking Stock of E-Development*, São Paulo, Brazil, 28-30 May, 2007.

PAHO. (2010). Vaccination Supplies Stock Management [VSSM]. *Immunization Newsletter*, Volume 32, No 6, Dec 2010, pp 7.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

570

Panir, M. (2011). Role of ICTs in the Health Sector in developing countries: a critical review of literature. *Journal of Health Informatics in Developing Countries*, Vol 5, No 1, pp197-208.

PATH. (2014). *PATH*, Seattle WA - www.path.org

Polio. (2014). *Global Polio Eradication Initiative*, http://www.polioeradication.org/Dataandmonitoring/Poliothisweek.aspx

Sahay, S., Asnestad, M. & Monteiro, E. (2009). Configurable Politics and Asymmetric Integration: Health e–Infrastructure in India. *Journal of the Association for Information Systems*, Vol 10: 5, pp. 399-414, May 2009.

Sahay, S. & Walsham, G. (2006). Scaling of health information systems in India: challenges and approaches. *Journal for IT and Development*, 12, 3, 185-200.

Shapiro, S., Richards, B., Rinow, M., & Schoechle, T. (2001). Hybrid Standards Setting Solutions for Today's Convergent Telecommunication Market. In *Proceedings of the 2nd IEEE Conference on Standardization and Innovation in Information Technology, E. J. Iversen (ed.),* IEEE Computer Society Press, pp. 348-351.

VillageReach. (2012). The framework for OpenLMIS white paper. *Seattle: VillageReach*, http://openlmis.hingx.org/Share/Details/312

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

571

FROM CO-OPTATION TO PRODUCTION: RISK IN HEALTH INFORMATION SYSTEMS IMPLEMENTATION AND DEVELOPMENT

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Abstract: In this paper we discuss the production of space in the arena of development of a server environment meant to host a new technology, which is the DHIS 2 software in Zimbabwe. Emerging technologies developed and implemented with the goal to integrate fragmented health information systems require robust and scalable server infrastructure offered in environments of reliable internet connectivity. We analyse the legacy space, that is decentralised and running standalone applications, as needing transformation to a new space with a centralised server architecture. We pay attention to the activities among the diverse stakeholders engaged in the production process as key to understanding the implementation. The process undertaken in order to develop the requisite new relationships to meet these demands is considered as the 'production of space'. Using this conception, we find that there are asymmetries between the co-opted space of donor agencies, the representations of space inscribed in the technology and the material lived context of the health information systems change intervention which severely impact on the production of space. We thereby present perspectives through which challenges of complex large scale and generic technology implementations can be understood and interventions sustained.

Keywords: production of space, integrated health information systems, architecture, materiality, intervention, co-optation

1. INTRODUCTION

Increased access to the Internet in Africa, particularly due to the rapid roll-out of mobile networks, has presented new opportunities for the development and implementation of health information systems (Matavire & Manda, 2014; Sanner, Roland, & Braa, 2012). Many governments have chosen to leverage this infrastructure to develop integrated data warehouses for the storage and dissemination of their data (Braa & Sahay, 2012). The District Health Information Software (DHIS 2) is a generic open source and Internet-based technology that many of these nations have chosen in order to address this concern (Braa & Sahay, 2012). This technology runs on a central server and creates the possibility for health workers at all health facilities with internet connection to capture routine data for surveillance of health indicators across regions. The challenge is that the techno-organisational development necessitated by the implementation of this software does not occur on a tabula rasa. There is a pre-existing configuration of society, organisation, politics and technology in these spaces which is often called the installed base (Hanseth & Lyytinen, 2010) on which novel techniques need to be applied to produce the 'new' spaces of production for the technology (Lefebvre, 1991). This study focuses on server infrastructure development in the context of Zimbabwe, where pre-existing arrangements constrained the production of a space for the appropriation of the DHIS 2 technology.

To understand the challenges, it is essential to give an overview of the dominant structures characterising this domain. Many developing countries have adopted the World Health

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

572

Organisation's (WHO) Sector Wide Approach to Health Development (SWAp) in the hope of resolving the numerous challenges they face within their public health systems. These challenges include shortages of funding, poor infrastructure and limited human resources (Braa & Sahay, 2012). The adopted Sector Wide Approach (SWAp) is "*a sustained government-led partnership with donor agencies and the civil society in-which sector-wide interventions are applied to an expenditure framework and national implementation system for the health policy*" (Taderera, Madhekeni, Zhou, & Chevo, 2012, p. 159). Accordingly, a key component of the SWAp in Zimbabwe is to pool donor resources within the Ministry of Health and Child Care (MOHCC) in order to coordinate activities aimed at strengthening the national health information systems. Increasingly tense relationships between the government of Zimbabwe and numerous agencies involved in the healthcare sector led donor organisations to channel money, not through the pool of funds, but directly to Non-Governmental Organisations (NGOs) and United nations agencies such as the United Nations Development Program (UNDP) and United Nations Children's Fund (UNICEF) among others (Taderera et al., 2012). Research suggests that billions of dollars are channeled through these organisations toward the diverse interests of the involved stakeholders based on the premise that they are less corrupt and more accountable than despotic African regimes (Gary, 1996). There is consequently a persistent highly fragmented environment of multiple donor programs, siloed information systems (Braa & Sahay, 2012) and possibly, a weakened state (Gary, 1996).

This situation contributes to the production of data of low quality which is neither used, nor adequate for decision making (Hotchkiss, Aqil, Lippeveld, & Mukooyo, 2010; Lippeveld, Sauerborn, & Bodart, 2000). Consequently, there is a drive to replace legacy systems, with integrated and internet based solutions. There is also a drive to increase ownership of these systems in the government given the unsustainability of prior interventions. This task is complex, and is either characterised by high rates of failure or, at least, largely unmet expectations. Research to account for these complexities has however been largely trapped within a micro-meso-macro conceptualisation of the phenomenon serving the different 'professional concerns' of the researchers. For instance, there is a predominance of institutional level analysis, and the application of institutional theories to account for the challenges faced and failures experienced (Asangansi, 2012; Sahay, Sæbø, Mekonnen, & Gizaw, 2010; Sanner & Sæbø, 2014). On the other hand, micro perspectives highlighting the strategies employed by users in 'domesticating' technologies for local use have also found a consistent place in the discourse (Asangansi et al., 2013; Heeks, 2002; Matavire & Manda, 2014). Few have undertaken to develop explanations that transcend these dichotomies. In this regard, "*pursuing alternative perspectives on, and ontologies of, technology may be especially important and valuable*" (Orlikowski, 2010, p. 127). In our analysis, we have discovered emergent fit between the phenomenon, and conceptions of Lefebvre (1991) on 'production of space'. Numerous studies have highlighted the value of spatial analysis in information systems research which they rightly contend is often taken for granted as demonstrated by the paucity of such studies (Czarniawska, 2004; Jorgensen & Sorensen, 1999; Kaniadakis, 2012; Sahay, 1997). We look to Lefebvre (1991), and his concept of 'production of space' to theorise the process through which the server infrastructure in the Zimbabwe health ministry emerges from, and necessitates the formation of, new relations. We see that to run the technology, a decentralised architecture and its spaces need to transition to a centralised architecture with the requisite spatial rearrangements. However, misalignments between the conceptions of planners, necessary competencies and daily realities of users constrained the emergence of the new infrastructure.

2. THEORETICAL BACKGROUND

2.1. Production of Space

A key challenge that motivated Lefebvre (1991) to present the concept of production of space was the dominance of the object-subject distinction in philosophy and social science. This,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

573

according to Lefebvre served a discourse that propagated and increased the gap between the mental and the social. Marxism transcended these dichotomies by providing a theory and methodology which related the physical, mental, and social aspects of life. However, unlike many of his contemporaries in the French Communist party, Lefebvre viewed Marx historically and dialectically. Marx's categories of analysis, particularly the economic analysis of commodities and social relations were limited by the time and place of his writing. For Lefebvre, the increasing importance of urbanization and space and its effect on everyday life was simply not visible to Marx at that time. He was thus not able to adequately address the challenge presented by new developments in the productive forces of society giving rise to a '*new mode of production which is neither state capitalism nor state socialism, but the collective management of space*' (Lefebvre, 1991, p. 103). This discussion of Lefebvre (1991), dovetails with an increasing awareness in information systems that the distributed nature in which software is now developed, implemented and used calls for spatial conceptions of the phenomenon (Kaniadakis, 2007; Pollock & Williams, 2008). The concept of 'production of space' can therefore provide greater analytical insight into these spaces of technology development, implementation and use. Despite this shared awareness, very little has been done to utilise these ideas in technology studies, a gap we aim to fill in this paper.

Lefebvre (1991) posits a tool, the spatial triad, in order to uncover the process of production of social space. Within this tool are what he refers to the moments of production of space which are 'spatial practice', 'representations of space', and 'representational space'. Lefebvre (1991, p. 38) notes that "*the spatial practice of a society secretes that society's space, it propounds and presupposes it, in a dialectical interaction*". Spatial practice, also referred to as perceived space, foregrounds the relationship between a space and its use and can be understood by looking at the varying competencies that make up a society. For instance, the hospital as a space engenders visions in the mind of the practice of doctors, nurses and their patients of using that space. Similar analogies can be demonstrated for markets, stadia, malls, and other spaces demarcated for specific practice. Representations of space are the conceptualised spaces and these are related to techniques which produce artifacts such as maps, plans, models, and designs of a space (Lefebvre, 1991). Representations of space, also known as conceived space, are linked to "*tools, methods, systems, discourses, models, images, and strategies which are engaged in the materialisation of ideas*" (Carp, 2008, p. 134). Finally, the third in the conceptual triad of Lefebvre (1991) is 'representational space', which is also known as lived space. Representational spaces "*are those places that evoke an unusually deep sense of meaning*" (Carp, 2008, p. 135). Lefebvre (1991, p. 33) posits that representational spaces embody "*complex symbolisms, sometimes coded, sometimes not, linked to the clandestine or underground side of social life, as also to art*". If coded, representational spaces could be monuments, memorials, churches, art forms and other such structures which are found in social space. Having expounded the conceptual triad as such, it is important to note that it is to be considered in a holistic and concrete manner if the concept of 'production of space' is to be grasped. Consequently, Lefebvre (1991) thinks of the elements of the spatial triad as 'moments' in the production of space.

2.1.1. Placing Technology in Space

Having introduced the concept of production of space, it is important to bring to the fore the 'place'' that information technology has in this process. According to Smith (2008), advances in information technology differentiate and enhance co-operative labour between workers distributed in space, something which is of vital importance to capital by virtue of its reduction of the costs of production. In particular, "*the obsolescence of old technologies and the rise of new ones, so vital to capitalism, is simultaneously the transformation of old spatial structures into new ones*" (Smith, 2008, p. 128). New information technologies therefore, at least partially, account for changes in the spatial relationships of production. Lefebvre (1991) also notes that space is both a product and is itself a means of production. This means of production, and the

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

574

product, can not be separated from the "*productive forces, including technology and knowledge, or from the social division of labour ... or from the state and the superstructures of society*" (Lefebvre, 1991, p. 85), and also, perhaps, from nature. The production process itself implies mediation, that is the application of a technique to move from the 'raw material' to the product (Lefebvre, 1991).

2.1.2. Health information systems strengthening space

Pollock and Williams (2010, p. 540) assert that the healthcare sector has "*the largest and most complex organisational structures*". The healthcare space of nations considered as developing is particularly complex in that it is populated by multiple donor agencies and programs with vertical reporting systems (Braa & Sahay, 2012; Lippeveld, Sauerborn, & Bodart, 2000; Taderera, Madhekeni, Zhou, & Chevo, 2012). The state has increasingly co-opted donor agencies in order to support service delivery in the areas of healthcare, education etc (Gary, 1996). Co-optation refers to a scenario where one group uses the space of another, in areas where interests meet, in order to achieve its own objectives. Lefebvre (1991) provides the example of the earlier and enduring use by Christians of buildings which had originally been set aside for other public activities as its cathedrals as a successful case of co-optation. This co-opted space is the dominant space in health information systems interventions where policy, strategies, plans, architecture, standards, technologies, and funding mechanisms are agreed upon among diverse stakeholders (Braa, Monteiro, & Sahay, 2004). The space of health information systems strengthening is consequently constituted of actors of varying competencies, from the local level of health workers, to the global level of multilateral and unilateral agencies. Furthermore, many of the actors are actual users of the health information systems that are implicated in this space and interventions are driven by their acceptance of the systems in their contexts (Braa & Sahay, 2012).

3. RESEARCH APPROACH

Overall, the study was conducted within the action research tradition (Davison, Martinsons, & Kock, 2004). Since the aim of the study was to generate an explanatory theory of the development and implementation of a generic software in a local setting, for which action research is not fully equipped (Baskerville & Pries-Heje, 1999), it was supported by techniques from the grounded theory methodology (Glaser & Strauss, 1967; Matavire & Brown, 2013). A particular technique that was used for theoretical elaboration from the methodology was the 'constant comparative method'. This implied the continuous and reflexive movement between data, theoretical codes and literature in search of both gaps in literature and relevant conceptual formulations which were faithful to the empirical material. This was supplemented by discussions among the co-authors on the implications, fit and suitability of alternative conceptions of the phenomenon under study. Early stages of the study were largely inductive, yet latter stages focussed on the emergent theoretical conception and its applicability in explaining the data.

3.1. Research Context

The research context concerns an initiative by the Ministry of Health and Child Care (MOHCC) in Zimbabwe to implement an Internet-based routine health information system from early 2012 to late 2013. The study was exploratory, with initial visits organised to get insight into a relatively concealed process and later visits being organised with specific interventions in mind. The study presented a unique opportunity to study the implementation of the system from prior to a decision to adopt the system, through to piloting and rollout to more than 60 districts in the nation. The global context of the development and implementation of the generic DHIS 2 software that was being implemented by the MOHCC also presented a unique phenomenon of enquiry. The authors were involved with the project at the numerous levels, from having access to developers and sponsors based in the north, to interacting with implementation partners and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

575

government officials at the numerous levels of the MOHCC and across organisational boundaries in Zimbabwe. The study was concerned with understanding this ensemble of people, organisations, artefacts and practice and developing explanatory theory on the development, implementation and use of generic software.

3.2. Data Collection

Following the action research method of learning by doing, actors across organisational units, in and outside the health ministry, were engaged to identify and resolve the various challenges that were being faced in adopting and implementing the DHIS 2 technology. Up to 24 interviews were conducted with health staff from the facility up to the national level and across organisational boundaries. These were with 7 directors, 2 programmers, 2 provincial officers, 6 district health information officers, and 7 health facility workers. Interview questions were focused on understanding the health information system from the perspective of the different actors at the multiple levels, identifying problems and collectively designing interventions to resolve them. Observation of health information staff was done in their work settings and in training sessions arranged in order to understand work practices and facilitate the transition to the new system. This paper focuses on the area of server infrastructure which was a critical component to the system, and for which engagement with the authors intensified in the 6 months from June 2013 to December 2013. During this period, two field visits were organised, the first with two of the authors of this paper and the second with all three. In particular, a training workshop for IT staff in the ministry of health in order to build capacity around the server infrastructure, which had almost completely been neglected in the roll-out of DHIS 2 was organised. During this training, a participatory risk analysis exercises with the IT staff was conducted. The aim was to understand the risks around the deployment of the system and to collectively design interventions to resolve them.

3.3. Data Analysis

The data collected, and activities for each day were developed into comprehensive field notes. The field notes were in turn developed into more palatable reports which were shared with the MOHCC, training participants and partners. Using these reports, plans for further intervention were developed with feedback from the numerous stakeholders, both 'local' and 'global'. Information and documents collected in the research were kept confidential, stored on local machines and also backed up on virtual machines. The study occurs in a complex domain where knowledge claims are tested in practice, and where the subjects of research can speak out against science. The scientification of society or socialisation of science is often considered in itself as a unique characteristic of emerging global phenomenon (Nowotny, Scott, & Gibbons, 2001). Consequently, participants in the study were to varying degrees involved in analysing the phenomenon. We were involved in diagnosing problems, and solving them in a practical setting. Our interventions were judged as essential by the participants and constituted ongoing analysis. The authors also discussed on the key areas on which the phenomenon could be theorised. After numerous cycles, the authors agreed on the relevance, fit and explanatory reach of Lefebvre's (1991) ideas on the 'production of space'.

4. RESEARCH CASE

Zimbabwe is a country in Southern Africa which was in 2012 struggling to emerge from a serious political and economic crisis characterised by hyperinflation and abandonment of the national currency. As a nation, it obtained independence from British colonial rule in April 1980. It underwent a number of socio-economic and political transitions culminating in the imposition of sanctions by its western allies at the turn of the millennium. During this period, a hyper-inflationary environment was experienced as foreign currency reserves were depleted, lines of credit were closed and donors scaled down their initiatives in the country. It is also during this period that the public health system struggled and collapsed, exacerbated by an exodus of skilled

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

576

professionals such as administrators, health information officers, doctors, and nurses to other countries. Prior to the crisis, Zimbabwe's health information system was considered the best in the Southern African region, given that the nation had been developing it since its attainment of independence, buoyed by a vibrant educational system. However, the economic crisis reversed many of the gains made, affecting the individual, social, economic and political fabric of the nation.

A key development in the nation is the ultimate increased involvement with the international donor community. Civil society in the nation had also become politically polarised, and trust in the governments' ability to implement programs had ceased. A result was that, international funding for key sectors of the economy, such a healthcare, was channelled through parallel systems. This led to the proliferation of program specific silos which received funding on behalf of their areas of interest such as malaria elimination, Prevention of Mother to Child Transmission (PMTCT), AIDS, TB and health systems strengthening. However, in spite of these challenges, the nation set forth to establish a vision for the development of its health systems after 2008. The year 2008 is significant, as it marked the zenith of socio-economic decline in Zimbabwe, leading to the forced transition of the nation to a government of national unity, which lasted until 2013. The nation also adopted a multi-currency regime to mitigate the effects of inflation. Civic society was increasingly co-opted into the government at all levels and donor agencies found themselves in strategic positions across the board as government sought re-engagement with the international community. A national health systems strategy was developed, whose aim was "*first to provide a framework for immediate resuscitation of the health sector and second, to put Zimbabwe back on track towards achieving the Millennium Development Goals*" (MOHCW, 2009a, p. 1). The 'Zimbabwe Health Information System Strategy' was also developed, given the necessity to develop the '*information building block*' of the overall health system.

4.1. Development of the Health Information System

To address the increased burden of disease and health service demand for increased data availability, the ministry had piloted the routine National Health Information and Surveillance (NHIS) system in 1985 and rolled it out in 1988 (MOHCW, 2009b). In 2004, this system had been recognised and awarded the title of best health information system in the region. Due to changes in technology, and given a new strategic direction of the unity government, and in collaboration with South African Health Information Systems Programme (HISP SA), an access based District Health Information System (DHIS 1.4) was piloted and introduced in 2010, replacing the NHIS system. DHIS 1.4 is a standalone system based on Microsoft Access technology. The system was successfully implemented by ZimHIS, a donor supported US agency, in partnership with the MOHCC and other international donors. Persistent calls for wider data availability and system integration of HIS, in line with the health strategy, are key drivers that led the MOHCC to a pilot of DHIS2 technology, which followed in December 2012. DHIS2 is a generic web based repository for tracking service indicators collected by healthcare providers used in over 50 countries and developed at the University of Oslo. The possibility of the system to interoperate with other technology through its application programming interface (API) made it a good candidate in the MOHCCs pursuit of a 'unified health information system'. The transition from DHIS 1.4 to DHIS 2 is as represented in Figure 1, below. Using the DHIS 1.4 technology, data was tallied daily and summarised periodically on paper at health facilities by nurses. These were sent to the administrative level for entry into the DHIS 1.4, by the District Health Information Officer (DHIO). They would in turn collate the data from other facilities, compress it and email, or send via memory device, to the next level. The process would be repeated at the provinces, with the data emailed to the national level.
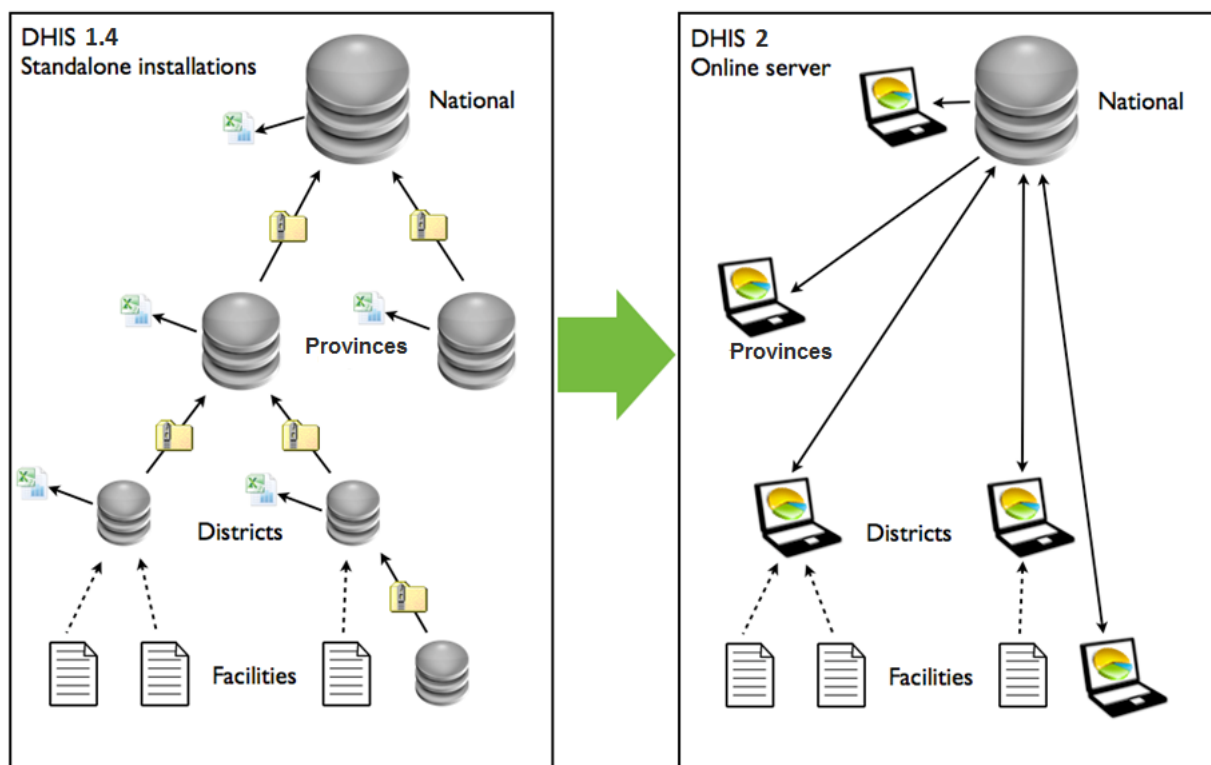
Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

577

Figure 1. Spatial Representation of transition from DHIS 1.4 to DHIS 2

The nature of the DHIS 2 technology also implied new relationships with the global community, particularly those based in Oslo, besides the need for a robust server infrastructure in the MOHCC headquarters. Furthermore, this implied engaging other stakeholders such as the government's internet service provider, and a team of programmers based at an organisation which was housed at a local university (varsIT) in order to bridge the gap between its global development and local users. ZimHIS, had the limited capacity of a single developer but had the strategic advantage of being housed in the MOHCC headquarters and being responsible for the day to day maintenance of DHIS 1.4 technology, among numerous other health information tasks such as capacity building. The MOHCC had limited IT personnel within its ranks, and consequently co-opted ZimHIS for support and maintenance. varsIT also provided complementary support to the MOHCC, particularly in developing and implementing the human resources information system. Other programs such as AIDS/TB and Malaria were not only running their own HIS, within their vertical IT Units, but were engaged in processes of procuring new technology from countries such as Tanzania and Ethiopia. The University of Oslo had been engaged to support integration of these systems through the DHIS 2 technology which was developed through its Health Information Systems Program (HISP). In particular, the national malaria control program started a project with HISP to develop mobile tools for monitoring cases in rural facilities. The legacy routine health information surveillance technology DHIS 1.4, being based on a Microsoft Access database, was maintained on desktop computers by the health information officers at the different levels of the health system, which are patient care level, health facility level, administrative level, and the national and international level. It is important to note that another health program, ZimRBF had also implemented DHIS 2 in Zimbabwe almost 12 months prior to the MOHCC, albeit in its own silo and with uneven success. They utilised the services of private consultants based in Tanzania, a fact which could not discount a need for local support. Later a local intermediary was given the task to address the day to day challenges that arose.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

578

5. FINDINGS / DISCUSSION

The risk analysis exercise revealed that Internet infrastructure at the national level was highly problematic, particularly as regarding a limited capability at this level to support the server. The network within the building was unsegmented and unmanaged and shared by hundreds of users, many with misconfigured machines. For most of the working day the network (including the single internet link) was saturated with unexplained and unmonitored traffic. The physical state of the server room was also poor, with insufficient air-conditioning, inadequate power supply and accumulated technological waste around. There was almost absolute reliance by the MOHCC for technical support on a single developer from the co-opted ZimHIS, coupled with an inadequate backup process and the absence of a disaster recovery plan raising the risk of data loss. There was no framework to engage consultants, vendors and partners, such as non-disclosure agreements. There were no available agreements with equipment vendors for the equipment that had been obtained. Co-opted agencies had uneven power relations foregrounding politics of controlling this server space at the expense of the production of the system. Due to limitations in skill, and weakened decision making capabilities there was also limited technical support coming from the IT unit. A solution proposed was for ZimHIS to mobilise resources in order to support a vacant IT director position in the MOHCC, thus increasing decision making capabilities in the unit. However, this had political connotations in this space. The IT Unit had a different reporting hierarchy, distinct from the health information unit thereby presenting challenges for support of the 'new' systems within the information unit. Sanctions on the country posed a risk for the security of the system given that the nation could not obtain certificates for encrypting data which are often provided by US and western agencies.

Organisation of server infrastructure development, while constituting the backbone of the implementation and rollout of the system, was given scant attention. The focus was on networking the country and while large amounts were used to lay fiber cables to all districts, funding for the server and its connection to the network outside the MOHCC headquarters was more or less forgotten. Web and server based technologies were not well known in the MOHCC, nor among donors or implementing actors who saw the 'server' as the container of the data and therefore something they needed to control. Among them were numerous ideas as concerning the hosting of the server, including hosting in the MOHCC headquarters despite inadequate infrastructure, increasing connections into this building, hosting in a main hospital, utilising local private cloud solutions or selecting international cloud hosting. This lack of understanding and politicisation of technology, as actors sought to occupy this 'empty' space, led to the sub-optimal configuration and implementation of the system which had an impact on the performance of the system since improved connectivity at the facility level would not matter if the server was unavailable. A district information officer noted that this impacted on his ability to retrieve reports when they were requested by executive staff. Prior to the implementation of the DHIS2 system, addressing technical challenges had been managed in a distributed manner by health information staff at the district, provincial and national level with limited support provided by ZimHIS. The new system represented a spatial shift to a stronger technical core unit, something only partially considered in plans and the production of this space proved difficult in practice.

6. CONCLUSION

Introduction of new information technologies and changes in the technological setup account for changes in the spatial relationships of production. Analytically, and utilising Lefebvre's (1991) conception of production of space, changes in productive relationships should be seen at the levels of spatial practice, representations of space and the representational spaces. These correspond in our case to the co-opted donor driven spatial practice, a representation of space inscribed in the DHIS 2 architecture replacing the older technology, and representational spaces of users of the technology which are changing with the shift to the new mode of production. The

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

579

dominant space of donor organisations led by the MOHCC decided upon the adoption of the DHIS 2 technology, and its representations of space. The representational spaces of users at the district were the subject of the rollout of a fibre optic network enabling them to enter data into the DHIS 2 system, while there was a conflict between the representational spaces of users at the national level and the representations for server infrastructure in the technology. While before, each district managed their own technology relatively independently, in the new central server based paradigm, they would suddenly all have to rely upon a centralized production set-up: a totally new technological space was being generated in conflict with pre-existing representational spaces. Due to lack of initial knowledge, the first approach focused on control of, rather than mastering of the technology.

We have seen that in the production of the space of the Zimbabwe health information system, there are contradictions between the mental, social and physical moments or dimensions of space. The shift in the technology design and architecture (from decentralised district 'servers' towards a central internet based server) has not been fully understood in terms of its organisational consequences, nor has it been properly catered for in terms of its material consequences. IT management structures and physical data centre infrastructure need to be co-produced with technology architecture but these have each proceeded at their own pace and according to the demands, interests, constraints and priorities of different actors. We have seen how the resulting misalignments are a source of risk for the ministry which need to be identified and managed. It is our view, based on the findings described here as well as elsewhere, that a broad spatially oriented approach to capacity development and security management is a useful way for the state to approach the discussion on clouds, data centres and hosting of web based information systems in the public sector. We see that the production of space perspective is useful in demonstrating the material aspects of web based technologies like DHIS 2. Technology that is Internet based comes inscribed with 'representations of space' which need to be produced in context, yet are sometimes taken for granted by the stakeholders concerned, including intermediaries engaged in implementation and development of the systems. This study shows that the spatial aspects of implementation of technologies in countries having limited infrastructure need to be foregrounded in order that these system meet their objectives. While the pre-existing arrangements in many African nations show significant degrees of co-optation, proper understanding of this space can lead to the sustained 'production of space'. The production of space as a historic "extrusion" also creates new voids, contractions and continuous opportunities for co-optation, domination and appropriation by different external and internal interests. This study has demonstrated the practical significance of the 'production of space' perspective in analysing complex spaces of technological development. The scope of the work of Lefebvre is broad, and hence we see this as presenting opportunities to current IS discourse. In particular, recent perspectives which seek to discuss the materiality of technology will benefit from this body of work.

7. REFERENCES AND CITATIONS

Alvesson, M., & Sköldberg, K. (2009). *Reflexive methodology: New vistas for qualitative research*: Sage Publications Limited.

Asangansi, I. (2012). Understanding HMIS Implementation in a Developing Country Ministry of Health Context-an Institutional Logics Perspective. *Online journal of public health informatics, 4*(3).

Asangansi, I., Macleod, B., Meremikwu, M., Arikpo, I., Roberge, D., Hartsock, B., & Mboto, I. (2013). Improving the Routine HMIS in Nigeria through Mobile Technology for Community Data Collection. *Journal of Health Informatics in Developing Countries, 7*(1).

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

580

Baskerville, R., & Pries-Heje, J. (1999). Grounded action research: a method for understanding IT in practice. *Accounting, Management and Information Technologies, 9*(1), 1-23.

Beck, U., Bonss, W., & Lau, C. (2003). The theory of reflexive modernization problematic, hypotheses and research programme. *Theory, Culture & Society, 20*(2), 1-33.

Braa, J., Monteiro, E., & Sahay, S. (2004). Networks of action: Sustainable health information systems across developing countries. *Mis Quarterly, 28*(3), 337-362.

Braa, J., & Sahay, S. (2012). *Integrated Health Information Architecture*. New Delhi, India: Matrix Publishers.

Carp, J. (2008). "Ground-Truthing" Representations of Social Space Using Lefebvre's Conceptual Triad. *Journal of Planning Education and Research, 28*(2), 129-142.

Czarniawska, B. (2004). On time, space, and action nets. *Organization, 11*(6), 773-791.

Davison, R., Martinsons, M. G., & Kock, N. (2004). Principles of canonical action research. *Information systems journal, 14*(1), 65-86.

Gary, I. (1996). Confrontation, co-operation or co-optation: NGOs and the Ghanaian state during structural adjustment. *Review of African Political Economy, 23*(68), 149-168.

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*: Aldine de Gruyter.

Hanseth, O., & Lyytinen, K. (2010). Design theory for dynamic complexity in information infrastructures: the case of building internet. *Journal of Information Technology, 25*(1), 1-19.

Heeks, R. (2002). Information systems and developing countries: Failure, success, and local improvisations. *The Information Society, 18*(2), 101-112.

Hotchkiss, D. R., Aqil, A., Lippeveld, T., & Mukooyo, E. (2010). Evaluation of the performance of routine information system management (PRISM) framework: evidence from Uganda. *BMC health services research, 10*(1), 188.

Jorgensen, U., & Sorensen, O. H. (1999). Arenas of development-a space populated by actor-worlds, artefacts, and surprises. *Technology Analysis & Strategic Management, 11*(3), 409-429.

Kaniadakis, A. (2012). ERP implementation as a broad socio-economic phenomenon: The agora of techno-organisational change. *Information Technology & People, 25*(3), 259-280.

Kaniadakis, A. (2007). *The Agora of techno-organisational change*. University of Edinburgh.

Lefebvre, H. (1991). The production of space, trans. Donald Nicholson-Smith: Oxford: Blackwell.

Lippeveld, T., Sauerborn, R., & Bodart, C. (2000). *Design and implementation of health information systems*: World Health Organization Geneva.

Matavire, R., & Brown, I. (2013). Profiling grounded theory approaches in information systems research. *European Journal of Information Systems, 22*(1), 119-129.

Matavire, R., & Manda, T. D. (2014). Design Breakdowns As Opportunities For Articulating Mobile Health Information Infrastructures. *The Electronic Journal of Information Systems in Developing Countries, 63*(3), 1-17.

MOHCW. (2009a). *The National Health Strategy for Zimbabwe 2009-2013. Equity and Equality in Health: A People's Right*. Harare.

MOHCW. (2009b). *Zimbabwe Health Information System Strategy 2009-2014*. Zimbabwe: MOHCC.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

581

Nowotny, H., Scott, P., & Gibbons, M. (2001). *Re-thinking science: knowledge and the public in an age of uncertainty*: SciELO Argentina.

Orlikowski, W. J. (2010). The sociomateriality of organisational life: considering technology in management research. *Cambridge Journal of Economics, 34*(1), 125-141.

Pollock, N., & Williams, R. (2008). *Software and organisations: The biography of the enterprise-wide system or how SAP conquered the world*: Taylor & Francis US.

Pollock, N., & Williams, R. (2010). E-infrastructures: How do we know and understand them? Strategic ethnography and the biography of artefacts. *Computer supported cooperative work (CSCW), 19*(6), 521-556.

Puri, S. K., Byrne, E., Nhampossa, J. L., & Quraishi, Z. B. (2004). *Contextuality of participation in IS design: a developing country perspective*. Paper presented at the Proceedings of the eighth conference on Participatory design: Artful integration: interweaving media, materials and practices-Volume 1.

Read, S., de Laat-Lukkassen, M., & Jonauskis, T. (2013). Revisiting "Complexification," Technology, and Urban Form in Lefebvre. *Space and Culture*, 1206331213487060.

Sahay, S. (1997). Implementation of information technology: a time-space perspective. *Organization studies, 18*(2), 229-260.

Sahay, S., Sæbø, J. I., Mekonnen, S. M., & Gizaw, A. A. (2010). Interplay of institutional logics and implications for deinstitutionalization: case study of HMIS implementation in Tajikistan. *Information Technologies & International Development, 6*(3), 19-32.

Sanner, T. A., Roland, L. K., & Braa, K. (2012). From pilot to scale: Towards an mHealth typology for low-resource contexts. *Health Policy and Technology*.

Sanner, T. A., & Sæbø, J. I. (2014). Paying Per Diems for ICT4D Project Participation: A Sustainability Challenge. *Information Technologies & International Development, 10*(2), pp. 33-47.

Smith, N. (2008). *Uneven development: Nature, capital, and the production of space*: University of Georgia Press.

Taderera, H., Madhekeni, A., Zhou, G., & Chevo, T. (2012). Sector Wide Approach in Health: Policy Response and Framework in Zimbabwe. *Journal of Public Administration and Governance, 2*(1), Pages 158-175.

Zhang, Z. (2006). What is lived space? *ephemera*, 219.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

582

INFORMATION SYSTEMS ARCHITECTURE AS PRODUCTION - BUILDING HEALTH INFORMATION SYSTEMS IN RWANDA

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Abstract: This paper is about the production of the health information system in Rwanda. It is a critical account which situates the ongoing architectural process historically and spatially. We have drawn on the ideas of Henri Lefebvre to pay particular attention to the often underplayed spatial dimension of information systems architecture. We draw some connections between the national space of Rwanda and other spaces and places in the world. We conclude that the architecture of such systems (including its discourse) takes place within the connected space of the world and actively produces all of that space simultaneously.

Keywords: architecture, development, ICT4D

1. INTRODUCTION

In this paper we discuss architecture in the context of the health information system of Rwanda. Borrowing from the theoretical work of Henri Lefebvre, we conceive of architecture as productive processes and practices whereby society shapes, secretes and reproduces its space. Whereas the public health system of Rwanda is active within national boundaries, or the territory of the state, the health information system is also a product of actions, intentions and trends in a broader world of technology, global initiatives and national and international interests.

The term architecture in the fields of computing, software engineering and information systems is used to describe a number of quite different concepts. In this paper we will explore how ideas which have been influential in the broader discipline of architecture and urban planning may be useful to interpret long term, complex ICT4D projects. To be clear, we use the term architecture to denote a set of (spatial) practices, thus distinguishing architecture as a practice from the products of architecture.

The architecture of the routine health information system in Rwanda is an ongoing project which is located historically at a moving intersection of moments in global health discourse, global capitalism, the global HISP project, and most importantly, within the historical trajectory of Rwanda's social, political and economic development – particularly in it's healthcare and ICT sectors. It is also located in space, and in places. A central assertion of Lefebvre is that these physical, mental and social spaces of "development", of health care, of Rwanda, of Oslo, of software and of the internet do not only form a passive backdrop or context to the architectural endeavour - they are also themselves being actively produced and reproduced by it. A central concern for the Rwanda Ministry of Health is how to appropriate, direct and sustain the architecture and the products of architecture, rather than simply enjoy the use value, or utility, of the system. This is both a practical question of human and infrastructural capacity development as well as a theoretical one related to how and from where the processes and products of architecture are driven and how value is created and appropriated.

We believe that such a theoretical exploration is particularly overdue in the context of information systems implementation in what are termed developing countries. There is for example some 25 years of deliberation in the IFIP 9.4 working group on "Social Implications of Computers in Developing Countries", much of that time (during occasional moments of critical self awareness) spent grappling for a sense of how ICTs contribute to development. There seems to be little progress made, neither in practice nor in theory. Perhaps particularly in theory (see Avgerou (2010), Thompson and Walsham (2010)).

2. ARCHITECTURE, SPACE AND DEVELOPMENT

2.1. Architecture

The effort to draw up on the concept of architecture in relation to ICTs is complicated by the fact that the architecture term has been differently appropriated by engineers, designers, managers, academics and practitioners in various fields of computing to mean quite different things. Broadly the literature has referred to computer architecture (related to hardware design), software architecture (related to the engineering practice of constructing programs) and enterprise architecture (relating to the governance and alignment of information systems with organisational goals). See Vassilakopoulou and Grisot (2013) for an overview of the varied use of architecture terminology in the IS field. More recently we have also seen the arrival of information architecture (with its roots in library and information science) in the context of structuring information on the web. It is variously used as noun and verb and variously incorporates notions of structure and process.

This ambiguity is present in the recent definitive book on the HISP project by Braa and Sahay (2012), where the term is variously used to describe socio-technical processes and systems as well as (good) technical design and software system artifacts (architectures). That there should be a complex, interrelated and even contradictory mesh of products of architecture is to be expected. Cunningham and Goodbun (2006), writing in the Journal of Architecture, identify three things that architecture produces within a Marxist understanding of social relations and productive forces: "*First, operating according to the demands of development, it produces particular material objects (buildings, environments, spectacle). Second, it produces social practices associated with both the production and consumption or occupation of these specific material objects and technologies. Third, it produces and reproduces itself as a discourse, as knowledge*" (Cunningham and Goodbun, 2006, p. 179).

This sense of architecture as a complex and productive social process or practice resonates with that perspective in the Information Systems discipline which sees information systems as primarily socio-technical, producing simultaneously technical artifacts and configurations together with social practice. Though by including the production of knowledge, it goes perhaps a step further. Of course the material production of buildings and cities (and their archaeological remains) provide readily readable texts for the production of architectural knowledge. This is less obviously so with information systems whose immaterial parts can remain opaque to all but a few on the one hand and also vanish without trace (or ruins) on the other. The commodification of products (including knowledge products) under a capitalist mode of production suggests also that such production will also generate fundamental contradictions related to use and exchange value. It is tempting to believe that the use of Free/Open Source Software on the one hand and participatory Action Research approaches in IS on the other, can both somehow neutralize these value categories and render their contradiction irrelevant - reducing all to a simple collaborative effort to generate use value which somehow serves the (imprecise) aims and objectives of development.

Architecture as a set of human practices and reflections in its more general sense is deeply inscribed in human history and culture. In its impact on the built environment its remnants tell stories of the ways people lived, how wealth and power were concentrated at particular times

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

584

and across particular spaces and what it is that those people have chosen to (and were constrained to) imagine and build. Richard Adam writing in the Architectural Review claims that *"...architecture can be a mirror to society ... But this view can be reversed; society can be made a mirror to architecture. We can understand architecture as a natural reflection of what is current socially, politically and economically"*. (2008)

For example Mussolini consciously used the expressive power of monumental architecture to convey and animate the fascist idea of the day. South African apartheid-era town planners designed black townships incorporating features of surveillance, control and separation. Architecture reflected, amplified and exerted the "big idea" of the day, that is the dominant idea of the powerful. In Production of Space, Lefebvre (1991) laments one of the singular failings of the Soviet Union was this failure to produce a new *socialist* space. The Soviet avant garde period which produced remarkable works of art, literature and architecture in the immediate pre- and post-revolutionary period was soon suppressed under the crushing weight of stalinist state productivism.

It is not unusual for architecture to reflect and celebrate new beginnings, particularly as new states are born and begin to consolidate power in territorial space. They are fragile and intense moments at, what the Jamaican socialist thinker and cricket writer, CLR James (1984), termed "the rendezvous of victory". And so, for example, the ultramodernist Indian city of Chandigarh, though laid out by Le Corbusier in 1951, was the product of Nehru's post independence vision of a new India: *"Let this be a new town, symbolic of freedom of India unfettered by the traditions of the past..... an expression of the nation's faith in the future"*.[1]

There may be some echo with the ambitious master plan for the city of Kigali, which similarly reflects the determinedly modernist drive of the Rwanda Patriotic Front in Rwanda, even in the face of caution from some in the international community and scholars like Goodfellow and Smith (2013) who have questioned its audacity and are discomforted by its vision.

The danger posed by such abstract city constructions to the everyday lived human life of the city has been described by Christopher Alexander (1968). Alexander is the architect whose work on patterns and pattern languages is best known in the software engineering field. But his work on architecture and town planning, which deals very fundamentally with the often contradictory scales of architecture with lived life, has not been widely referred to in Information Systems. What we attempt to do below is to link these notions of architecture as conscious production, with Lefebvre's theory of space within the broader context of what is understood as development. In doing so we present health information systems architecture in Rwanda as a strand within the broader architectural tradition.

2.2. Lefebvre on Space

Henri Lefebvre was a French marxist sociologist and philosopher whose work reflected a wide range of interests and spanned the better part of the last century. Though less well known in the English speaking world, his work is mostly known through the work of radical human geographers such as David Harvey (1989) and Ed Soja (1996). It is largely through these secondary appropriations that Lefebvre's ideas have found themselves into literature related to information systems and information technology. For example, early work of Sundeep Sahay (1997) adapts Harvey's spatial framework to provide a spatio-temporal framework for understanding socio-technical context. Harvey's framework derives from Lefebvre's triadic conceptualization of simultaneously perceived, conceived and lived space. This triad is presented (in different ways and under different guises) in Lefebvre's classic work on *"The Production of Space"* (Lefebvre (1991)). The work of Lefebvre himself is strongly influenced by his innovative reading of Hegel, Marx, Nietsche and Heidegger. There are two key ideas

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[1] From the official website of the Chandigarh Administration http://chandigarh.gov.in/knowchd_gen_ historical.htm

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

585

from *"The Production of Space"* which we will use in the analysis of architecture in relation to our case:

1. The contention that society actively produces, and is produced within, its own space (Lefebvre, 1991, Ch. 1). Information systems, particularly explicitly spatial ones such as a national health information system, are produced and materialized within space through existing social relations and in turn actively produce and reproduce those relations in space. To develop a critical understanding of IS architecture we need to address this complexity of what is being produced, together with the related questions of how and by whom.

2. That 'context' is not simply local or global or somewhere in between. *"Space's hegemony does not operate solely on the 'micro' level . . . nor does it apply only on the macro level as though it were responsible merely for the ordering of 'flows' within nations or continents . . . Today our concern must be space on a world scale . . . as well as with all the spaces subsidiary to it, at every possible level."* (Lefebvre, 1991, p. 412)

2.3. Development

Avgerou (2010) has analyzed existing discourses on ICTD along two axes. First she identifies ways in which context is addressed as being part of *universalist* and *situated* research traditions leading to the analysis of *transfer and diffusion* processes or *socially embedded* processes respectively. Second, she identifies how the question of development per se is treated differently by different researchers. Starting with an underlying assumption that there are specific transformative development aims, researchers tend to take a stance which is either *progressive* or *disruptive*.

On the axis of context, our point of departure is to consider architecture as a process of production in mult-levelled space. This necessarily implies a more complex view of context, incorporating the site of implementation and use (the Rwanda health system) as well as its place in the world. Here processes of transfer and diffusion combine with processes of social embedding in complex ways. There is a global division of labour involved in the production and distribution of exchange and use value which is not properly made clear by focusing only at one scale. In order to understand what gets produced, why this (rather than that) and for who and by whom it is necessary to look more or less simultaneously at a totality of space together with the particular. Of course space and the world is infinitely layered and divisible and so any attempt to consider its wholeness and its parts is fraught with difficulty - the selection process in the end betrays the epistemological and political positions and constraints of the researchers as well as the practical constraints of data collection.

The question of "development" (and perhaps particularly its aims) is problematic. Whereas it is tempting to trot out a prevailing wisdom that development consists of processes which expand human capabilities and freedoms to live the lives they value the ideas of Amartya Sen (1999) - observation of concrete practice in the world shows a more complex and contentious picture. Whereas few would argue that Sen's aims are not laudable aims, they are not the only aims and different actors are motivated differently in terms of the societal transformations required to bring about such individual development.

In a comprehensive and critical review of development theories, Peet et al. (2009) discuss a range of theoretical approaches which have been applied at different times and from different quarters, including Keynesian and neoliberal economic theories, theories of modernization, Marxist world systems theory and dependency theory, post-structuralist, post-modern, post-colonial and feminist theories. The range of approaches (and responses) leads Rist (2002, 2007) to conclude that the history of development reduces to a somewhat vague and imprecise "set of beliefs and assumptions about the nature of social progress". Development as a buzzword, or worse, an unchallengeable global faith, leads Rist to similar conclusions as Escobar (1995) and

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

586

Shiva (1988) - that the development concept itself can be as much a part of the problem as the "solution" to matters of human progress.

For all of the hazards outlined above, in this paper we are cautious not to commit ourselves to a developmental stance and have preferred where possible to avoid terms such as development, developing country etc. Rather we describe the process of architecture in the production of the health information system architecture in an African country from our multiple perspectives in the world. We return in the discussion to what might be understood as a Lefebvrian take on "development".

3. RESEARCH APROACH

The overarching research approach has been one of active engagement in the practical work in Rwanda to strengthen health information systems. While not dissimilar in practice to that of Action Research, there are however large enough differences that warrant some reflection. First, one author is engaged in the activities as his main occupation, with no overall research strategy other than to inform the day to day work. Second, the engagement of the other authors have not been planned as according to Canonical Action Research Principles, especially with regards to planned cycles of evaluation and dissemination of learning. However, the research *has* been carried out in cycles of engagement, and all authors have been actively involved, to greater or lesser extent, in the practical tasks of architecture in Rwanda as well as in the wider-spaces referred in this paper.

We have taken what might be termed a critical approach to this research. Critical both in the sense of challenging some ways of thinking (for example, about information systems architecture and development) but also in our conclusions which have something to say about dependency, self-reliance and the relationship between health information systems and the state.

This endeavour is not value free. "*Every discourse says something about a space (places or sets of places); and every discourse is emitted from a space*" (Lefebvre, 1991, p. 132). The position of the researchers has been critical in the way we have selectively collected and analyzed the material, and in the way we have acted in the architectural process. Particularly in our dual roles as researchers and active participants in the processes, it is our own praxis in many instances which is the subject of analysis and reflection.

Our methodology is a dialectical materialist one, informed by the progressive-regressive method which Lefebvre himself developed and which was to have a profound influence on Jean Paul Sartre's (Farrar, 2000, p. 16) self-reflexive method of discourse. It involves three "moments" or stages: the first is a descriptive moment, followed by a regressive one, where what is described is precisely dated in history. The final moment is a "historico-genetic" one where the "*general process of development of the structures in question is explained in the framework of the historical processes*" (Stanek, 2011, p. 160).

This dialectical method of Lefebvre has its roots in the work of Hegel, Marx and György Lukács, emphasising motion, change and historicity. It is a radical methodology in the sense of getting to the root of the matter. In previous information systems literature the approach is most similar to the dialectical hermeneutics described by Myers (1995).

We can also situate our research approach within the Critical Realist tradition as described by Mingers (2004): "*First, the critical realist is never content with mere description ...this is only the first step — critical realism wants to get beneath the surface to understand and explain why things are as they are, to hypothesize the structures and mechanisms that shape observable events* (Mingers (2004), p398)"

The *retroduction* described by Mingers serves a similar function and intent as the regressive and historico-genetic moments of Lefebvre.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

587

3.1 Data collection

The majority of data comes from personal engagement in the project described. Each author's role is described below. In addition to personal notes and email communication of the authors, other sources have also been consulted for data. Document analysis has been an important source of data, especially for the earlier periods described. Several assessments and data quality audits have been carried out, which constituted the bulk of written sources. Furthermore, interviews have been conducted with key people involved in the Rwanda HMIS, and all authors have access to the email archive of the users and developers lists for the software DHIS2, currently in use in Rwanda.

Of the three authors, all have held different roles in the described activities. Most close to the activities has the author who is part of the Ministry of Health, holding a central role in the HMIS development and day to day functioning. It is natural that most of data collection from this side has been informal, extensive, and potentially hard to sieve for relevant details. We also acknowledge the danger of bias given the personal involvement in and responsibility for the project, countering this with the relative distanced view of the other authors and the range of available other sources from which historic data can be retrieved. The two other authors have had access to the project from a more external role. One from a global role related to software development, standards, and collaborative architecture projects. These activities are interlinked, and come together in implementations such as in Rwanda. Maybe especially in Rwanda, which will be described in the chapter below. Suffice it here to link the author's lenses to Oslo as a geographical space for software development, Geneva and WHO for the work on standards, and the openHIE as a collaborative global initiative on health information architecture. The last author has only limited experience with the Rwandan HIS, but has taught Rwandan students in the use of it for health management and research. He has also been engaged in similar work in many other countries, and was also part of the Health Metrics Network in Geneva, who held a role as global promoter and legitimizer of certain architectural models and patterns. Together, the wide experience of the authors give access to not only detailed data of the processes in Rwanda, but also a comparative lens from their regional and global experiences.

3.2 Data analysis

Data analysis was performed as a group exercise through the development of the case narrative presented below. As according to Lefevbre's ideas of space, the various activities, turns, and ideas at global, national, and local level have been assessed in terms of what kinds of "space", or which "space", they influenced. For example, the turn from national statistics to patient-centred clinical data that has been observed the last few years concern different "spaces", from the nation state to individual human bodies. Likewise, the health information systems are all possible to analyze in terms of their space and related concepts such as location and reach. Our analysis is based on the conceiving of space and the resulting dialectic mechanisms between such spaces.

4. THE SPACE OF RWANDA HEALTH INFORMATION SYSTEMS ARCHITECTURE

As we have discussed above, the space of the local is physically, logically and socially connected, contiguous, part of and co-producing of the space(s) of the global. So it is impossible to understand the processes which shaped the health information system in Rwanda by confining our lens to that territorial space. Connectedness, globalization or *mondialisation* (to use Lefebvre's word) implies that there are many currents, some more powerful than others, which contribute to the modern maelstrom (Berman (1983)) within which the health information system is produced. And so we have organised our case description as a historical narrative across a number of spatial scales and particularities. Ranging over a period from 1994 through to the present we describe the production of the current health information system in the context of

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

588

Rwanda, whilst also attempting to chart other related happenings in the context of the global health IT industry (with its biggest engine in the United States of America), the HISP project of the University of Oslo and major tendencies within the World Health Organisation.

4.1. Wider space

4.1.1. Global health, the WHO and the Health Metrics Network

Health Information Systems strengthening reached the top of international and national agendas with the launch of the Health Metrics Network in 2005. This organization, working in partnership with WHO in Geneva, promoted and supported efforts all over the world to integrate systems. This attacked the common situation of uncoordinated, fragmented information "silos", and the HMN Framework became a golden standard for health information systems. A central tool was the concept of a data repository, containing data from all relevant sources. The HMN Framework was loose on technical detail, but articulated a high level approach which outlined the major building blocks and a maturity model for country health information systems.

However, after some very active years, HMN had to reduce ambitions as the global financial crisis affected the UN system's budgets. By this time a significant number of countries in Africa and Asia had adopted the HMN Framework as the foundation of their information system architectural efforts.

The Framework had been presented to the ISO TC215 Committee (Health Informatics) but was later withdrawn by WHO. In 2012 HMN was dissolved, and there is today no clear international lead in HIS strengthening. This did not mean that there was no longer an appetite for health information technology at the WHO. What we have seen instead is a change in the narrative of what *is* a health information system. Whereas in the context of the HMN Framework, the rationale was dominated by a public health rationale which emphasised a system of national coverage and the generation of health indicators for evidence based decision making by health system managers, there was to be a new turn towards promotion of global health industry standards for health IT. WHO withdrew from a position of being actively engaged in the creation of health IT standards, to one of facilitating and convening.

Between 2012 and 2014 WHO convened a series of eHealth standards workshops, two of which were attended by one of the authors. The substantial output of the most recent, February 2014, was a set of recommendations that all countries should adopt/mandate the use of "international" health IT standards (from industry consortiums such as HL7, DICOM, IHE, SNOMED etc). The challenge of national health information systems was being reduced to a technical problem for which the market had known good solutions. Countries needed to establish the right conditions (a standards regime) and the health IT industry would b e ready to invest. As one significant industry representative stated: "*standards will bring stability to emerging markets making it easier to participate in those markets*".

Another recommendation which found its way into the final summary was to *"Adopt appropriate electronic Health Information Exchange (HIE) technology, including at national and subnational levels, in vertical programmes, and in public and private health care facilities"* WHO (2014).

Having retreated from the HMN vision, WHO resolved to convene work on (yet another) framework which incorporated these new elements. But how did the private sector health IT industry rise to become such a dominant voice within WHO fora and what is Health Information Exchange technology? To understand this we need to understand another consequence of the crisis of capital which sank many major industrial powers, including the US, into deep recession in 2007/2008.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

589

4.1.2. Financial stimulation of the US Health IT industry

One of the major responses to the crisis in the US and other countries was to inject money into the economy, particularly to stabilize financial institutions. But of the nearly $1 trillion that was committed from state coffers, a substantial amount was earmarked to subsidize and kickstart an entire industry in Health IT. As part of the American Recovery & Reinvestment Act of 2009, $30 billion was committed through The Health Information Technology for Economic and Clinical Health Act (HITECH) of 2009, to create financial incentives to support the adoption and meaningful use of Electronic Health record (EHR) systems. The details are complex and have proven difficult in many cases for health providers to comply (see for example Gale et al. (2014)). Essentially health providers (clinical practices, clinics, hospitals) are incentivized to adopt standards based EHRs through a set of rewards and penalties. The Act outlines three stages at which different levels of meaningful use should be achieved over a period 2011-2016:

1. Data capture and sharing using EHR systems;

2. Advanced clinical processes involving standards based health information exchange (HIE);

3. Improved patient and population outcomes demonstrated through quality indicator reporting.

The scale of the national project has led to an expected boom in the health IT industry, but also a wider impact on the narrative of the function and form of health information systems. Whereas the HISP project (described below) and the HMN framework had the collection and processing of health quality indicators as its starting point, regardless of the existence or otherwise of EHR systems at the point of care, the "*concept of meaningful use is predicated on the belief that HIT is necessary to achieve these priorities and goals*" (Gale et al. (2014)).

We can see how the language and intent of HITECH has started to make itself felt globally in the WHO. How the national discourse in the US has come to influence and dominate the global discourse. As we will discuss below, this technological turn in what Lefebvre would term the representation of space of healthcare would also create competing visions within the national context of Rwanda.

4.1.3. The Health Information Systems Project of the University of Oslo

The HISP project grew out of South Africa, where an open source tool for health management decision support had been developed. While the South African part of the project institutionalized as a support and development structure for mostly domestic needs, the HISP project went international with pilot implementations in other countries. This was increasingly coordinated from the University of Oslo, Norway, who also started development of the second version of the open source software, called DHIS2. This development coincided with the creation of HMN, and the DHIS2 software reflected the main recommendations of the day; a single data repository which could hold data from many different sources, offering a range of information products to many different users. The DHIS2 software became tied to the HMN Framework, and was chosen by an increasing number of countries as their platform for a central data repository.

4.2. Rwandan space

This section presents Rwanda health information system architecture from the genocide in 1994 until today. For our purposes, the situation until 2005 mostly serves as a background, as the health information system at that time was predominately paper-based. However, the challenges from that period motivate the later initiatives. We here first briefly describe the situation until 2005, before turning to more recent initiatives.

4.2.1. The Health Management Information System

Rwanda, like many countries, has faced major challenges regarding access to accurate health information, such as attendance rates at clinics or statistics on treatments provided. Where such

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

590

data did exist, it was often not easily shared with other relevant users across the health sector. A national health management information system (HMIS) should collect a wide range of health service indicators[2] that help stakeholders at all levels throughout the health system to plan and take appropriate action. Data must be collected, processed and transformed, communicated, and used to inform decisions on resource allocations, policies, staffing, service delivery, cost-recovery, supportive supervision, and other elements working toward improved health outcomes.

Collaborative discussions to develop understanding of Rwanda's HMIS needs have included the Government of Rwanda (GoR), international and development partners, and other in-country stakeholders. The Ministry of Health (MoH), through one of its Health Sector Cluster Technical Working Groups, HMIS/Mapping, formally requested assessment of Rwanda's health information systems in 2005[3] as a step toward health systems strengthening. Terms of Reference (TOR) for this work included analysis of existing systems, structures, and flows for collecting and using health information; consideration of major health sector actors' information needs; and recommended improvements to better meet information needs and strengthen the health system in general.

Prior to 2005, the initiatives to make the HMIS electronic had mostly been focusing on the central level, while health facilities and districts were still based on paper forms and reports. The GESIS (Gestion du Systeme d'Information Sanitaire) software was applied with external funding from 1997[4], but was found rather limited in a range of ways. Firstly, it was owned by external agencies, which had to be relied upon for making even simple changes to the data collection tools. It was also built on already at that time old technology, and did not support any use of networks. Data was collated from paper-based registers, and went through several steps of manual aggregation before being entered into the software at central level. Data sharing and quality continued to be serious challenges with this system. Due to this situation, data use was limited.

In 2008/2009, the MoH changed the data collection forms and the database, while at the same time extending the electronic system down to health facility level, which had been equipped with computers. Nevertheless the new GESIS retained many of the qualities of the earlier design - any changes to forms required the intervention of the programmer. There was only a single programmer of the system who became increasingly difficult to access. As it was put by a USAID
sponsored HMIS support person, "*It was really a pain . . . we didn't have access to the source code, couldn't change a single indicator . . . We could never get him to come back and fix anything.*"

Even though the new system remained problematic, the MOH implemented a program in 2009 which had more far reaching implications for the quality of data than the change of software. A new cadre of data managers were recruited and specifically trained in data entry, data checking, and data analysis and data quality assessment. Supervisors and M&E specialists with clear terms of reference have also been hired at the district level. HMIS unit of Ministry of Health enhanced their capacity by giving Data management procedures in different fields of data management. Now every District Hospital and health center in Rwanda has a data manager recruited especially for tasks related to data management.

In 2010, through contacts with the WHO, the MOH became aware of the possibilities of DHIS2 software. At that time the HMN process was still strong within WHO and the HISP project in

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[2] http://www.wpro.who.int/publications/docs/Healthmanage.pdf

[3] United States Agency for International Development, Rwanda HMIS Assessment Report, p4

[4] United States Agency for International Development, Rwanda HMIS Assessment Report, p23-26

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

591

Oslo was well regarded in Geneva. Replacing the ailing GESIS with DHIS2 had a number of attractions for Rwanda:

- it was an open source project (the value of which was now very clear from experience);

- it had a large and growing community of users, implementers and experts, including in the East African region;

- it could accommodate the HMIS reporting requirements of the ministry, at the same time allowing them to change reports, forms etc without direct intervention of programmers;

- it was being implemented at the time as a national web-based system in Kenya, with health facilities interacting with the system over the GSM network. The prognosis was good that the same could work in Rwanda.

- the web based approach would also throw open access to data which had previously been siloed in programs and across geographic space.

The Rwanda Ministry of Health initiated a project, in collaboration with WHO and the University of Oslo (UIO), and launched the Rwanda Health Management Information System (R-HMIS) in February 2012. The new system reflected all that was current globally.

There were some significant hurdles towards implementing this modern vision. Whereas the early design and prototyping of the system was done on an international cloud server through 2011, it needed to be materially incarnated and running in Rwanda in time for the launch. The challenges of hosting a reliable web-based server using linux and other open source components which were unfamiliar to the HMIS team had been underestimated here (as they were also in Kenya, Ghana, Uganda and other countries which were on the same road). Having staff from UIO install and manage the prototype system on "the cloud" effectively hid the underlying technical labour and physical infrastructure required if the Rwanda MOH was to fully appropriate the system and ground the data in national space.

Whereas a significant effort had gone into the training of data managers as users of the system, the HMIS team were ill equipped to maintain and run it at the centre. Nevertheless, the HMIS team set about the enormous learning task (of which they had little background), with vigour and enthusiasm. Sophisticated internet technology in the regions of Europe and North America and parts of Africa, Asia and Latin America, depends on a highly developed division of labour with specializations in network management, systems administration, security management etc. Health information experts perform their high level tasks on top of such infrastructure, with seldom even an awareness that such tasks exist. Downey (2001) describes how such hidden labour of the internet has always existed in networks, taking examples from the old telephone network. In Rwanda the small HMIS team were obliged to develop a wide range of skills over a short period to successfully maintain the system to the present.

The R-HMIS has been operational countrywide since February 2012 and collects data from over 700 public health facilities. To have an effective Health Information system, the Ministry of Health equipped all health facilities with computers for data management, and all health facilities are equipped with at least 2 Desktop and one laptop and a modem for Internet for the facilities where there is no fixed internet. Recently, the staff from nearly 70 private clinics and dispensaries in the Kigali urban districts was trained on how to use the software and have started to report on their activities. Additional modules are being added to the system and a national data warehouse has been created using the same software. This will provide a one-stop-shop for monitoring the overall performance of the Rwanda health sector.

R-HMIS has improved reporting timeliness, completeness, and accuracy. In the past, it could take months to receive reports from remote health areas. Now, reports from every health facility can be viewed immediately. Validation rules help to avoid erroneous data, which has

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

592

considerably increased data quality. Though the training of data managers and support from the HMIS team may have been at least as important a factor in sustaining this progress.

Recently, building on the existing skills base, the DHIS2 has been adapted in Rwanda to take over the functionality of other systems including the Integrated Disease Surveillance and Response (IDSR), the Performance Based Management system, the national bloodbank and the R-HMIS acts as the de facto source of Health Facility information in the country.

4.3. The parallel emergence of the Rwanda eHealth Architecture

The HMIS team were not the only group involved with health information systems architecture in the MOH. The Partners in Health (PIH) project had been involved in Rwanda, strengthening HIV care in rural health settings since 2004 Richards et al. (2014). Given the complexities of management of HIV patient care, PIH combined their experience of previous work in Haiti with the Regenstrief Institute's work in Eldoret, Kenya, to collaboratively create the OpenMRS EMR system. The second ever OpenMRS deployment went live in Rwinkwavu hospital in Rwanda in 2006. Since that time there have been plans to rollout OpenMRS to some 700 health facilities across the country. A team of java programmers has been established within the ministry to support the national deployment.

In 2011 The MOH, supported by a consortium of donors, embarked on their most ambitious and explicit architectural project yet: to create a "Rwanda eHealth Architecture" which would encompass all eHealth systems in the country. Crichton et al. (2013) describes the project to implement an HIE in Rwanda. The HIE is the central architectural feature, consisting of registry systems for facilities, providers and "clients" in combination with a terminology server and a shared health record data store. After 3 years the system is still struggling to emerge from pilot stage. It currently involves the linkage of EMR systems in 17 health facilities capturing data for the Ante-Natal Care Program in a national shared health record. The vision is predicated on the same meaningful use rationale which underlies the HITECH sponsored national program in the US. That EMR systems and HIE are necessary pre-requisites for achieving improved health outcomes. The technical design of the HIE follows the principles described by Dixon and Grannis (2014), and are based on the Regenstrief experience with the Indiana Network for Patient Care.

The Rwanda HIE acted as an early prototype of the OpenHIE project, which is a collaborative open source endeavour lead by the Regenstrief Institute to build on the Rwandan experience to implement the infrastructural model of (Dixon and Grannis (2014)), but defining all of the interactions in terms of health industry standards.

5. DISCUSSION

The story of the production of health information system architecture in Rwanda is a rich source of insights, lessons and contradictions. A combination of intense external donor involvement and funding together with a determined Rwandan national modernization drive, has given rise to a range of ambitious architectural projects. The HMIS project, which has been our primary focus, has been largely successful in its coverage of the national space, with nearly 100% reporting rates from public facilities across the country, and increasing incorporation of the private sector facilities into the system. Dynamic maps of the national territory are directly viewable by the Minister of Health, showing the position and status of health facilities, reporting rates and health indicators (including progress towards Millenium Development Goals) down to the subdistrict level across the national territory. For Lefevbre, national territory is conceived of as state-space (Brenner and Elden (2009)). The production of the social space of territory, including the work of its health workers and the health of its inhabitants, is an integral part of the state national project. We would argue that the production of the HMIS system, as a product of architecture, can be usefully seen as an element of this broader project of the production of

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

593

territorial space, empowering the machinery of state at various administrative levels to manage the health system, assess progress and plan interventions.

But we should not over-privilege the role of national space in its own (re)production. As we have also seen, the DHIS2 software which forms the base for the current national HMIS, incorporates technical lab our from elsewhere (primarily the University of Oslo), and is enscribed with ideologies with historical roots in South Africa and Scandinavia with subsequent absorbtions from its various sites of implementation across Africa and Asia through the the HISP project (Gizaw (2014); Sæbø (2013)). Through the spatial practice of both HISP and the Rwanda MOH, the DHIS2 and HISP too is (re)produced.

The use of DHIS2 in Rwanda had a number of direct technical impacts on the Oslo project. Whereas at the time the developers of DHIS2 were emphasising greater centralization and advocating a single national data store, the MOH had developed a vision of a number of (national) DHIS2-based systems which would feed data into central data warehouse/dashboard which was in fact closer to the HMN model. These requirements stretched the existing DHIS2 interoperability capabilities and lead to substantial improvements. This has been a general characteristic observable elsewhere - each time the system is materialized and institutionalized in a different setting, it has emerged changed by that setting. The use value which is produced in such architectural endeavours is shared within the network. The production and distribution of exchange value is less clear in the context of open source software, but in the sense of tradeable knowledge and control of the software artifact to be used in subsequent projects it might be fair to assume that it is largely accumulated back in Oslo. Though not entirely. The skills gained by the Rwandan HMIS team have proven to be in demand in support of other DHIS2 projects in the region.

The "globalization" of DHIS2 was strongly reinforced by its good fit with the HMN Framework which represented, at the time, the modern, current, best-practice abstract representation of national health information system space. That the HMN Framework had spatial assumptions embedded within it - it was a framework for country systems - made it readily absorbable in state territorial projects.

The space of the individual - of "*the body in action*" (Lefebvre, 1991, p. 174) – has not featured much in our discussion of global and territorial space, but is perhaps central to understanding the HIE approach to architecture. The focal point of the HIE is the individual record. With a starting point of EMR systems, lab systems, billing systems etc at the point of care, HIE is aimed at the seamless and secure sharing of patient oriented data between such systems. The computation and exchange of health service quality indicators is seen as a later product of such functionality - notably it is a meaningful use stage 3 requirement in the US system of penalties and rewards whose date for compliance is currently pushed to 2017. There is no implicit assumption of territorial space in the HIE. The patient population can be national (as ultimately envisaged in Rwanda) or may cover the space of a city, a district or even the abstract space of a provider network.

That the approach of HIE and HMIS proceed from different starting points in space in itself is quite interesting but there is no necessary contradiction in it. Until the EMR oriented HIE starts creating national spatial infrastructure components (eg. in Rwanda the facility registry). And the HMIS starts creating systems of individual records. Then there is the possibility of a collision.

Architecture in the world, that is concrete social practice building in physical space, such as health information systems architecture in Rwanda, is conditioned by what is "current". Perhaps not least because those who define what is current (states, international organisations, funding organisations and the private health IT industry) are also those who control the resources to build.
It is through our understanding and experience of the world that we come to understand and recognize the broad outline of architectural shapes and practices which have been materialized,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

594

contextualized and reshaped in Rwanda. The relations between actors, perhaps particularly between the Rwandan state actors and the range of donors, consultants and other partners who play such a dominant role in the imagining of systems, both shape and are shaped by the process of architecture. We build systems together and then relate to one another through those systems. What gets built is determined both by the relations between the state and its citizens as well by its relations in wider extra-territorial space.

In this context, the question of Rwandan state ownership and control which we posed at the outset, is difficult to address in a straightforward static, structural way. Everything is in flux, thrown into motion by processes of development. In Capital volume 1, Marx chose to focus on value and the commodity as a starting point, not to model the structure of capitalism, but rather to understand its transformative and contradictory behaviour in motion. An analysis of the production and distribution of *value* in information systems architecture, particularly as it is transformed and reified across space and in time, is necessary to better grasp what it is there is to be owned and controlled. We see the HMIS system, for example, as generating use value for managers (as evidenced by complaints when it is down) though it offers limited scope for the production of exchange value. Though its instantiation on Kigali-based private cloud infrastructure exposes new social relations of exchange (expensive rental contracts) which have activated economic activity around the architecture. The HIE project, which is technologically and socially more *dense* offers potentially much greater circulation of exchange value and (arguably) greater potential absolute use value for clinicians and patients. But it has proved more difficult to stabilize and realize in context.

Lefebvre saw development (it is not clear if he ever used that term) and difference as the (uneven) production of social space - that is both society in space and the space of society. That process of production proceeds from existing social relations in space where the pursuit of capabilities and freedoms of actors can be, and are, in competition with one another. In his conceptual triad, **representations of space** (the realm of designers, architects and the powerful) exist in a dialectic (or trilectic) relation with both **spatial practice** (embodying the actual production and reproduction of social space in everyday life) and **representational spaces** linked to an underground, clandestine side of social life, including art.

Through social practice, social space in its three dimensions, is secreted into the future and into itself. We can see actual development (as distinct to planned, intended, wished, funded) as an ongoing dialectic process of resolving contradictions of this spatial reproduction.

6. CONCLUSIONS

The main theoretical contribution we have tried to make in this paper is to introduce a wider discourse around architecture and space into information systems thinking, particularly in the context of what is termed development and developing countries. From the broader discipline of architecture we have taken to heart that the resulting artifacts are only one output; social relations and discourse are also products of architecture. We have found the work of Lefebvre to be useful in framing basic concepts in space, but are also conscious of the fact that, in the process, we have not engaged fully with the "project" behind his work. The final chapter of "The Production of Space" claims that "*it has been informed from beginning to end by a **project**, though this may at times have been discernable only by reading between the lines. I refer to the project of a different society, a different mode of production, where social practice would be governed by different conceptual determinations.*"

To engage with such a project would require, we believe, a more thorough treatment of the mode of production, including its contradictory generation of use and exchange value, than we have been able to explicate here.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

595

For practical work both in systems development and in implementation in countries like Rwanda, we believe the paper has contributed to an understanding of the importance of a historical and multi scaled spatial view of health information systems.

REFERENCES

Adam, R. (2008). Globalisation and architecture. *Architectural Review, London*, 1332:74.

Alexander, C. (1968). A city is not a tree. *Ekistics*, 139:344–348.

Avgerou, C. (2010). Discourses on ICT and Development. *Information technologies and international development*, 6(3):1–18.

Berman, M. (1983). *All that is solid melts into air: The experience of modernity*. Verso.

Braa, J. and Sahay, S. (2012). *Integrated Health Information Architecture: Power to the Users : Design, Development, and Use*. Matrix Publishers.

Brenner, N. and Elden, S. (2009). Henri Lefebvre on State, Space, Territory. *International Political Sociology*, 3(4):353–377.

Crichton, R., Moodley, D., Pillay, A., Gakuba, R., and Seebregts, C. J. (2013). An Architecture and Reference Implementation of an Open Health Information Mediator: Enabling Interoperability in the Rwandan Health Information Exchange. In *Foundations of Health Information Engineering and Systems*, pages 87–104. Springer.

Cunningham, D. and Goodbun, J. (2006). Marx, architecture and modernity. *The Journal of Architecture*, 11(2):169–185.

Dixon, B. E. and Grannis, S. J. (2014). Public Health Informatics Infrastructure. In *Public Health Informatics and Information Systems*, pages 69–88. Springer.

Downey, G. (2001). Virtual webs, physical technologies, and hidden workers: The spaces of labor in information internetworks. *Technology and Culture*, 42(2):209–235.

Escobar, A. (1995). *Encountering development: the making and unmaking of the Third World*. Princeton Univ Press.

Farrar, R. C. (2000). *Sartrean Dialectics: A Method for Critical Discourse on Aesthetic Experience*. Number 97. Rodopi.

Gale, J. A., Hartley, D., and Croll, Z. (2014). Meaningful Use of Electronic Health Records by Rural Health Clinics. *Maine Rural Health Research Center*.

Gizaw, A. A. (2014). *Open Generification*. PhD thesis, University of Oslo, Norway.

Goodfellow, T., & Smith, A. (2013). From urban catastrophe to 'model' city? Politics, security and development in post-conflict Kigali. Urban studies, 50(15), 3185-3202.

Harvey, D. (1989). *The condition of postmodernity*, volume 14. Blackwell Oxford.

James, C. L. R. (1984). *At the Rendezvous of Victory: selected writings*. Allison & Busby London.

Lefebvre, H. (1991). *The production of space, trans. Donald Nicholson-Smith*. Oxford: Blackwell.

Mingers, J. (2004). Re-establishing the real: critical realism and information systems. *Social theory and philosophy for information systems*, 372:406.

Myers, M. D. (1995). Dialectical hermeneutics: a theoretical framework for the implementation of information systems. *Information Systems Journal*, 5(1):51–70.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

596

Peet, R., Hartwick, E., and Hartwick, E. (2009). *Theories of development: contentions, arguments, alternatives*. The Guilford Press.

Richards, J., Douglas, G., and Fraser, H. S. (2014). Perspectives on Global Public Health Informatics. In *Public Health Informatics and Information Systems*, pages 619–644. Springer.

Rist, G. (2002). *The history of development: from western origins to global faith*. Zed Books.

Rist, G. (2007). Development as a buzzword. *Development in Practice*, 17(4-5):485–491.

Sæbø, J. I. (2013). *Global scaling of health information infrastructures: Circulating translations*. PhD thesis, Faculty of Mathematics and Natural Sciences, University of Oslo.

Sahay, S. (1997). Implementation of information technology: a time-space perspective. *Organization Studies*, 18(2):229–260.

Sen, A. (1999). *Development as freedom*. Oxford University Press.

Shiva, V. (1988). *Staying alive: Women, ecology and development*. Zed Books.

Soja, E. W. (1996). *Thirdspace: Journeys to Los Angeles and other real-and-imagined places*. Blackwell Oxford.

Stanek, L. (2011). *Henri Lefebvre on space: Architecture, urban research, and the production of theory*. U of Minnesota Press.

Thompson, M. and Walsham, G. (2010). ICT Research in Africa: Need for a Strategic Developmental Focus. *Information Technology for Development*, 16(2):112–127.

Vassilakopoulou, P. and Grisot, M. (2013). Exploring the concept of architecture in Technology and Organization studies. In *36th Information Systems Research Seminar in Scandinavia (IRIS 2013)*.

WHO (2014). Joint Inter-Ministerial Policy Dialogue on eHealth Standardization and Second WHO Forum on eHealth Standardization and Interoperability. Technical report, World Health Organization, Geneva, Switzerland

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

597

A CRITICAL UNDERSTANDING OF ICT4D

598

Track Chairs:

Brian Nicholson
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Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

598

INVESTIGATING TELECENTRE IMPLEMENTATION THROUGH A POSTCOLONIAL LENS: THE GHANAIAN PERSPECTIVE

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Abstract: This study draws on Postcolonial theory and the use of a case study to analyse the rationale for the continuing establishment of telecentres. It departs from the compilations of factors for the success or failure of pro-poor public ICT initiatives to undertake a critical analysis of the underlying reasons for implementation failures. We found that postcolonial legacies influenced the design and implementation of Community Information Centres (CICs) and their subsequent non-use. This research contributes to understanding the problematic issues of telecentre implementation in developing countries by introducing an alternative assessment approach.

1. INTRODUCTION

Universal access to the Information and Communication Technologies (ICT) has become the most prevalent initiative by developing countries as a panacea for development and helping impoverished communities participate in the information age (Proenza, Bastidas-Buch, & Montero, 2001). In 2005, the government of Ghana with the support of the United Nations Development Programme (UNDP) and the Indian government, commissioned the first batch of telecentres called Community Information Centres (CIC) throughout the country. The CICs operate under a hybrid for-profit telecentre and non-profit community resource centre model. Like most telecentres established, CICs are to provide universal access to underserved and underprivileged communities with the hope of empowering inhabitants of rural Ghana (Ghana Investment Fund for Electronic Commination (GIFEC), 2013). They also serve as an Internet point of presence and to support economic activities in the rural areas by providing ready information needed by users, eventually leading to narrowing of the digital divide (GIFEC, 2013). Essentially, these centres are to be the pivot around which rural Ghana is to witness technological transformation.

Careful observations of these centres, however, tell a different story about the objectives they were meant to achieve. Most of these centres are either closed or underutilised in the Upper East Region of Ghana, the setting of this study. Sey & Fellows (2009) in an elaborate study established that public access centres implemented with pro-poor intentions were underutilised. She came to this conclusion after a review of studies of public access centres around the world. Awotwi & Owusu (2010) and Oppong-Tawiah & Boateng (2011) also arrived at a comparable conclusion when their study of CICs reported widespread non-use of centres. Similarly, the Communications Manager of GIFEC had course to complain when on a routine tour of CIC facilities, he observed that most of the centres had been abandoned (GIFEC, 2014). Yet, 2012, GIFEC announced its intention to establishing 360 new centres (Tawiah, 2012). As at the time of this research, 16 were completed, and funds had been made "available for the construction of 21 more Community Information Centres" (Ministry of Finance, 2014: 53-54).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

599

A school of thought argues that most of these interventions are failing because these technologies are embedded with specific cultural values and communication preferences that aids and abets a form of "computer-mediated colonization" (Ess, 2004). This phenomenon denotes the situation where Western cultural values inscribed within ICTs dominate those of beneficiary communities. This frequently occurs because most ICT initiatives deployed in developing country context such as Ghana are adopted from western philosophies. This inadvertently means users of these systems adapt to ICTs in order to benefit from the 'promise' they offer since beneficiary requirements were not inscribed during design (Oppenneer, 2009). Champions of the Information and Communications Technology for Development (ICT4D) discourse notably the UN, IMF, World Bank and some developed countries (collectively called the 'West') have adopted a new form of developmental agenda that has taken the character of "contemporary colonialism" (Alfred & Corntassel, 2005). The hegemonic implantation of ICT initiatives with a willing support of beneficiary nations begs the question: who benefits? "The developing world has carried the burden of colonization and slavery. This has resulted in a lack of confidence in developing economies and the belief that they are not on par with the rest of the world" (Jhunjhunwala, Ramachandran, & Bandyopadhyay, 2004: p.30).

This paper departs from the compilations of factors for the success or failure of pro-poor public ICT initiatives (Prado, Câmara, & Figueiredo, 2011; Awotwi & Owusu, 2010; Johansson, 2011; Chaudhri & Dash, 2007; Vannini, 2013; Mariscal, Gil-Garcia, & Aldama-Nalda, 2011) such as the CIC of Ghana to undertake a critical analysis of the underlying reasons for implementation failures (Bailur, 2008; Sandeep & Ravishankar, 2014). We suggest that this phenomenon can benefit from a micro and macro examination (users, management and implementing bodies) through a critical approach to shed light on why the CIC initiative is failing to meet its objective. This research contributes to understanding the problematic issues of telecentre implementation in developing countries by introducing an alternative evaluation approach. We follow the trails of (Bailur, 2008) to draw on concepts from Postcolonial theory and the use of a case study to analyse the rationale for the continuing establishment of CICs in Ghana. In doing so, this research responds to her call to use this theory in telecentre primary studies in a developing country context. Can postcolonial theory uncover possible hidden agendas that may lie behind the rational explanations for the failure of CICs? Why are CICs still being built when the evidence points to widespread non-use? These questions motivated this study.

The rest of the paper is organised as follows: the theoretical framework is presented highlighting postcolonial discourse focusing on elements of power, voice and otherness. It is followed by a review of related studies. Then, the case study context is discussed, followed by research methodology. Finally, the research findings are then presented and discussed, followed by limitations and conclusion.

2. POSTCOLONIAL THEORY

Postcolonial theory is a body of discourse that traces its origins to literary and cultural studies. It denotes that period following the disbandment of political and economic domination or subjugation of one nation or group of people over another. It denotes that period following the disbandment of political and economic domination or subjugation of one nation or group of people over another. Postcolonialism represents that period of "decolonization and the determined achievement of sovereignty – but also the realities of nations and peoples emerging into a new imperialistic context of economic and sometimes political domination" (Young, 2001, p. 57). The theory is a convolution of thoughts (theories) enacted by scholars who try to define the influence colonialism has had on the colonised. Postcolonial literature offers a counter-narrative to the dominant master narratives of Europe. The reality is that postcolonial theorists have vested interest in analysing and explaining the effect colonialism, and by extension imperialism, has had on subjugated nations and, therefore, cannot be considered neutral. Postcolonial theorists engage their audience through a specific critical lens. That critical

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

600

lens is meant to analyse and explain the effects of colonialism on indigenous inhabitants. This comes in various forms or ideas espoused by a myriad of postcolonial scholars. Dominants discourses in this regard have emerged from scholars in Africa (Chinua Achebe), Asia (Gayatri Chakravorty Spivak) and Middle East (Edward Said) or predominantly descendants from these origins in the diaspora.

However the term postcolonialism has been in direct conflict with imperialism (going beyond implantation of settlements to include indirect mechanisms of control) which some scholars argue will more aptly describe the conditions postcolonialism seems to address (Kohn, 2014). Said (1994) however holds a different view of both concepts. In his opinion postcolonialism is merely trying to understand the tenets of imperialism/dependency theory.

Dependency theorists first of all argue that there are different kinds of states in the world with each meant to perform a specific role. Countries at the periphery (South) serve the economic interest of those at the centre (North). This was made possible through the creation of a class system in these countries whose primary aim it is to ensure that the system stays the same through the formation of alliances and corporations amongst the dominant classes of both divides. A wealthy few use resources at their disposal to ensure technological and economic dependence and domination of the poor. This system of dependence is controlled by multinational cooperation's such as Banks and Institutions that all serve the interest of those at the centre. Hence, the South is thus susceptible to suggestions from these organisations as to how to improve their economies (Kapoor, 2002). Dependency scholars are of the opinion that the world is structured in such a way that the south is meant not ever to get developed but rather staying in the status quo so as to serve the interest of the global North. From their point of view, it is not possible for Southern states to ever develop because state structures are designed to prevent development (Kapoor, 2002). Thus, the system promotes dominance, exploitation and, therefore, underdevelopment (Frank, 1969). Capitalism according to dependency theorists motivates the drive behind dependency relationships.

More recently a third strand of theorists in the field of Science and Technology Studies have questioned some of the assumptions of postcolonial theory by bringing studies that show how citizens from the Global South not only passively receive ideas and material relations from the North, but also reshape and reinterpret them often in unpredictable ways. They are especially critical of the Northern style of science and technology for development and the cultural assumptions embedded within these technologies received from the North (Rajao, Duque & De`, 2014). According to Rajao, Duque & De`, these body of studies have investigated the use of Northern technologies in postcolonial settings with most of them "questioning the linear and deterministic assumptions linking technoscience and socioeconomic development" (pp. 768). For instance, Cherlets' (2014) article articulates how northern concepts of development, through the provision of technology, are reshaped and adapted to fit local context as opposed to wholesale adoption as espoused by postcolonial theorist. Similarly, Rajão and Duque (2014) argue that the hegemonic hold of northern collaborators of developing countries is not as strong and irresistible as hitherto imagined.

Just as dependency theorists have received a fair share of criticism from postcolonialist, so also has postcolonial theory been critiqued. For instance, there has often been a contention of the period 'postcolonial' refers. Childs, Williams and Williams (1997) ask; "after whose colonialism? After the end of which colonial empire?" This has arisen because there has been a series of colonisations around the world at different times. In some cases, colonised states later became colonisers. Some also criticise the theory as being too diffused with no core tenet to tackle (Chibber, 2014). He posits that if one tenet is critiqued, postcolonial theorists simply point to the other tenets and try to leverage their argument on those concepts. Spivak's works are often criticised for their density and difficulty to be understood by some audience. Similarly, Bhabha has been accused of writing lengthy and incomprehensible text (Eakin, 2001).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

601

We identify three postcolonial concepts that could be applied to our findings at a macro level. In so doing, we follow Bailur (2008) and answer her call for the use of postcolonial concepts in primary research. We discuss these concepts in the following subsection.

2.1. Subaltern

We adopt the interpretation of this concept that describes the lower classes and the social groups who are at the margins of society and often denied agencies because of their status in society. People in this grouping are denied a 'voice' to even decide what is good for them. Their needs and often wants get mediated through the thoughts of the elite. Gayatri Chakravorty Spivak's literary work ("Can the Subaltern Speak?") brought to the fore the concept of the subaltern in postcolonial studies (Spivak, 1988). Sandeep & Ravishankar (2014) use the Indian caste system where one's status in society is determined by virtue of one's birth (high born or low born), as an example to explain this concept of class differentiation and to stereotype. In development discourse, the subaltern can be described as the underprivileged and underserved in rural communities (margins) whose daily livelihood is dictated by powerful government officials who reside in the capital (centre). Their agencies are often denied because developmental projects are often 'imposed' on them from the 'centre' without necessarily considering their actual needs (Williams, 2004). The people at the 'margins' have little access to their means of expression and are thus dependent upon the language and methods of the ruling class to express themselves. This highlights the importance of Spivak's question; "Can the Subaltern Speak". However, Spivak is critical of adopters of the concept and accuses them of oversimplifying who a subaltern is (de Kock, 1992).

2.2. Otherness

In applying our interpretation of "otherness" for use in this paper, we explain this as the situation where a group of people label or categorise themselves and others and in so doing exclude or marginalise another. This often is manifested through social or psychological means but more prominently in economic relationships. It subsumes stereotyping and differentiation, which is often so entrenched that the less privileged seek the approval, respect and admiration of the dominant group. Historically, one's social and economic status in certain cultural settings can lead to a form of stereotyping which can adversely affect their ability to demand what is rightfully theirs or even their livelihood. In postcolonial literature, this can be likened to the concept of 'Otherness'. Otherness is illustrated in two forms; one with the big 'O' and the other with a small 'o'. "Lacan refers to the symbolic Other as the big Other and the imaginary other as the little other, but for the most part Lacan simply uses capitalization to distinguish the Other from the other" (Van Pelt, 2000). It is through the gaze of the powerful 'Other' that the dominated 'other' gains identity. The 'other' depicts the colonised or subjugated who must seek acceptance in the eyes of the 'Other' (coloniser). Bhabha (2004) describes this situation as a crisis of identity. An example of this concept could be countries where women, minorities and indigenes being deprived of their right must in the same instance be seen to be in awe of the superordinates so as to have a chance of receiving what are rightfully theirs and the hope of future rewards. This is reflective of how contemporary organisations, institutions or even governments of high status interact with those perceived to be of low standing.

2.3. Hegemony

Hegemony is sometimes referred to as an extension of a nation's rule over a territory beyond its borders. It also refers to the establishment and maintenance of colonies in one territory by people from another country or those in power to maintain their control through dominant ideologies. They are seen as universal ideologies, perceived to benefit everyone while only benefiting their proponents (Gramsci, 1991). For example, hegemonic ideologies are evident in the conditionalities (Washington Consensus) enforced by the Bretton Woods Institutions when granting loans to less endowed nations. In these cases, these loans instead of trying to liberate

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

602

struggling economies perpetuate dependency through structural impositions embedded in the Loan conditions. It is important for readers to hold the view that postcolonialism as discussed in current discourse also looks at the contemporary forms of colonialism. Hegemony holds true and strong even today and does not necessarily involve nations imposing their authority and ideologies over others but involves corporations, organisations, conglomerates and in some cases occur in-country. The dominant discourse suggests that colonialism did not end with decolonisation but continues to fester in different forms.
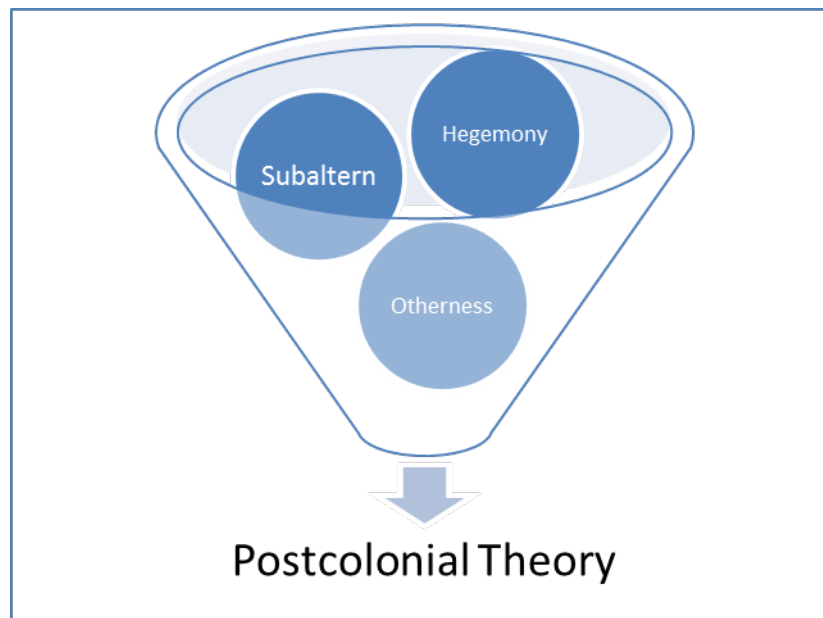
Figure 1: Conceptual Diagram of Postcolonial Theory tenets

3. FAILURE AND CONTEXT IN ICT4D STUDIES

There is a substantial body of ICT4D literature that argues that failure of ICT initiatives intended to benefit less developed economies is due in large part to a lack of consideration of the local context, including the cultural, historical and institutional situation and power asymmetries (Heeks, 2002; Heeks, 2005; Kumar and Best, 2006; Prakash & De`, 2007; Avgerou, 2010; Chaudhuri, 2012).

Some authors, for instance, have criticised the failure of ICT projects on the basis that they were implemented from afar and thus did not understand the local nuances that influence success of projects and are often laden with poor and insufficient planning (Zheng, 2009). From a postcolonial perspective, Oppenneer (2009) posits "misguided ICT4D implementation that doesn't take into consideration a wide range of cultural factors and explicitly or implicitly imposes Western processes or structures upon indigenous recipients does constitute a new form of computer-mediated colonialism". Ess (2004) supports this view and advocates a more culturally-aware design of systems to reflect needs of the local community. Thus, ICT4D initiatives may transform marginalised communities only when implementation is thoughtfully executed. Dyson (2004), however, questions the ideology of rejection of western values embedded in ICTs as the cause of failed systems. In her study of indigenous Australians, she found contrary evidence that points to factors such as cost, isolation, poor telecommunications infrastructure and low computer skills as contributory factors and not western values embedded in ICT projects.

We also draw on the work of Escobar (1995) which traces the history of colonialism and its remnants on colonised states even after its dismantling. Escobar argues that most development efforts of western investors favour the transfer of technology to underdeveloped regions over empowering them to be producers. This way, they 'invisibly' have a foothold in such states

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

603

through this imbalanced alliance. Thus, nurturing and compelling developing countries to be consumers and dependent on Western technologies (and hence contemporarily colonised).

Thompson (2004) points out that ICT interventions are being spearheaded by powerful 'development partners' (World Bank and IMF) as a panacea to development that inadvertently does not achieve intended objectives. Thompson (2004) further suggests the World Bank further imposes its hegemonic authority on the periphery by establishing the 'Global Development Gateway' (GDD) which was meant to be a one-stop-shop of legitimate information which seeks to improve aid transparency and governance. Gurstein (2003) also criticised its establishment as a top-down imposition on developing countries where grant/aid recipients may not have had a voice and the data authenticity may have been compromised in favour of its funders (Gurstein, 2001).

Kenny (2013) examined the role of 'power' in the design and implementation of ICTD projects by a Western ICT NGO. Her findings show an intricate web of power play in the release of donor funds to NGOs and government's influence on whom recipients of ICT projects should be. It emerged that in most cases donations were purely connected to particular political and vested interests. Although as an organisation they were aware of the political interest and the fact that beneficiaries of their products might not necessarily be the right people, they were constrained. They could not act independently because a higher power was at play (the significant 'Other'). The discussion of the lack of independence on the part of some donor agencies and of recipient communities raises the question of whether colonialism is not finding another means into developing countries (through predominantly old colonial masters who do not want to see their powers wane in face of new global dominance).

4. STUDY CONTEXT

In 1821, the British Government took control of the British trading forts on the Gold Coast (now Ghana). In 1844, Fanti chiefs in the area signed an agreement with the British that became the legal steppingstone to colonial status for the coastal zone. Later, they succeeded in establishing firm control over the Ashanti hinterlands and eventually making the northern territories a protectorate. In 1951, a constitution was promulgated that called for a greatly enlarged legislature composed principally of members elected by popular vote directly or indirectly. This paved the way for elections in 1954 and 1956 with Kwame Nkrumah's CPP winning both elections and subsequently leading to the declaration of independence in 1957.

However, after a series of coup d'états and the mismanagement of state resources, "Ghana had become a veritable symbol of the "failing" and/or collapsing African state, improvident government and decaying society. Its economy was stagnant, the fiscal situation could be best described as bankrupt" (Gyimah-Boadi, 2008: p. 2). It was against this contextual poor economic performance that government initiated the Economic Recovery Programme (ERP) in 1983, based on the Structural Adjustment Programs of the World Bank and IMF (Abdulai, 2009). This set the scene for a wave of "contemporary colonialism" (Alfred & Corntassel, 2005). Since then, the government has initiated several programmes aimed at improving the structural deficit responsible for the 'collapse' of the economy. The state recognised that for the developmental effort to be successful, it was necessary to initiate and involve underprivileged communities in the development effort. In 2003, government passed into law the ICT4AD policy document which was to spearhead the development effort of the country with a focus on the implementation of strategic ICT initiatives through which the country was to be transformed into a middle-income economy (G-ICT4AD, 2003). The policy proposed the implementation of universal access centres as the best approach to introduce the pervasive power of ICTs in underserved and underprivileged communities mostly located in rural areas of Ghana. Following this recognition, the first batch of universal access centres (CICs) was rolled out in 2005. Initially, these centres emerged to be relatively successful but along the line there have been reports of non-use and closure of most of these centres comparable to reports from other

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

604

developing countries that also adopted similar initiatives. Irrespective of this trend, the Ghanaian government is still pressing on with its implementation. This study, therefore, turns to critical studies to understand the rationale for continuing establishment of these interventions.

5. METHODOLOGY

A qualitative case study designed to investigate the underlying reasons for the continued non-performance of the CIC initiative in Ghana. A case study is used for an in-depth investigation of a given phenomenon in order to give a more detailed representation of the entity (Yin 2009). We carefully examined three different kinds of CICs. We investigated a centre that was fully operational (1), those that were open for business but were severely handicapped due to various level of wear and tire at the facility (2), and other centres which had actually closed primary because of non-use (4). Walsham (1995) and Avgerou (2010) make a strong case for researchers concerned with the social implications of ICT initiatives in developing countries to draw on interpretive or critical studies. The aim was also to facilitate a better understanding of the influence of postcolonial elements on the implementation of ICT initiatives especially in Ghana.

Multiple sources were used in the gathering of data to enhance triangulation of information (Eisenhardt, 1989; Mathison, 1988). The approach was used to reduce the limitations of single methods with their strengths complementing one another. More importantly social phenomena are complex in nature, and so multiple perspectives are essential for better understanding them. A total of forty (40) semi-structured interviews were conducted with different stakeholders thereby providing a triangulation of perspectives (Creswell, 2012; Eisenhardt, 1989; Yin, 2009). The interviews were conducted using different interview protocols for each category of informants (Centres Managers, District Assembly Officials, GIFEC, IICD Official and Users). Participants in all five categories were purposively sampled. Interviews were recorded after participants had given their consent. Interviews took an average of 55 minutes. These were then transcribed. Also, field notes were recorded in a field notebook and at the close of each observation session they were read and converted into an electronic format. Even though, data collection was done mainly through semi-structured interviewing, data were also obtained through observation. The official website of the responsible government department (GIFEC) tasked with the duty of implementing the CIC initiative where information regarding the context of the initiative was used. Data gotten from this source gave insights into the evolution of the CICs.

Data was converted to an electronic format and uploaded to Nvivo software for qualitative analysis (Leech & Onwuegbuzie, 2011). The software is useful for organising the different data types and sources (Ozkan, 2004). The information gathered was read and re-read several times and the emerging themes with regards to elements of contemporary colonisation were identified and coded. In so doing, we allowed the data to speak to us. The approach of data analysis was guided by Postcolonial theory and conducted in a reflective manner thereby enabling an efficient interrogation of data.

6. FINDINGS

6.1. Subaltern

Evidence from the study shows that the beneficiaries (or majority of stakeholders) of the project neither participated in the planning/design of the initiative in any way nor were they involved in the implementation of the project. In a discussion with a member of staff at the implementing agency, the following reference was made;

"The assessment was done by the ministry of communication together with the district assembly specifically asked to show where the building should be situated" (Assembly Official)

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

605

Interviews with most Assembly officials corroborated the above statement. The only indication of participation, however, had occurred when the beneficiary District Assembly participated in the tendering process to award the building of the CIC structure (building) and in identifying the location of the building. Community support and needs were therefore assumed and inscribed into the planning and design of the system. Respondents were of the opinion that the centre had not given villagers more choice over their lives.

"Specifically for the illiterate populace I don't think it has directly changed their lives. Indirectly, because their children are using it indirectly help them in such a way that if your mother wants to transact business they can do it on their behalf but I am looking at those women being able to use the centre on their own. You know most of them are traders" (IICD Consultant).

Most managers said the most requested service was video games usually by children. They however did not have such software neither did they encourage children to engage in their use. Likewise, there was little or no local content. What was available was invariably in a language (English) that few patrons could make adequate use. Users interviewed said they knew of people who decided not to visit the centres because information they were seeking was not packaged in such a way that they could adequately use them to their benefit. Centre managers pointed out that the number of patrons visiting their facilities was dwindling by the day. Partly because the centres could not provide their basic information needs.

Findings indicate that the CIC neither facilitated a bridging of any of the gaps it was intended to close. It did very little to bridge the gap between the rich or poor, male or female and young or old. Rather, the disparity in these categories was rather widening at the time of this research than when they were initially established. However, an interesting finding was that there was a degree of some bridging of knowledge gaps between those who had access to news outlets at work or home and those who were not fortunate enough. One of the expert/practitioner interviewees made the following observation;

"I think it has bridged some gaps and theses are more in line with knowledge gaps and not rich or poor, male or female gaps. Those who would have had the CIC as their only option to read news will now be closing the gap with those who have more money or can read news from their offices or newspapers" (Expert/Practitioner).

6.2. Otherness

In the above findings, 'otherness' begins to emerge in the form of rural versus urban inclusion in the information society and the country comparing its economic status with the outer world in terms of 'economic revolution'. From the analysis of the site of the GIFEC, a clear manifestation of existing in the eyes of big Other comes to the fore. The work of GIFEC is given a boost through the CMAI NTA World Communication Awards. The following speech was delivered by the CEO of GIFEC;

"… with GIFEC's recognition as the Most Outstanding Universal Access Fund, Ghana has been placed as the nation foremost in the provision of access to electronic communications. This, therefore, means strides have been made in the provision of basic telephony, ICT, broadcasting, internet, multi-media service, to the unserved and underserved communities in Ghana" (GIFEC CEO).

This in the eyes of the GIFEC official interviewed is recognition by external agencies of their hard work. The fact that these awards are coveted implies something must be going right for them to have been awarded such a prize.

Most managers especially those who managed centres that had closed had a divided attention to manage the facilities they were responsible for. They complained of inconsistent payment of salaries that often took several months. Also, a majority of managers were not permanent staff of

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

606

the assembly. This was corroborated by Assembly officials and IICD consultant interviewed. They had promised to engage them as core staff. However, most of them complained that these promises had been long overdue and was affecting their work since they did not know their 'faith'. In their opinion, this was because their superiors (significant Other) did not care about their wellbeing neither were they respected or held in any esteem. According to them this was demoralising and thus affected the way they administered the centres. For some of them this othering affected them emotionally because they felt they did not 'belong' and were not a part of the system (District Assembly).

6.3. Hegemony

Also, we see the entire implementation of the CIC initiative as hegemonic in that the government imposed the centres on the beneficiary communities without giving them a voice. In a discussion with one of the CIC schedule officers at an assembly, the officer complained that;

"to some extent there wasn't much consultations because people did not know what they were meant for ... when I made some follow-ups by interacting with the people from GIFEC I got to know that the project was not even supposed to be as it is now" (Assembly Official).

It is also interesting to note that whereas government officials stated that that the contracts for the building of the CIC structure was awarded in consultation with the various assemblies, responses from the majority of assemblies suggest differently.

"the construction of the structures were not properly done, they were awarded in Accra, so people came and did whatever they wanted, nobody new the design, they put up structures and at the commissioning then people are then getting to know what is going on, so you could see some cracks, frequent breakdown of equipment..."(Assembly official).

Also, there was political interference in the appointment of some centre managers and this according to assembly officials occurred along political lines. Appointing officials were not given the free will to choose competent people to management centres. A change in government invariably means change of alliances. Consequently, some of them lose their jobs. New people are then recruited and have to be trained again.

The foregoing indicates a situation in which users and managers of the initiative believe that there is a disparity between the centre and the periphery that must be closed if they are to share in the 'economic revolution' envisaged.

7. ANALYSIS AND DISCUSSION

According to implementing officials, an opportunity for effective participations is directly linked to educational background. School leavers understand the benefits of ICT and the ability to use them hence can effectively participate in their use and consequently the design. This can be interpreted to mean that since villagers or the poor majority were uneducated the decision of participation was taken out of their hands.

Managers and owners of the CIC were involved mostly in 'othering' the subaltern (rural underprivileged folk). Whereas most managers and Assembly officials complained of the fact centre patrons were dwindling by the day, they took very little steps to ensure that this was curtailed. First of all, most of the users interviewed indicated that they discovered the centre by chance or through friends who had used the centres before. Awareness creation was therefore very minimal. Secondly those who found their way in there to use the system were not given the boost to keep coming. If the underprivileged and underserved who were meant to reap the benefits of the systems did not know it existed, how then were they going to have access, use and then leverage its potential to partake in the information society?

As Bailur (2008) points out, the introduction of ICTs is given as examples of progress and modernity over tradition. The fact that rural folk have to 'catch up with' urban dwellers implies

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

607

that the status quo is not acceptable and must be eliminated in other to usher in a new world other which is better with ICTs. To achieve this end requires the understanding of the needs of all those at the periphery. This is akin to the Orientalist mentality espoused by Said (1978). As a country, Ghana is striving hard to join the economic revolution implying there are those countries 'below' and those 'above'. Ghana finds itself below and wants to ensure that it joins those above.

It was abundantly clear that the 'centre' imposed the CICs on the 'periphery' thereby deepening the 'othering' process. Community members were disengaged from the project since they were hardly involved, and hence its non-performance. The impression of participation where district assemblies were to indicate where the centres were to be sited gave a false illusion of participation as described by William (2004).

It is interesting to note that the GIFEC official and by extension GIFEC as an institution revel in the award given by an external institution (seeking acceptance in the eyes of the Other). We must, however, ask whether this reflects the situation especially in the case of CICs. Is the recognition by the 'Other' greater than the benefit that 'other' gets from these projects? At least in this study the evidence points to the fact these communities were not getting value for money since the majority of centres investigated had closed.

The mixing of different cultures leads to the emergence of new cultures. English is the cultural legacy of postcolonial Ghana. The majority of the underserved and unserved communities that were meant to benefit from the CIC, however, are mostly illiterate. Since information is not packaged in a format useable by the majority, it becomes impossible to harness the full potential of the centres for their information needs.

The discussion and analysis of the findings from a postcolonial perspective gives a worrying depiction of failure. In a broad sense, Postmodernist hold the view that communities or individuals have agencies and, therefore, do not necessarily have to adopt wholesale what has been imposed on them. Therefore, we need to ask why organisations, communities and individuals involved in the initiative are not appropriating these facilities to their benefit.

The failure of the CICs could be conceptualised as an 'institutional void' (Khanna & Palehu, 2010) because the infrastructure necessary for the success of the initiatives in the context of the study is present. Khanna & Palehu describe 'institutional voids' as the absence of efficient intermediaries in an organisational environment whose supporting role are essential in the execution of an instructional mandate. The key to success is to understand that voids exist and find the most appropriate means to work around them to the advantage of the institution. We identify a void (deficiency) in the governance system of the CICs that needs urgent attention to turn around the failing fortunes of the initiative. In order to plug that void a realignment of institutional 'thinking', as well as alternative and beneficial use, would have to be found for the CICs. For instance, we suggest that the present governance model of the CICs be restructured to involve the private sector in the delivery of services. Such public-private arrangements may be skewed towards the use of these facilities as regional Technology Hubs to engage young and enterprising individuals in these deprived communities. They could serve as spaces where young entrepreneurs are given the opportunity to nurture dreams learning and starting their businesses. The failure of the centres, although it can be ascribed to a postcolonial malaise of inaction does not have to persist. The institutional structures (although dormant) are in place to create an alternative reality for these initiatives. The findings suggest that alternative narratives need to be investigated to supplement the postcolonial macro analysis. These will be related to power, politics and culture.

8. CONCLUSION

We began by trying to understand why most development initiatives such as CICs of Ghana often do not succeed in fulfilling their mandate. We also use an alternative approach to

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

608

understand why such systems, even though, unsuccessful are still perpetuated in developing countries. The research argued that Postcolonial elements were visible and thus influenced the implementation of ICT initiatives in a former colonial state. The implementation failures of the CICs in Ghana point to weak institutional and governance structures and the 'othering' (marginalisation) of so-called unserved and underserved communities (Subaltern) living at the periphery. This notwithstanding, we suggest that it is possible to stem this tide of failure by strengthening institutional structures and putting the centres to alternate use. This is achievable by encouraging community and private participation in the management of centres in a context devoid of political interference.

We acknowledge that the use of postcolonial theory in our study narrows our vision and interpretation of findings to predetermined concepts thus narrowing the possibility to digest the data thoroughly and arrive at alternate results. Although we recognise the usefulness of postcolonial concepts to explain the continuing implementation of such projects in Ghana, it is by no means adequate to account for all reasons for failure. We, therefore, suggest that future work on CICs consider the use of different frameworks or theories to investigate the phenomena from different perspectives such as culture and class differentiation, politics and power.

9. REFERENCES AND CITATIONS

Abbitt, E. S. (2001). Androgyny And Otherness: Exploring The West Through The Japanese Performative Body. Asian Theatre Journal, 18(2), 249-256.

Abdulai, A. G. (2009). Political Context Study– Ghana. Leeds And Accra: Human Rights, Power And Civic Action Research Project,

Alfred, T., & Corntassel, J. (2005). Being Indigenous: Resurgences against Contemporary Colonialism. Government and Opposition, 40(4), 597-614.

Ashcroft, B., Griffiths, G. And Tiffin, H. (1998). Key Concepts in Post-Colonial Studies. London: Routledge.

Avgerou, C. (2010). Discourses On ICT And Development. Information Technologies And International Development, 6(3), 1-18.

Awotwi, J. E., & Owusu, G. (2010). Ghana Community Information Centers (Cics) E-Governance Success Or Mirage? Journal Of E-Governance, 33(3), 157-167.

Bailur, S. (2008). Analyzing Telecentres Using Postcolonial Theory. Paper No.35: Development Informatics Working Paper Series,

Bhabha, H. K. (2004). The Location Of Culture. London: Routledge.

Chaudhri, N., & Dash, S. S. (2007, December). Community information centers: E-governance at subdistrict level: A case study. In Proceedings of the 1st international conference on Theory and practice of electronic governance (pp. 366-369). ACM.

Chaudhuri, A. (2012). ICT for development: Solutions seeking problems. Journal of Information Technology, 27(4), 326-338.

Cherlet, J. (2014). Epistemic and technological determinism in development aid. Science, Technology & Human Values, 39(6), 773-794. doi:10.1177/0162243913516806

Chibber, V. (2014). How Does The Subaltern Speak?: An Interview With Vivek Chibber. Retrieved From: Https://Www.Jacobinmag.Com/2013/04/How-Does-The-Subaltern-Speak/

Childs, P., Williams, R. P., & Williams, P. (1997). An Introduction To Post-Colonial Theory Prentice Hall London.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

609

Creswell, J. W. (2012). Qualitative Inquiry And Research Design: Choosing Among Five Approaches Sage.

De Kock, L. (1992). Interview With Gayatri Chakravorty Spivak: New Nation Writers Conference In South Africa. Ariel, 23(3), 29-47.

Dirlik, A. (1994). The Postcolonial Aura: Third World Criticism In The Age Of Global Capitalism. Critical Inquiry, 20(2), 328-356.

Dyson, L. E. (2004). Cultural Issues In The Adoption Of Information And Communication Technologies By Indigenous Australians. Proceedings Cultural Attitudes Towards Communication And Technology, 58-71.

Eakin, E. (2001). Harvard's Prize Catch, A Delphic Postcolonialist. The New York Times, Http://Www.Nytimes.Com/2001/11/17/Arts/Harvard-S-Prize-Catch-A-Delphic-Postcolonialist.Html.

Eisenhardt, K. M. (1989). Building Theories From Case Study Research. Academy Of Management Review, 14(4), 532-550.

Escobar, A. (1995). Encountering Development: The Making And Unmaking Of The Third World. Princeton, N.J: Princeton University Press.

Ess, C. (2004). Questioning The Obvious? Ethical And Cultural Dimensions Of CMC And Icts. Springfield: Drury University.

Fanon, F. (2008). Black skin, white masks. Grove press.

Frank, AG (1969) Latin America: Underdevelopment or Revolution (New York: Monthly Review Press)

G-ICT4AD. (2003). THE GHANA ICT FOR ACCELERATED DEVELOPMENT (ICT4AD) POLICY. The Republic Of Ghana.

GIFEC (2013). The Community Information Centers Project. Retrieved From Http://Gifec.Gov.Gh/Index.Php?Option=Com_Content&View=Article&Id=83:Uuniversal-Access-To-Electronic-Communications-Programme&Catid=38:Projects&Itemid=248

GIFEC (2014). Assemblies charged to maintain CICs. Retrieved from: http://gifec.gov.gh/index.php?option=com_content&view=article&id=192%3Aassemblies-charged-to-maintain-cics&catid=42%3Alatest-news&Itemid=166

Gramsci, A. (1991). Prison Notebooks. New York: Columbia University Press.

Gurstein, M. (2001). Rural Development And Food Security: A" Community Informatics" Based Conceptual Framework. System Sciences, 2001. Proceedings Of The 34th Annual Hawaii International Conference On, 10 Pp.

Gurstein, M. (2003). Effective Use: A Community Informatics Strategy Beyond The Digital Divide. First Monday, 8(12), Http://Journals.Uic.Edu/Ojs/Index.Php/Fm/Article/View/1107/1027.

Gyimah-Boadi, E. (2008). Ghana's Fourth Republic: Championing The African Democratic Renaissance? CDD-Ghana Briefing Paper, 8(4)

Heeks, R. (2002). Information systems and developing countries: Failure, success, and local improvisations. The Information Society, 18(2), 101-112. doi:10.1080/01972240290075039

Heeks, R. (2005). e-government as a carrier of context. Journal of Public Policy, 25(01), 51. doi:10.1017/S0143814X05000206

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

610

Irani, L., Vertesi, J., Dourish, P., Philip, K., & Grinter, R. E. (2010). Postcolonial Computing: A Lens On Design And Development. Proceedings Of The SIGCHI Conference On Human Factors In Computing Systems, 1311-1320.

Jhunjhunwala, A., Ramachandran, A., & Bandyopadhyay, A. (2004). N-Logue: The Story Of A Rural Service Provider In India. The Journal Of Community Informatics, 1(1)

Johansson Hedberg, L. (2011). Telecentre For Community Development: Evaluation of the Tunjang telecentre, Malaysia. The Journal of Community Informatics, 6(2).

Khanna, T. & Palepu, K. (2010). Winning in Emerging Markets: A Road Map for Strategy and Execution. Harvard Business Press, Boston.

Kenny, K. M. (2013). Power And The Construction Of Independence In ICTD Organizations. Information Technology For Development, (Ahead-Of-Print), 1-17.

Kohn, M. (2014). Colonialism . In Edward N. Zalta (Ed.), The Stanford Encyclopedia Of Philosophy (Spring 2014 Edition Ed.). Http://Plato.Stanford.Edu/Archives/Spr2014/Entries/Colonialism/:

Kumar, R., & Best, M. L. (2006). Impact and sustainability of e-government services in developing countries: Lessons learned from Tamil Nadu, India. The Information Society, 22(1), 1-12.

Leech, N. L., & Onwuegbuzie, A. J. (2011). Beyond Constant Comparison Qualitative Data Analysis: Using Nvivo. School Psychology Quarterly, 26(1), 70.

Mariscal, J., Gil-Garcia, J. R., & Aldama-Nalda, A. (2011). Policies on access to information technologies: The case of e-Mexico. Information Technologies & International Development, 7(2), 1-16.

Mathison, S. (1988). Why Triangulate? Educational Researcher, 17(2), 13-17.

Ministry of Finance (2014). Mid-Year Review of the Budget Statement and Economic Policy and Supplementary Estimates of the Government of Ghana. Retrieved from: http://www.mofep.gov.gh/sites/default/files/budget/2014%20Mid%20Year%20Review%20and%20Tables.pdf

Oppenneer, M. (2009). ICT4D: Seeking The Spaces Inbetween. Retrieved From: Http://Resources.Ethnosproject.Org/Ict4d-Seeking-The-Spaces-Inbetween/

Ozkan, B. C. (2004). Using Nvivo To Analyze Qualitative Classroom Data On Constructivist Learning Environments. The Qualitative Report, 9(4), 589-603.

Prado, P., Câmara, M. A., & Figueiredo, M. A. d. (2011). Evaluating ICT adoption in rural brazil: A quantitative analysis of telecenters as agents of social change. The Journal of Community Informatics, 7(1-2)

Prakash, A., & De`, R. (2007). Importance of development context in ICT4D projects: A study of computerization of land records in india. Information Technology & People, 20(3), 262-281.

Proenza, F. J., Bastidas-Buch, R., & Montero, G. (2001). Telecenters For Socioeconomic And Rural Development In Latin America And The Caribbean. Washington, DC: FAO, IADB And ITU,

Rajão, R., Duque, R. B. & De', R. (2014). Introduction Voices from within and Outside the South—Defying STS Epistemologies, Boundaries, and Theories. Science, Technology & Human Values, 39(6), 767-772.

Said, E. (1978). Orientalism. London. Pantheon.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

611

Said, E. W. (1994). Culture And Imperialism. London: Vintage Books.

Sey, A., & Fellows, M. (2009). Literature Review On The Impact Of Public Access To Information And Communication Technologies. Center For Information And Society,

Spivak, G. C. (1988). Can The Subaltern Speak? In Nelson, C. And Grossberg, L Eds (Ed.), Marxism And The Interpretation Of Culture () Macmillan, Basingstoke.

Tawiah, O. (2012) Over 360 dormant post offices to be turned into ICT centres. Retrieved from: http://business.myjoyonline.com/pages/news/201205/86470.php

Thompson, M. (2004). Discourse, 'Development' & The 'Digital Divide': ICT & The World Bank. Review Of African Political Economy, 31(99), 103-123.

Van Pelt, T. (2000). Otherness. Postmodern Culture, 10(2)

Walsham, G. (1995). The Emergence Of Interpretivism In IS Research. Information Systems Research, 6(4), 376-394.

Williams, G. (2004). Evaluating Participatory Development: Tyranny, Power And (Re) Politicisation. Third World Quarterly, 25(3), 557-578.

Yin, R. K. (2009). Case Study Research: Design and Methods Sage Publications.

Zheng, Y. (2009). Different Spaces For E-Development: What Can We Learn From The Capability Approach? Information Technology For Development, 15(2), 66-82.

Mariscal, J., Gil-Garcia, J. R., & Aldama-Nalda, A. (2011). Policies on access to information technologies: The case of e-Mexico. Information Technologies & International Development, 7(2), pp. 1-16.

Prado, P., Câmara, M. A., & Figueiredo, M. A. D. (2011). Evaluating ICT adoption in rural Brazil: a quantitative analysis of telecenters as agents of social change. The Journal of Community Informatics, 7(1-2).

Sandeep, M. S., & Ravishankar, M. N. (2014). The continuity of underperforming ICT projects in the public sector. Information & Management, 51(6), 700-711.

Sandeep & Ravishankar, 2014

Vannini, S., Rega, I., Sala, S., & Cantoni, L. (2013) "Motivations of non-use of telecentres: a qualitative study from Mozambique". GlobDev 2013. Paper 21.

Young, R. J. C. (2001) Postcolonialsm: An Historical Introduction. Blackwell Publishers, Oxford.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

612

IDOLS OF THE ICT4D THEATER. THE STAGE

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Abstract: An analysis was done on 45 academic journals that focus on development. Searches were performed on frequencies of thematic concepts to determine the dominant theoretical themes in development journals. A subset of these journals focus on ICT4D. Semantic Network Theory was used to construct semantic superclasses of the themes, and assigned to the theoretical frameworks of popular theoreticians. Philosophical frameworks of sociology, economics and politics dominate, while communication theory and theory of technology hardly get any attention, which is odd as the abbreviation "ICT4D" suggests that both *communication theory* and *theory of technology* are part of the equation in development. Results indicate different emphases between development journals in general (focusing mainly on economics, politics and sociology), and ICT4D journals (focusing predominantly on socio-economics, with a little bit of politics thrown into the mix).

Keywords: ICT4D, semantic superclass, economics, politics, sociology, theory of technology.

1. INTRODUCTION

Francis Bacon's *idols of the theatre* is the thematic hook on which this paper hangs. In his *Novum Organum Scientiarum* (in English: *New Instrument of Science*), first published in 1620, Francis Bacon (1561–1626) proposed logical induction as a tool to obtain knowledge. He wrote against the ultimate cultural authority of his time, namely tradition, especially religious tradition. His argument runs as follows. In our rational search for knowledge, we should be careful of phantoms (usually translated as *idols* as transliteration of the Greek *eidolon*) that may mislead us. These phantoms are of the tribe (biological bias), of the cave (cultural bias), of communication (the market place) and conceptual frameworks (the theatre). This paper investigates the phantoms of conceptual frameworks in ICT4D narratives, and is a first step in an exploratory journey into the dense forest in the world of ICT4D. Much more research is required as only a few machete strokes are presented here.

2. BACKGROUND

The "discipline" of ICT4D is relatively new. The term ICT4D consists of the semantic components information technology, communication technology and development. In ICT4D research papers, one would expect a balance between conceptual frameworks of development studies, of information technology and of communication technology. It goes without saying that ICT4D is multi-disciplinary. Yet reality indicates that the weight seems to be in favor of development, and particularly socio-economic development, while the conceptual frameworks of technology and of communication seem to take a back seat in ICT4D literature.

ICT4D players from different theaters typically publish in different journals, while papers are reviewed against different frameworks as well as methodological expectations. Academic actors on the ICT4D stage come from a variety of traditional disciplines. Those with a technological angle are from Information Systems, Computer Science, Applications Development and Engineering. Information Systems players might also publish in IS journals. Computer scientists

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

613

and engineers might publish in IEEE journals. These actors are often not much interested in philosophical matters - especially the engineers (based on personal interviews over the years with engineers in the field). Information Systems is a latecomer to non-positivistic methodologies, which means the type of papers accepted need to be based on a particular philosophical framework. Venkatesh, Brown and Bala report "... that less than 5 percent of the empirical studies published between 2001 and 2007 in the six major IS journals identified in the Senior Scholars' Basket of Journals (AIS 2007) have employed mixed methods." (2013:22). The same very likely applies to the other technical disciplines. Other authors come from various other backgrounds, ranging from geography, health, sociology to politics and philosophy. This means that there is no single voice regarding theory or philosophy. That may not be a bad thing. Yet, despite that there is no single theoretical focus, there are nevertheless favorite philosophies and theoreticians, as shown in this paper.

Given the ubiquity and pervasive nature of ICT in developed regions, where ICT has become a commodity, it is not surprising that so many authors from so many different philosophical and theoretical positions touch upon technology in some or other way. Few, however, have developed theories or philosophies of technology, or particularly ICT. Thinkers who indeed address technology typically do so from some or other ideological foundational perspectives, not socio-technical theories. The dominant approaches are such as ICT for economic development, or ICT based on sociological or political theories.

Actors with some kind of social conscience, or an inclination towards activism are from almost any and all other academic disciplines: sociology, economics, anthropology, politics, public administration, health, gender studies, education, public administration, and even psychology. This should allow for a very rich blend of ideas, theory and philosophy, but as yet no coherent theory or philosophy has arisen for ICT4D. In fact, as will be shown in this paper, technology philosophy and theory are underrepresented, while ICT4D is, regarding theory, dominated by sociology, economics and politics. There is of course abundant publications on technical matters, such as telecenters and mobile phone and application development. But papers reporting on these are typically not concerned with philosophy or theory, even when there is reference to say, Castells or Sen. Their foci might be, for example, on assessing success factors, or type of use, such as type of content, or function, or of users (e.g. gender distribution). This paper is not interested in such technical topics. Although there are representative papers that touch on technology theory, an observer might conclude that theory of technology is not important in ICT4D publications. There is no common voice about methodologies, about narrative styles, about what counts as good research, and not even about what ICT4D means. At this stage it seems that anything goes, though not in the sense that Feyerabend (1975) had in mind as development journals do have favorite "paradigms" of thought.

On one hand intellectual thinking about the world might be about deep philosophical and theoretical matters, and on the other hand about "mundane" technical matters, such as application development, without any concern about the bigger issues. There is no objective reason why both approaches are not important. It is my contention, though, that if the focus is too much on particulars, one may get lost among the trees in a forest. A practical implementation of a network in a remote village embraces a host of assumptions and theories, even if the implementers are unaware of them. Theory and worldview directs practice, even if only tacitly. It is important for practitioners to understand the broader theoretical perspectives. In my view it is this lack of a philosophical or theoretical understanding of issues why so many ICT4D projects fail. A particular ideology might underlie a project, but the ideology is not critiqued and accepted at face-value, whether applicable to the local circumstances or not. Experiences such as these prompted the origin of research for this paper as an attempt to uncover the dominant themes in development.

Conversely, many theoreticians do not understand the conceptual frameworks of technologies, or may either ignore technologies or philosophies or theories of technology, or approach

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

614

practicalities from the framework of their own discipline. Despite the abundance of papers reporting on technical matters such as telecenters and mobile phones it is telling how little reference there is in ICT4D literature to Science and Technology Studies (STS - e.g. Bijker *et al*, 2012), or philosophy or theory of technology (e.g. Ellul 1954/1964, Ihde 2004), or the more recent work of Hodder (2012) on entanglement between humans and things. Such papers typically do not discuss, and perhaps not even recognize that their approaches are tacitly based on some or other philosophical or theoretical framework. This indicates that the technology part of the term ICT4D does not receive as much attention as the development part. The technical part of technology does indeed receive attention. It is interesting that some cited theoreticians, such as Amartya Sen, did not even consider technology at all. Other authors (Castells, Giddens, Habermas, Foucault and so forth) who wrote about technology wrote not from a technological perspective, but from the point of view of sociology or politics. In ICT4D journals authors who indeed wrote from a technology point of view, such as Bruno Latour, rank far below socio-economic theorists in terms of frequency of references. The bulk of ICT4D literature is thus not about technology, but about what technology is used for - an instrumentalist view of technology, which proposes that the purpose of technology is to be used for something within some context. That context is what the dominant theories are about. For perhaps all the participants in the ICT4D theatre, the "discipline" is about social change, while technology is used as an intentional tool to achieve that change. Some form of activism thus applies.

Development Studies as a discipline has been around for about half a century, and originated against the backdrop of the economies of the so-called Third World after efforts in the mid 20th century of decolonization. Originally its main thrust has been on economics and politics, but gradually other theories have been incorporated. Although rational economics is still very prominent in development, over recent years more and more papers in development journals are taking a socio-economic stance. For example, Amartya Sen is the second most cited author in development journals - more so than in ICT4D journals. Although he is an economist, his theories have a very strong social component. ICT4D might be regarded as a relative newcomer and a sub-discipline of Development Studies. In ICT4D economics and politics are still prominent. Rational economic theory does not feature much in ICT4D, but socio-economics certainly dominates.

Given mass media reports (many blogs and ICT4D projects reported by NGOs) on ICT4D and even some academic narratives, one dominant assumption is that ÌCT will make an economic difference. Here are just a few examples. Chew and Ilavarasan (2013) investigated the link between mobile phones and micro-enterprise growth. Aker, and Mbiti (2010) hailed the mobile phone as the new economic savior of Africa. Turpin, Alexander and Phahlamohlaka (2013) use systems theory "to assess the influence of the ICT4D project on the socio-economic development." (note the term economic). Kamau, Reberio-Hargrave, Saito *et al* (2014) propose that ICT offers opportunities to improve the economic sustainability of villagers.

Economics is also buried in Castell's (the most cited author in ICT4D) theoretical notion of information as production method (and consequently an economic activity). The present paper shows that the economics bias in ICT4D literature lurks much more subtly in the background, as the dominant underlying theories of ICT4D can be labeled with the semantic superclass *socio-economics*.

3. ANALYSIS

An interpretivist mixed methods approach was followed. Different kinds of data sets were analyzed, following different methods. As first step, content analysis was done on a limited set of abstracts of each of 45 academic development journals (a few more journals than in the list of Heeks 2010). Then searches were conducted on certain keywords, using internal journal search functions as well as Google Scholar searches. An informal comparison was done between these sets to find thematic correlations. With informal is meant that no formal quantitative statistical

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

615

methods were used. An informal semantic taxonomic hierarchy was established based on semantic network theory (Quillian 1967, Sowa 2014), which is conceptually similar to the cladistic method of biologists. Data, result details and the list of journals consulted are available on the companion website available at www.steyn.pro/ict4dtheatre.

A taxonomic hierarchy is a definitional network, i.e. a network that indicates subtypes, or *is-a* relations that result in a generalization hierarchy. For example, in the field of economics, the following common sub-nodal keywords within the hierarchical network encountered in journals are classified with *economics* as superclass: market, trade, finance, labour, employment, skills, entrepreneurship, industry, poverty. This means that even if an article does not contain the keyword economics, if it contains semantically subordinate keywords of the superclass *economics*, it is categorized as such.

Selecting the target keywords to be presented by the nodes of the semantic networks was not done formally, but informally, based on personal knowledge of the English language and about fifteen years of experience in the field of ICT4D. The selection process was also informed by the grand themes addressed by the most popularly cited authors, reported elsewhere.

Keywords that might appear occasionally in a particular journal, but not in other journals, are classed under the superclass parent node and not reported separately. Consider the keyword *violence*. Its dominant semantic markers are deemed to concentrate on social violence, and not personal sphere violence, such as domestic violence. Although public violence is often due to economic factors, the economic factors are often the result of some political decisions (*politics* defined here as position of power), hence *violence* is not classed as economics, but politics.

Theoretical themes have historical origins, the custom being to refer to the author first to publish the ideas. Emerging themes identified in the present paper thus implicitly refer to their originators. In this paper the focus is on the themes, not the authors, who are presented in another paper to be published.

Results on keyword searches can only mean *that* a keyword was found. As no in-depth content analysis was done (in the sense of parsing whole articles), the results make no claim on *what* was written about the keyword. An in-depth much more formally quantitative project would be a massive undertaking, and if conducted, it would be interesting to compare results. From the present more informal and interpretative data analysis it can only be concluded that a certain author or concept features in the literature. Nothing can be concluded about whether the referring author agrees or disagrees with the referred construct. For example, an author might refer to ANT. The method does not pick up whether the author accepts, rejects or uses ANT. What the results do show is an awareness (hopefully) by the citing authors of the works of cited authors and concepts. Assuming that the citing authors indeed read the works of the cited authors, the ideas of the cited authors are thus alive in the theaters of development, and of ICT4D.

4. THEMES IN DEVELOPMENT JOURNALS

Several popular macro themes emerge from the content analysis. Three methods were used to determine these themes: informal semantic analysis of journal abstracts, clustering of emerging dominant keywords and informal indexing into hierarchical structures, and finally, based on these result, searching journals (using their internal search facilities) on identified generic terms and theories.

Based on the identified semantic super classes, it is evident that by far the most dominant theme in the 45 journals consulted focus on *socio-economics*, which is also confirmed by the analysis of the theoretical authors, reported in a different paper. Topics related to the superclass *politics* rank second (Figure 1). Economics dominate even more in development journals than suggested by the obvious results, as activities such as trade, finance, industry, market, labour, employment

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

616

and skills are economic activities. When data from these activities are added to the semantic class *economics*, economics themes dominate by more than three times the political themes.

The dominant semantic marker regarding the superclass *politics* concerns power relations, which feeds into dipolar concepts such as social, gender and digital divides. Many sociologists (e.g. Castells, Foucault, Bourdieu) also approach their social theory from the point of view of power relations. For the taxonomical purpose of this paper, the superclass *politics* includes references to social, gender and digital divides. In this sense even Marx' class struggle may be regarded as a struggle for social power or as as an economic struggle. Marx could thus be classified with either the superclass *politics* or the superclass *economics*. The boundaries between politics and social matters are blurred. From a certain perspective economics is a cultural activity, and in that sense a sub-domain of *sociology*, but this is not made explicit especially by rational economists who regard economics as a supra-historical, objective entity with a life of its own. Also, politics can operate only in social contexts, which means that politics would be a sub-domain of sociology. The boundaries between economics, sociology and politics is often fuzzy, and not as neatly packaged as suggested by the taxonomies reported in this paper. In order to make some sense of the different perspectives, sociology, economics and politics were regarded separately. Where they intertwine too densely, the terms *socio-economics* and *socio-political* were used.

The semantic superclasses of economics, politics and sociology dominate development journals, as evident from the graph in Figure 1. If the subdomain keywords (such as gender, governance, trade, industry, etc.) are added to these superclasses, their dominance is evident.

Figure 1. Most common themes in development journals

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

617
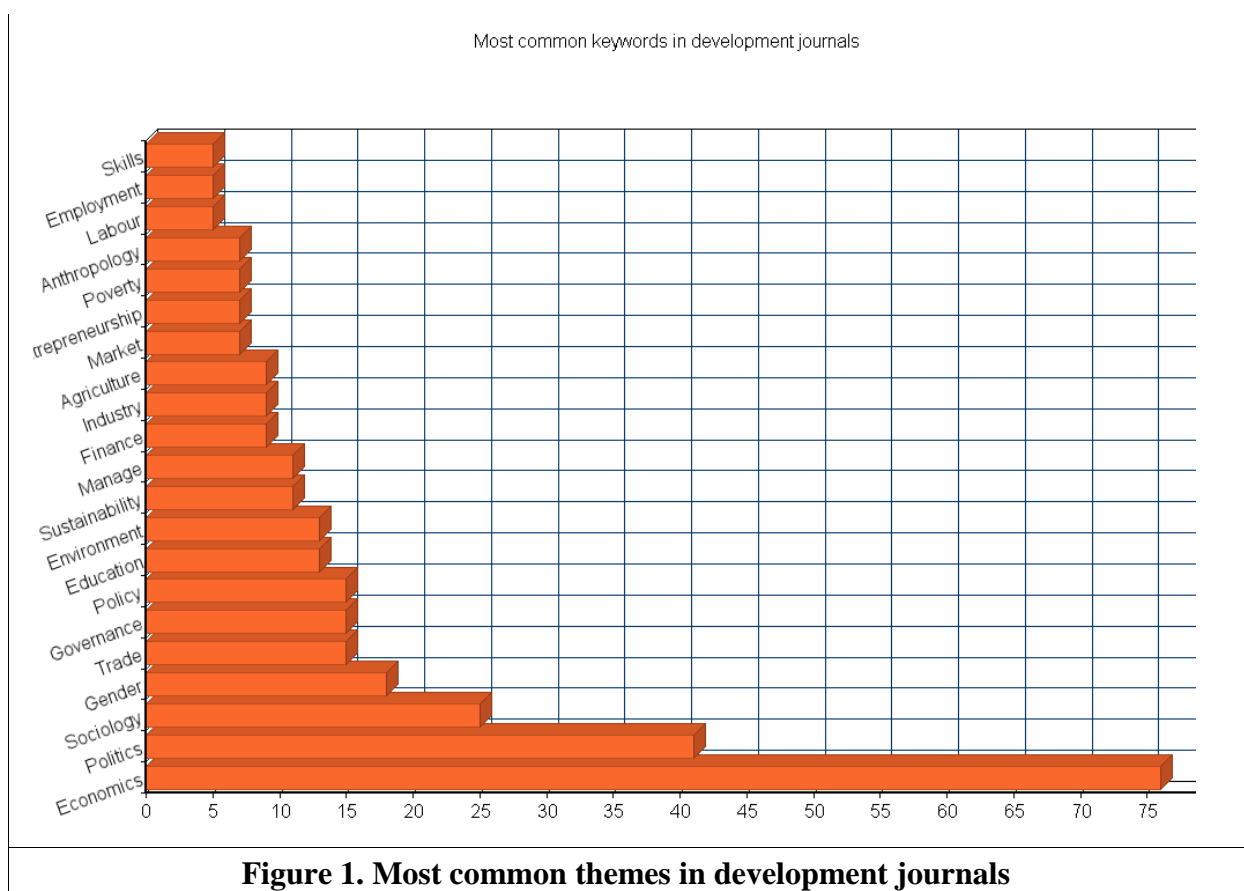
5. THEMES IN ICT4D JOURNALS

Specific searches were also done in ICT4D journals to determine the prominence of theories. Obviously the term *ICT4D* was searched for, but so too were *technology* and *computer*. As suspected, in journals that focus on information and communication technology, the term "technology" certainly dominates (Figure 2). Surprisingly, the term "ICT4D" itself does not rank high, but this might be due to the it being tacitly assumed in all papers, and thus not verbalized.

Figure 2. Most common themes in ICT4D journals
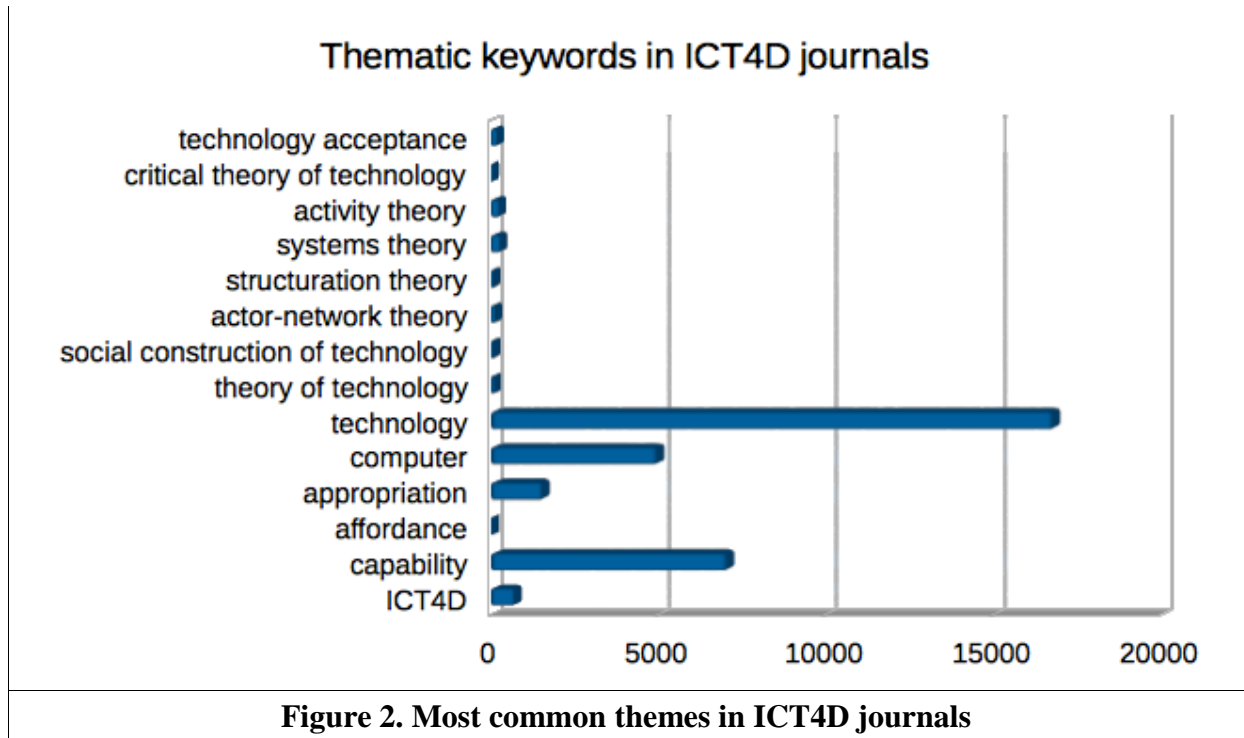
Figure 3 illustrates the themes remaining after stripping the dominant keywords *technology*, *computer* and *capability*. After the keyword *appropriation*, keywords *systems theory* and *activity theory* are prominent, but strangely, technological theories such as t*heory of technology*, *critical theory of technology* and *social construction of technology* do not feature much. There is a correlation here with author citations, as Bruno Latour (reported in another paper), whose philosophy is socio-technical, also does not rank prominently.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

618

Figure 3. Themes in ICT4D journals
- excluding the keywords "technology", "computer", "capability"
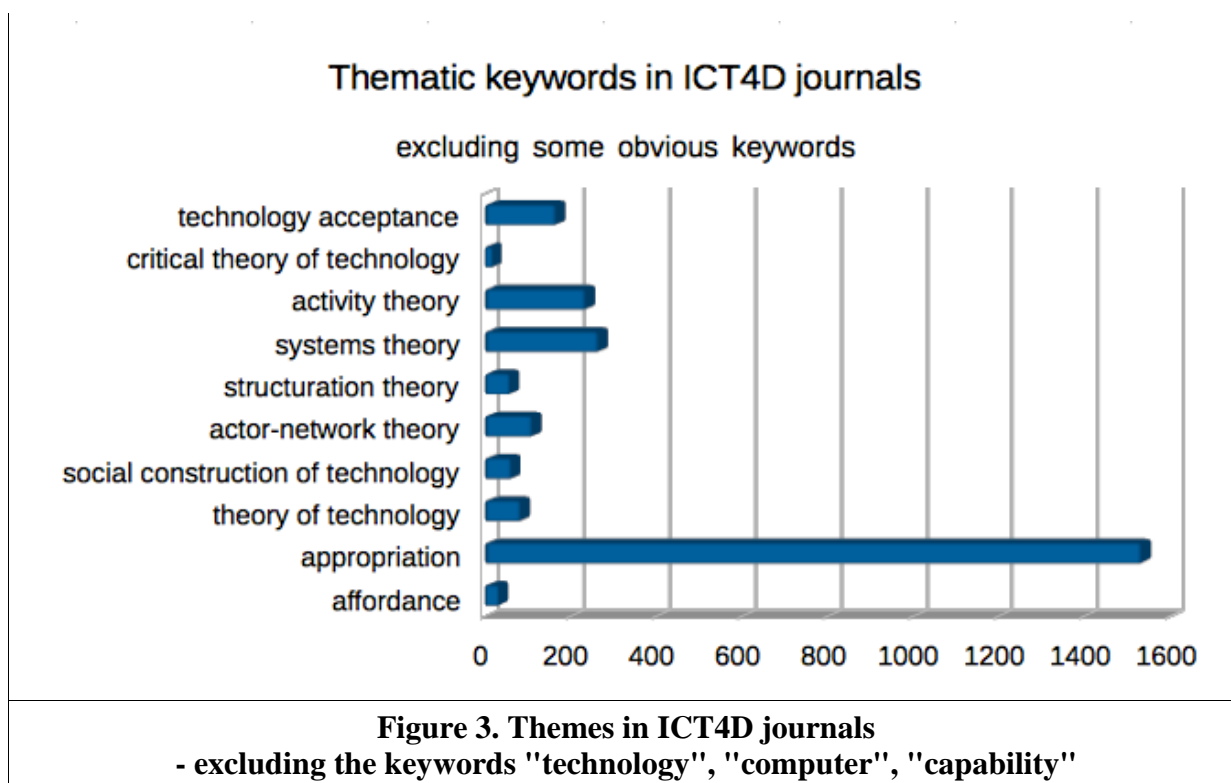
6. CONCLUSION

When clustered into semantic superclasses the most common keywords suggest that development authors (including ICT4D authors) are biased toward economics, politics and sociology. Technology theorists and communication theorists do not feature much. This suggests that the term *ICT4D* is a bit of a misnomer. There is writing about development, but in keeping with general development thinking. Technical IT does indeed feature significantly -- such as the use of specific technologies, e.g. telecenters or mobile phones, and applications. Yet the *C* and the *T* in the abbreviation ICT4D are generally speaking neglected. The dominance of socio-economic approaches might perhaps result in a lack of richness of thought. What is also lacking is a solid case for the role of ICT in developing non-economic well-being, such as psycho-social well-being. I have not come across a solidly argued case for this position. And if ICT indeed plays a positive role in well-being, how does this differ from the roles of other technologies? Why ICT and not other technologies? There is a vast area not investigated in ICT4D literature. The discipline seems to be stuck on the same old stage.

In conclusion, *socio-technology*, *theory of technology* and *philosophy of technology* are not popular among ICT4D authors. It seems that the "technology" part of ICT4D focuses more on specific types of technical artifacts and applications (e.g. mobiles, telecenters). In order to do more justice to the technology part, a strong case can be made that Latour should receive much more attention than presently. And of course, so too do authors focusing more on technology. Neither is communication theory popular. A case can thus also be made that ICT4D authors should pay more attention to communication theorists.

As there is not much theorizing from the perspective of technology, while adopting mainly theories about economic welfare and power struggles (even if from a sociological point of view), it comes as no surprise that so many ICT4D projects fail to live up to their promises. In general ICT4D authors seem to blindly accept notions such as that ICT enables economic development, or can act as social catalyst, or "agent" of change. As these types of assumptions are tacitly present in all ICT4D activities, perhaps more energy and effort should be spent scrutinizing, analyzing and critiquing them. Perhaps then, instead of comparing this and that technicality or artifact (e.g. whether development projects should implement telecenters or go for mobile), but

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

619

rather foundational assumptions and concept, we would be able to determine the reasons why projects fail, and why so few seem to be successful. Of course there are ICT4D authors who do indeed consider theoretical and philosophical questions. But they seem to be in the minority.

This paper identifies a gap in ICT4D literature. There is not enough space here to explain how communication theory or technology theory might contribute to ICT4D. Whether more focus on the "C" or "T" might lead to a different result is not clear. But it is worth investigating.

The ICT4D theater is full of actors, perhaps stuck with the same play on the same stage far too long. Perhaps the script became a bit muddled - perhaps even lost? As the character Jaques said in Shakespeare's *As you like it*: "All the world's a stage..." (Shakespeare *ca* 1599).

7. REFERENCES

There is a companion website that includes data and other relevant information not fitting into the space of this paper: http://www.steyn.pro/ict4dtheatre/

Aker, J.C., Mbiti, I.M. (2010). Mobile Phones and Economic Development in Africa. *The Journal of Economic Perspectives,* 24(3): 207-232.

Bacon, F. (1620). Novum Organum Scientiarum. Available at http://oll.libertyfund.org/titles/1432, last accessed August 2014.

Bijker, W.E., Hughes, T.P., Pinch, T. (2012). The social construction of Technological Systems. New directions in the sociology and history of technology. MIT Press.

Chew, H.E., Ilavarasan, P.V. (2013). When there's a will, there might be a way: the economic impact of mobile phones and entrepreneurial motivation on female-owned microenterprises. Proceedings of the Sixth International Conference on Information and Communication Technologies and Development, Volume 1: 196-204.

Ellul, J. (1954/1964). The Technological Society. New York: Vintage.

Feyerabend, P. (1975). Against method. New Left Books.

Heeks, (2010). Development Studies Journal Ranking Table. Available at http://ict4dblog.wordpress.com/2010/06/17/development-studies-journal-ranking-table/, last accessed August 2014.

Hodder, I. (2012). Entangled. An archaeology of the relationships between humans and things. Wiley-Blackwell.

Ihde, D. (2004). Has the Philosophy of Technology Arrived? A State-of-the-Art Review. *Philosophy of Science*, 71: 117–131.

Kamau, J., Reberio-Hargrave, A., Saito, H. *et al*. (2014). Social services on wheels: A sustainable model to improve access in unreached communities. IEEE, IST-Africa Conference Proceedings: 1-8.

Quillian, M.R. (1967). Word concepts: A theory and simulation of some basic semantic capabilities. *Behavioral Science*, 12(5): 410–430.

Shakespeare, W. (ca 1599). As you like it. Available at http://shakespeare.mit.edu/asyoulikeit/full.html, last accessed August 2014.

Simpson, D. (no date). Francis Bacon (1561—1626). Internet Encyclopedia of Philosophy. Available at http://www.iep.utm.edu/bacon/, last accessed July 2014.

Sowa, J.F. (2014). Semantic Networks. Available at http://www.jfsowa.com/pubs/semnet.htm, last accessed August 2014.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

620

Turpin, M., Alexander, T., Phahlamohlaka, J. (2013). Assessing the Contribution of Information Technology to Socio-economic Development: A Case Study from Rural South Africa. *Journal of Community Informatics*, 9(4). Available at http://www.ci-journal.net/index.php/ciej/article/view/979/1050, last accessed August 2014.

Venkatesh, V., Brown, S.A., Bala, H. (2013). Bridging the qualitative–quantitative divide: guidelines for conducting mixed methods research in information systems. MIS Quarterly, 37(1): 21-54.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

621

CRITICAL INTENT & PRACTICE IN ICT4D: A TYPOLOGY OF ICT4D INITIATIVES

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Abstract: The idea of 'Openness in ICT4D' begs critical questions including, 'open to whom?' and 'open to what development ends?' From the critical perspective espoused in this paper, 'Openness in ICT4D' should enable disadvantaged groups themselves to appropriate technology within their own programmes to overcome structural deprivation, discrimination and (dis)advantage. However influential reviews of the field suggest that ICT4D is currently characterised by 'top-down', technologically-determined processes in which 'intended beneficiaries' are insufficiently involved, and where the relationship between ICT and development is treated uncritically. Using a theoretical framework combining the critical pedagogy of Paulo Freire, the critical feminisms of Maxine Molyneux and Ineke Buskens and the critical theory of Jürgen Habermas, this paper outlines a conceptual framework for critical intent and critical practice in ICT4D. A typology of ICT4D initiatives is proposed, illustrated by a matrix of three types of development intent, and three types of development practice. The paper argues that an initiative is an example of critical ICT4D to the extent that it combines the critical-emancipatory practice of enabling the 'intended beneficiaries' of development to be the authors, architects and arbiters of ICT4D initiatives, with the transformist intent of tackling the root-causes of under-development.

Keywords: critical, openness, ICT4D, typology, matrix, conformist, reformist, transformist, intent, practice, emancipatory

1. INTRODUCTION

Michael Gurstein (2010) is among scholars who have shown that uncritical approaches to 'openness in development' can have the unintended effect of further accentuating existing inequality and (dis)advantage. He uses the example of 'open data'. When government data is made 'open', people's ability to exploit this new resource is shaped by existing patterns of structural (dis)advantage. Those who have privileged access to education, computers and the internet are afforded new opportunities by open data to exploit their advantage in new arenas. Those disadvantaged by lack of access to ICT and skills are further disadvantaged in relative terms (Gurstein, 2011). From this perspective 'openness in development' must be as much about building people's capacity to make "effective use" of technology as it is about providing access (Gurstein, 2003).

This paper will argue that what communities need to appropriate technology to make effective development use of it are not only narrow technical skills, but also critical skills to better determine their own strategic interests. As a result, this paper proposes that ICT4D initiatives should include activities designed to enhance participants' abilities to ask and resolve critical development questions such as, 'open to whom?', 'achieved by what means?', 'whose interests are being served?', and 'open to achieve what development ends?'

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

622

We are often unconscious of, and uncritical about, the relationships of (under)privilege and (dis)advantage structuring our lives. We live in societies where there is inequality (UNDP, 2014) and where that inequality and (dis)advantage is structured along intersecting dimensions including gender, 'race' and class (UNDP, 2014a, Davis, 1982; Crenshaw, 1989; Anderson and Hill Collins, 2010). We are all socialised into cultures that are grounded in unequal social relations (Buskens, 2014) and where dominant discourse has the effect of making these unequal social relationships appear 'natural' and immutable, rather than socially constructed and subject to change. Unless we are critically conscious of structural inequalities during the design and implementation process, there exists a real danger that our ICT4D initiatives reproduce and perhaps further accentuate (dis)advantage just as in Gurstein's (2011) open data example.

In order that ICT4D practitioners and project participants bring awareness about these issues to bear on project design and development this paper argues that an inclusive process of critical dialogue is desirable alongside other project activities. By involving all parties in deliberation about the development challenges faced, the underlying structural causes, and the kind of developments that they are co-intent upon producing, project actors are able to guard against reproduction of the unequal relationships that characterise the status-quo. By means of a collective analysis of their own political and cultural context (Heeks, 1999), and the underlying power interests, participants co-produce a 'critically conscious' understanding of their situation (Freire, 1994) that enables them to determine their own interests (Geuss, 1981), and to co-design ICT4D initiatives that address both their immediate practical needs and longer-term strategic interests (Molyneux, 1985).

To facilitate this process this paper presents a typology of nine kinds of ICT4D initiative. The typology differentiates between three categories of ICT4D *intent* and three categories of ICT4D *practice*. It is intended that this framework will contribute to a conceptual language that will enhance the design and evaluation of ICT4D initiatives by enabling practitioners, 'intended beneficiaries', and researchers to share their thinking about the intent, practices, and the underlying 'theory of change' upon which their initiatives are based.

2. WHAT IS 'CRITICAL' ABOUT CRITICAL ICT4D?

Influential reviews of the field of ICT4D have identified uncritical assumptions about the relationship of ICT to development as problematic (Avgerou, 2008, 2010), and identified a general failure to define the kind of development that ICT4D is intent upon (Walsham, 2006, 2013). It has been argued that this uncritical, technically-driven approach (Chamberlain, 2012), which limits the agency and participation of 'intended beneficiaries', is partly responsible for ICT4D's high failure rate (Heeks, 2002; Gao and Gunawong, 2014).

Alternative approaches are emerging. Dorothea Kleine (2010) is among scholars who have unpacked the 'D' in ICT4D and Kentaro Toyama's (2010, unpaginated) review of ICT4D projects in India contradicts technologically deterministic assumptions, concluding that, *"In every one of our projects, a technology's effects were wholly dependent on the intention and capacity of the people handling it"*. Stahl (2008), Unwin (2009) and Zheng and Stahl (2011) are among those that have used critical theory to interrogate ICT4D, but so far this remains a minority approach and not one that is widely understood.

One challenge is the lack of clarity about what it means to be 'critical'. The term is used within academic writing with such a wide range of meanings that its significance has become unclear. In this paper I will use the term 'critical' in the explicitly political and emancipatory sense employed by the founders of critical theory from the Frankfurt School, as well as by Southern scholar-activists and radical feminists such as Paulo Freire (1974), Steve Biko (Arnold, 1978), and bell hooks (2000). Writing about Frankfurt School critical theory, Raymond Geuss (1981: 2) provides a useful definition, arguing that, *"critical theories have special status as a guide for human action, in that they are"*:

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

623

(a) *aimed at producing enlightenment,* i.e. enabling agents to determine their own interests,

(b) *emancipatory in intent*, i.e they aim to free agents from coercion and domination,

   including internalised oppression,

(c) *productive of knowledge* (including self-knowledge), and

(d) *epistemologically reflective* rather than objectifying.

According to Geuss (1981) critical theory has dual roots in the psycho-analytical method initiated by Freud, and in the socio-analytical method employed by Marx. Critical theory involves its users in a process of critical reflection and critical dialogue to identify the often hidden or repressed, root causes of oppression. Critical theory offers the possibility of fundamental change by excavating beyond the symptoms of (dis)advantage to expose its root-causes. The intention is that by revealing the hidden mechanisms of domination embedded in culture, ideology, and the unconscious, people become better able to determine their own interests and to overcome the constraints on their own development (Ray, 1993). *"A critical theory, then, is a reflective theory which gives its agents a kind of knowledge inherently productive of enlightenment and emancipation"* (Geuss, 1981: 2). In the remainder of this section I will briefly review elements of the critical theory of Habermas (1972) and the critical practices designed to develop collective awareness developed by Paulo Freire (1970) and advocated by feminists including Longwe (in March, 1999) and Ledwith (2005).

Jürgen Habermas is the key living proponent of the founding Frankfurt School of critical theory. In *Knowledge and Human Interests*, Habermas (1972) argues that three basic human drives lie at the root of the three main knowledge constituting paradigms (Ray, 1993). Habermas sees the *'technical control of nature'* as the deep-seated human drive structuring the mode of enquiry and knowledge production that characterises the empirical-analytical sciences. Likewise the human drive, for *'communicative-understanding',* in Habermas' view, structures the interpretive-hermeneutic sciences. The final *'emancipatory interest in overcoming domination'*, structures the critical-emancipatory mode of enquiry and knowledge production. Unwin (2009; 63) uses Habermas' knowledge-constitutive interests to frame his historical analysis of ICT4D and suggests that, *"this approach could usefully be developed further into a practical framework for a critically aware ICT4D practice",* one that, *"empowers poor people sufficiently to overcome the conditions that have impoverished them"*. This paper aims to make progress in that direction.

In his book, *Pedagogy of the Oppressed,* Brazilian scholar and popular educator Paulo Freire (1970) developed a critical theory and practice with the emancipatory aim of enabling disadvantaged people themselves to overcome the conditions that impoverished them. This critical practice was adopted by more than 500 development agencies in more than 60 countries (Riddell, 2001; Duffy, 2008). Freire's assertion (1970, 1998) that poor people can and should be actively involved in critically analysing their own reality, and in determining their own action for development, continues to influence popular literacy, participatory rural appraisal and participatory action research (McIntyre, 1998: 3; Kindon, Pain, Kesby, 2010; 10). In his original analysis of the situation with Brazilian peasants Freire (1970) discerned three levels of consciousness, which he termed magical, naïve and critical. *Magical consciousness* was characterised by an apparent passive acceptance of the inequities of the *status-quo* and a fatalistic acceptance of an apparently 'natural' and immutable social order. *Naïve consciousness* was evidenced by increased awareness of unequal social relations, but also by a failure to question the structural root-causes of that inequality, or to recognise the potential of their own agency to bring about change. Freire's method was a question-posing dialogic process in which disadvantaged people themselves uncover the structural causes of the problems they face. *Critical consciousness* was characterised by peoples' awareness that their situation was not 'natural' and immutable, but rather socially-constructed by actors pursuing their interests. Freire

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

624

argued that this critical ability to 'read the world' enabled people to identify their own interests and informed their ability to 'act in the world' to transform it.

This method of group dialogue about people's immediate practical problems as a means to generate critical insight about the power interests structuring (dis)advantage, is not unique to Freire's process of 'conscientisation'. It is also a central methodological element of gender consciousness-raising workshops employed by many feminists (Sarachild, 1970; Ledwith, 2005) hooks, 2010) as well as to Black consciousness-raising in South Africa (Arnold, 1978; Magaziner, 2010) and class consciousness-raising by trade unions (Cooper, 2007). It is beyond the scope of this paper to review all of these approaches so I will confine myself here looking at one element of feminist practice that illustrates what it is to be critical.

Maxine Molyneux (1985) made a key distinction between women's immediate *'practical interests'* such as access to childcare and equal pay, and their *'strategic interests',* in securing change in the gendered divisions of labour, power, and control. Examples of strategic interests include ending male control over women, and women's responsibility for domestic work and child care. The challenge, Molyneux argued, is that practical interests are often symptomatic of deeper-seated structural issues of power and control, and it is the latter which must be overcome in order to achieve fundamental change. "*[Addressing] practical interests do not in themselves challenge the prevailing forms of gender subordination, even though they arise directly out of them*" (Molyneux, 1985; 233).

In critiquing Molyneux's categorisation, scholars including Sara Longwe (in March, 1999; and Young 1993) have argued that practical and strategic interests cannot easily be separated; that initiatives in the realm of practical needs often have consequences on strategic interests; and that therefore development interventions should target *both* practical needs and strategic interests. In order to enable the analytical tools of practical needs and strategic interests to be used in a more nuanced way, Kate Young (1993; 156) suggested the concept of 'transformatory potential'. The method that she proposed was,"*to allow the interrogation of practical needs (by women themselves) to see how they can become or transform themselves into strategic concerns. In other words have they the capacity or potential for questioning, undermining or transforming gender relations and the structures of subordination*." As Molyneux had herself originally said (1985; 233) the group work of translating practical interests into consciousness of strategic interests, "*constitutes the central aspect of feminist political practice*".

In the terms of Geuss' (1981) definition these methods are all *reflective*, productive of *knowledge and enlightenment about interests*, and they aim at *emancipation* from both the external social and internal psychological constraints on people's self development.

3. CRITICAL INTENT

In this section I appropriate and adapt a matrix originally developed for gender research, in order to produce a typology of ICT4D initiatives. Whilst I do not anticipate that this typology is sufficient to adequately represent any but the simplest ICT4D initiative, I hope that it might serve as a useful conceptual tool for project participants and stakeholders to collectively discuss project ends and means, and to refine their intentions and practices at both the design, implementation and evaluation phases of the project cycle. Doing so may contribute to addressing the uncritical approaches to ICT4D identified by the influential reviews of ICT4D outlined at the beginning of Section 2.

In her work on gender awareness in development research, Ineke Buskens (2014) produced a nine-fold matrix for categorising researcher intentionality and choice of research methodology (Table 1, below). Drawing on Habermas' (1972) theory of knowledge constitutive interests, Buskens' table intersects the three main research paradigms with three categories of researcher intentionality, which she characterises as conformist, reformist and transformist. Buskens' categories of intent correspond with Freire's three levels of magical, naïve and critical

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

625

consciousness. In both cases it is only in the third category that intent is focused on the structural basis of (dis)advantage, or what Molyneux's might refer to as 'strategic interests'.

Buskens' **conformist** category refers to research that is, consciously or unconsciously, intent upon conforming with the status-quo. It does so by generating knowledge about how people might better cope with, or respond to, the existing unequal gender relations without challenging or changing those relations.

The **reformist** category is home to research that is intent on highlighting the unequal nature of gender relations and reforming them. It does so however without changing the socio-economic, political and religious structures that support unequal gender relations.

Finally the **transformist** category describes research that is consciously intent on understanding and transforming both unequal gender relations and the socio-economic, political and religious structures that support them.

It is possible to critique Busken's categories of development intent on the basis that, in conceiving of change only extending from the status-quo in an egalitarian direction, she does not acknowledge possible negative development outcomes. Neo-liberal theorists have argued that inequality is desirable and productive of economic growth (Hayek, 1976, Friedman, 1980). Informed by neo-liberal economic theory World Bank Structural Adjustment Programmes, certainly delivered 'reforms' and 'transformational' structural change, but in a quite different direction from the kind of 'development' apparently valued by Buskens.

Intent/Method	Conformist	Reformist	Transformist
Empirical-Analytical	Quantitative Research that aims to understand how to make women better respond to the demands of the existing socio-economic-political- religious structures that support, amongst other things, unequal gender relations.	Quantitative Research that aims to reform gender (labour) relations that are discriminatory, whilst leaving the socio-economic-political- religious structures that support such relations intact.	Quantitative Research that aims to transform the socio-economic-political- religious structures that support unequal gender relations, through understanding to what degree women are dependent on those structures for their needs and practical gender interests.
Interpretive-Hermeneutic	Qualitative Research that aims to understand how to make women better respond to the demands of the existing socio-economic-political- religious structures that support, amongst other things, unequal gender relations.	Qualitative Research that aims to understand the emotions and justifications women have developed in adaptation to their unequal gender relations in order to reform those unequal gender relations.	Qualitative Research that aims to transform the socio-economic-political- religious structures that support gender inequality through assisting women to understand their feelings, emotions and choices regarding their discriminatory realities.
Critical-Emancipatory	Participatory / Action Research that aims to assist women to better cope with unequal gender relations and the socio-economic- political-religious structures that support them.	Participatory / Action Research that aims to understand women's feelings, emotions and reactions in their relationships and situations in order to reform these unequal gender relations.	Participatory / Action Research that aims to transform unequal gender relations and the socio-economic-political- religious structures that support these, through assisting women to understand to what degree they are dependent on those structures for their needs and practical gender interests.

Table 1: Gender Research Intent and Methodology Overview: Buskens, 2014

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

626

Building on Busken's conceptual framework for gender research in development, in this paper I propose a conceptual framework for ICT4D that categorises practitioner intent and practice initiatives (Table 2.). My proposed framework differs from Buskens' in four main respects. Firstly my framework is not related to research activities but rather to operational ICT4D initiatives (projects, programmes and processes). Secondly, reflecting this objective change, I have used Habermas' concepts of practical human interests instead of the knowledge constitutive interests used by Buskens'. Thirdly the scope of my framework extends beyond gender to encompass other dimensions of inequality including 'race'-ethnicity and class-caste. Finally whilst I retain Buskens' categories of conformist, reformist and transformist *intent*; I modify her *method* categories to foreground three modes of operational development *practice* that I suggest are characteristic of ICT4D initiatives: techno-centric, comms-centric and human-centric. In the following paragraphs I outline the basic characteristics of conformist, reformist and transformist intent in ICT4D. It is worth noting that whilst in some liberal and progressive discourse the terms conformist, reformist and transformist can be used pejoratively - and can therefore elicit defensive responses - here they are used only in their original descriptive sense.

'**Conformist ICT4D**' includes those initiatives that use ICTs to improve the efficiency of existing social institutions but which do not disrupt the *status-quo*. Conformist ICT4D leaves inequality structured along dimensions including 'race'-ethnicity, class-caste and gender unchallenged (as well as the power interests that give rise to this inequality). In leaving unequal relations intact, conformist ICT4D initiatives are likely to have the effect of serving the power interests of those already privileged groups that most benefit from the *status-quo*. Examples might be an 'eGovernment' portal that offers online access to government information and services, or an 'Open Government' initiative that enables citizens to 'hack' government data about transport. As a citizen one may have very good reason to value ICT4D initiatives that enable individuals to access data about cycle routes or to process a planning application online. However this is consistent with saying that it does not reform unequal social relations or transform the structures that support them.

'**Reformist ICT4D**' initiatives, in this categorisation, are those that use ICTs in ways designed to reform unequal social relations, but which do not attempt to challenge or transform the structural causes of those unequal social relations. Reformist ICT4D may, for example, meet the practical needs of rural women for access to information and services but it would make no attempt to tackle the power interests that structure (dis)advantage along gendered lines. Examples of Reformist ICT4D might include civic-tech initiatives that use social media to hold elected representatives to account, or a 'women in technology' project that aims to increase the number of women in the technology sector. As a citizen one may have very good reason to value such initiatives. At the same time it is fair to say that they do not necessarily target change in the political system and structures of male-domination that give rise to and support unequal gender relations.

'**Transformist ICT4D**', it will already be clear, are ICT4D initiatives that have the critical intent of transforming the structural root-causes of inequity in addition to unequal gender/'race'/class relations that are symptomatic of them. Examples of Transformist ICT4D in which disadvantaged people use technology to address their strategic interests include the Take Back The Tech initiatives to end violence against women, the citizen-led work of Twaweza that targets fundamental change in Tanzania, as well as the strategic use of social media in the so-called 'Arab-Spring' uprisings.

Although I have already made the point, it is important to underscore that no claim is being made here that only transformist ICT4D initiatives have value as development. As individuals we have good reason to value any ICT4D initiatives that meet our practical needs, irrespective of whether they we categorise them as conformist, reformist or transformist. In practice realising 'transformational potential' will often be built on reformist initiatives. All that is being claimed

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

627

here is that some initiatives will not challenge unequal social relations or transform structural inequality.

Having provided example initiatives to illustrate discussion of the above categories it is also worth repeating that I do not anticipate that this typology is sufficient to comprehensively represent specific ICT4D initiatives. In practice many ICT4D initiatives will contain aspects of more than one segment of the matrix and over the lifetime of an initiative it may traverse others. My intention for the typology is modest: that it might serve as a tool to stimulate critical deliberation amongst stakeholders about which forms of practice and intent they wish to incorporate in their initiatives.

4. CRITICAL PRACTICE

Along the vertical axis of Table 2. I locate ICT4D initiatives according to Habermas's (1972) three categories of practical human interests: technical control interests, practical communicative interests and emancipation from domination interests. In creating the related categories of technocratic ICT4D, communication-centric ICT4D and human-centric ICT4D my intention is not to claim that all ICT4D initiatives can be unambiguously fit within one or other category. My more limited intention is to provide a conceptual basis to initiate critical dialogue amongst participants and stakeholders of ICT4D initiatives about to what extent proposed practices align with their development aims. The following paragraphs characterise three forms of ICT4D practice.

Technocratic ICT4D: the first row in the table represents ICT4D shaped by Habermas' practical human interest of 'technical-control over nature'. These interests may be seen as giving rise to a particular kind of development logic that seeks to use technology to control human processes by means of top-down technical 'solutions'. The underlying empirical-analytical approach here asserts an uncritically positive relationship between technology provision and development impacts. This technologically deterministic logic effectively sees *technology-as-development*. This approach may be coupled with positivist claims that, for example, a certain rate of mobile phone registration is causal in GDP growth (GSMA, 2012). Examples of Technocratic ICT4D that may be seen as characteristic of technocratic logic are supply-side, technology- or data-centric solutions such as One Laptop Per Child, eGovernment portals or national healthcare MIS 'solutions'. This school of ICT4D is perhaps most close to the 'modernisation' development paradigm and the practice of facilitating

Intent/Practice	Conformist	Reformist	Transformist
Techno-centic ICT4D *Technical Control interests*	Tech- and data-centric ICT4D initiatives, addressing basic needs and services; that enable people to better cope with or **conform** to the existing unequal social relations of gender/'race'/class, whilst leaving the structures and interests that underpin them unchallenged.	Tech- and data-centric ICT4D initiatives, addressing practical interests, that enable people to better **reform** the existing unequal social relations of gender/'race'/class, whilst leaving the structures and interests that underpin them unchanged.	Tech- and data-centric ICT4D initiatives, addressing practical and **strategic interests**, that enable people to better **transform** the existing unequal social relations of gender/'race'/class, *and* the **structures and interests** that give rise to and support them.
	Communication-focused	Communication-focused	Communication-

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

628

Comms-centric ICT4D *Practical Communicative interests*	ICT4D initiatives addressing basic needs, and services, that enable people to better cope with or **conform** to the existing unequal social relations of gender/'race'/class, whilst leaving the structures and interests that support them unchallenged.	ICT4D initiatives addressing practical interests, that enable people to better **reform** unequal social relations of gender/'race'/class, whilst whilst leaving the structures and interests that give rise to and support them unchanged.	focused ICT4D initiatives addressing practical and **strategic** interests, that enable people to better **transform** the existing unequal social relations of gender/'race'/class, and the **structures and interests** supporting them.
Human-centred ICT4D *Emancipation from Domination interests*	Human-centred ICT4D initiatives, that enable people's production of *new knowledge* about basic needs and services that enables them to better cope with or **conform** to the existing unequal social relations of gender/ 'race'/ class, whilst leaving the structures and interests that support them unchallenged.	Human-centred ICT4D initiatives, that enable people's production of *new knowledge* about their practical interests that enables them to better **reform** the existing unequal social relations of gender/'race'/class, whilst leaving the structures and interests that underpin them unchanged.	Human-centred ICT4D initiatives that enable people's production of *new knowledge* about their strategic interests that enable them to better **transform** the existing unequal social relations of gender/'race'/class, and the structures and interests that give rise to and underpin them.

Table 2. Matrix of ICT4D Intent & Practices: author

technology 'transfer' from the global North to the global South (Melkote, 2001). The underlying theory of change in Technocratic ICT4D is: *under-development plus technology equals development* and is characterised by an absence of community actors in initiative conception and design.

Comms-Centric ICT4D: the second row in Table 2. represents those ICT4D initiatives constituted by Habermas' practical human interest of 'communicative-understanding'. Comms-centric ICT4D sees the role of ICT as a medium of amplifying communication-centric development. Initiatives from this school of ICT4D may have a theory of change of '*communication-as-development'* or a more nuanced *'people plus communication plus communication technology equals development'*. Examples of ICT4D initiatives that may be seen to be characteristic of this logic are communications and info-sharing platforms like the [Esoko](#) eAgriculture platform that enables farmers to find the price that crops command in different markets and enables online communication between potential suppliers and buyers. Some 'communication for development' initiatives such as disaster communications networks that convene dialogue around disaster preparedness, response and reconstruction might also be considered to fall into this category. A wide spectrum of communication modalities are encompassed here ranging from the 'monologic', top-down type that Freire (1974) characterised as *communiqué* rather than genuine 'dialogic' *communication.*

Human-centric ICT4D: the third row in the table represents those ICT4D initiatives shaped by Habermas' practical human interest of 'emancipation from domination'. This school of ICT4D is characterised by a bottom-up approach to development that is people-centred and may be characterised as *critical-dialogue-as-development.* This approach is shaped by the emancipatory

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

629

interest of humans to free themselves from internal and external forms of domination and coercion. 'Human-Centric ICT4D' sees development as a dialogic process of people progressively identifying and freeing themselves from constraints on their development, including both internalised (Fanon, 1963) and structural impediments (Fals-Borda, 1991). ICT4D initiatives located here will involve the 'intended beneficiaries' as the principal authors, architects and arbiters in the process of design and development and will aim to build people's own knowledge (including self-knowledge) as well as their organisational capacity to appropriate and to produce technology for development. Examples of ICT4D initiatives that might be considered to be characteristic of this approach include some Community Informatics initiatives (Gurstein, 2007), and the Freire-based Reflect ICTs process used by Action Aid, Practical Action and others (Beardon, 2004). The theory of change implicit here is: *people's agency plus critical consciousness plus technology equals development.*

Like any framework that tries to fit complex social reality into abstract categories, the typology offered in this paper is imperfect. In reality categorical boundaries are porous and subject to overlap. Some ICT4D initiatives will straddle more than one box. Other initiatives may migrate from one box to another over the initiative's lifetime. My intention is not to design perfect mutually-exclusive categories that over-simplify technology's role in development. My much more modest hope is to produce a visual aid and conceptual framework that adds to the vocabulary practitioners have at their disposal, allowing them to share thinking with participants and researchers about the critical intent of an initiative to produce change in the world.

Richard Heeks has written about the need for participatory design in ICT4D (Heeks, 2009a) and argued the need for ICT4D initiatives to be informed by an analysis of their political and cultural contexts (Heeks, 1999), rather than a continued over-reliance on technical assessments. This typology could be used as one means to critically review any particular sector of ICT4D in which there is a proliferation of initiatives. Mapping initiatives may be a means for actors to reflect and share their understandings of the project intent and underlying theory of change.

5. CONCLUSION

At the outset this paper posed the question, "What is 'critical' about critical ICT4D?" It is now possible to offer some answers and to make some tentative proposals regarding elements of a critical theory-practice of ICT4D. This paper has argued that the critical intent to identify and tackle the root-causes of unequal social relations is key to transformative development, and that the critical practice of conscientisation is an effective means to that end, used extensively in other development contexts. It is my conclusion that the combination of the *transformative intent* of structural change with the *critical-emancipatory practice* of conscientisation lies at the heart of critical ICT4D. By combining Geuss' (1981) definition of critical theory with the critical practice of Freire (1970) and feminists including Molyneux (1985) Young (1993) and Buskens' (2014) it is possible to propose that an ICT4D initiative is critical to the extent that:

a) It is *reflective,* enabling participants to *produce knowledge* and *enlightenment* about their interests that informs their own *emancipatory* action for development.

b) It involves disadvantaged people themselves reflecting critically on their practical circumstances and strategic interests to determine how they might best appropriate ICT4D.

c) In practice this process of critical dialogue involves posing questions including, "What problems do we face?", "Who's interests are currently being served?", "How can our common interests better be served?" and "Can technology help us toward that end?".

d) This paper proposes that an initiative is an example of *'Critical ICT4D'* to the extent that it combines the *transformist intent* of tackling the structural causes of underdevelopment, with the *critical-emancipatory practice* of making 'intended

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

630

beneficiaries' the authors and primary protagonists of ICT4D initiatives. This approach aims to de-centre technology as the driver of change and identifies collective human agency and political intent as the basis of transformational change. From this perspective those initiatives closest to the bottom-right corner of Table 2. constitute Critical ICT4D.

Looking forward, critical ICT4D theory and practice offers significant potential to enhance people's 'transformatory potential' (Young, 1993). By going beyond the provision of technology and narrowly technical skills, critical ICT4D practice holds the possibility to enhance people's ability to effectively appropriate technology to overcome the changing problems that they face. By building critical capacities ICT4D initiatives afford the potential to identify and target the root-causes of (dis)advantage, as well as treating its symptoms.

BIBLIOGRAPHY:

Andersen, Margaret and Hill Collins, Patricia (2010) *'Race', Class and Gender: an anthology,* California, Wadsworth.

Arnold, Millard (1978) *Steve Biko: Black Consciousness in South Africa,* New York, Vintage.

Avgerou, Chrisanthi (2008) *Information Systems in Developing countries: a critical research review.* Journal of Information Technology, 23 (3), 133–146.

Avgerou, Chrisanthi (2010) *Discourses on ICT and Development.* Information Technologies and International Development, 6 (3). pp. 1-18.

Beardon, Hannah (2004) *ICT for Development: Empowerment or Exploitation? Learning from the Reflect ICTs Project,* London, Action Aid Publications. http://www.actionaid.org.uk/sites/default/files/content_document/ICTpo.pdf

Buskens, Ineke (2014) *Developing the Capacity for Gender Awareness in Development Research: a think piece for the IDRC's Information & Networks Team* (internal document).

Buskens, Ineke & Webb, Anne (2009) *African Women and ICTs: investigating technology, gender and empowerment.* London, Zed Books.

Chamberlain, Sara (2012) *Pilot-itis. What's The Cure?*, BBC Media, accessed 13/10/14, http://www.bbc.co.uk/blogs/bbcmediaaction/posts/Pilot-itis-Whats-the-cure-

Collins, Patricia Hill (2000) *Black Feminist Thought,* London, Routledge.

Cooper, Linda (2007) *Workers' education and political consciousness: a case study from South Africa.* Economic and Labour Relations Review, Vol. 17(2).

Crenshaw, Kimberlé (1989). *Demarginalising the Intersection of 'race' and Sex: a Black Feminist Critique of Antidiscrimination Doctrin and Antiracist Politics.* University of Chicago Legal Forum 1989: 139–67.

Davis, Angela (1982) *Women, Race & Class*, London, Women's Press.

Duffy, Maura et al (2008) *Review of 16 Reflect Evaluations*, London, Action Aid, accessed 18/10/13, http://www.reflect-action.org/~reflecta/sites/default/files/u5/Review%20of%2016%20Reflect%20Evaluations%20-%20English%20full.pdf

Fals-Borda, Orlando (1998) *People's Participation: Challenges Ahead,* London, Intermediate Technology Publications.

Fals-Borda, Orlando & Rahman Mohammad (1991) *Action and Knowledge: breaking the monopoly with participatory action research*, London, Intermediate Technology Press.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

631

Fanon, Franz (1963) *The Wretched of the Earth*, New York, Grove Press.

Freire, Paulo (1970) *Pedagogy of the Oppressed,* New York, Continuum.

Freire, Paulo (1974) *Education for Critical Consciousness,* NewYork, Continuum.

Freire, Paulo (1994) *Pedagogy of Hope,* New York, Continuum.

Friedman, Milton & Rose (1980) *Free to Choose: a personal statement,* London, Pelican.

Gao, Ping & Gunawong, Panom (2014) *Understanding e-Government Failure from an Actor-Network Perspective: The Demise of the Thai Smart ID Card,* Development Informatics Working Paper Series, No.11/2002. Manchester: IDPM.

Geuss, Raymond (1981) *The Idea of a Critical Theory,* Cambridge University Press.

GSMA (2012) *What is the impact of mobile telephony on economic growth?*, London, Deloitte.

Gurstein, Michael (2003) *Effective Use: A Community Informatics Strategy Beyond the Digital Divide, First Monday*, accessed 21/012/15, http://firstmonday.org/article/view/1107/1027

Gurstein, Michael (2007) *What is Community Informatics and why does it matter?,* Milan, Polimetrica.

Gurstein, Michael (2010) *Open Data: Empowering the Empowered or Effective Data Use for Everyone?*   http://gurstein.wordpress.com/2010/09/02/open-data-empowering-the-empowered-or-effective-data-use-for-everyone/

Gurstein, Michael (2011) *Open Data – Louder Voices*, Open Knowledge Foundation blog accessed 21/02/15, http://blog.okfn.org/2011/06/20/open-data-louder-voices/

Habermas, Jürgen (1972) *Knowledge and Human Interests,* London, Heinemann.

Hayek, Friedrich (1976) *Law, Legislation and Liberty: The Mirage of Social Justice,* University of Chicago Press.

Heeks, Richard (1999) *The Tyranny of Participation in Information Systems: Learning from Development Projects*, Manchester University IPDM Working Paper 4.

Heeks, Richard (2002) *Failure, Success and Improvisation of Informations Systems Projects in Developing Countries,* Development Informatics Working Paper Series, No.11 Manchester: IDPM.   Accessed   12/10/14 http://www.sed.manchester.ac.uk/idpm/publications/wp/di/di_wp11.htm

Heeks, Richard (2009) *The ICT4D 2.0 Manifesto: Where Next for ICTs and International Development?* IDPM Working Paper 45, University of Manchester.

Heeks, Richard (2009a) *Participatory Design Problems in ICT4D: The Low Self-Efficacy Issue,* accessed 20/10/14, http://ict4dblog.wordpress.com/2009/01/23/participatory-design-problems-in-ict4d-the-low-self-efficacy-issue/

Hooks, Bell (2000) *Feminist Theory: From Margin to Center,* London, Pluto Press.

Kindon, Sarah, Pain, Rachel & Kesby, Mike (2007) *Participatory Action Research Approaches and Methods: Connecting People, Participation and Place*, Oxon, Routledge.

Kleine, Dorothea (2010) *ICT4WHAT?: using the Choice Framework to operationalise the capability approach to development,* Journal of Int. Development, Vol.22 (5).

Ledwith, Margaret (1997) *Participating in Transformation,* Birmingham, Venture Press.

Ledwith, Margaret (2005) *Community Development,* Bristol, Policy Press.

Magaziner, Daniel (2010) *The Law and the Prophets: Faith, Hope and Politics in South Africa*, Ohio University Press.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

632

March, Candida, Smyth, Ines and Maitrayee Mukhopadhyay (1999) *A Guide to Gender‑analysis Frameworks,* Oxford, Oxfam Publishing.

Melkote, Srinivas & Steeves, Leslie (2001) *Communication for Development in the Third World*, London, Sage.

McIntyre, Alice (2008) *Participatory Action Research,* London, Sage.

Molyneux, Maxine (1985) *Mobilization without Emancipation? Women's Interests, the State, and Revolution in Nicaragua,* Feminist Studies, 11:2 p.227 – 253.

Ray, Larry (1993) *Rethinking Critical Theory: emancipation in the age of global social movements,* London, Sage.

Ridell, Abby (2001) *A Review of 13 Evaluations of Reflect*, London, CIRAC, accessed/10/13, http://www.actionaid.org.uk/sites/default/files/doc_lib/192_1_evaluation.pdf

Sarachild, Kathie. (1970) Sarachild, Kathie. *"Consciousness-Raising: A Radical Weapon,"* in Feminist Revolution, New York: Random House, c1978, pp.144-150. http://library.duke.edu/rubenstein/scriptorium/wlm/fem/sarachild.html, accessed 18/07/14

Stahl, B. (2008) *Information Systems: Critical perspectives,* London, Routledge.

Toyama, Kentaro (2010) *Can Technology End Poverty?,* Boston Review, accessed 01/11/14, http://www.bostonreview.net/forum/can-technology-end-poverty

Toyama, Kentaro (2011) *Technology as Amplifier in International Development*, Procedings of the iConference, pages 75-82, New York, ACM.

UNDP (2014) *Human Development Index,* http://hdr.undp.org/en/data, accessed 09/10/14.

UNDP (2014a) *Gender Inequality Index*,

http://hdr.undp.org/en/content/table-4-gender-inequality-index, accessed 08/10/14.

Unwin (2009) *ICT4D*, Cambridge University Press.

Walsham, Geoff (2013) *Development Informatics in a Changing World: Reflections from ICTD2010/2012,* Information Technologies and International Development, 9 (1) pp 49–54. http://itidjournal.org/itid/article/viewFile/1030/425, accessed 30/09/14.

Walsham, G. & Sahay, S. (2006) *Research on information systems in developing countries,* Information Technology for Development, 12 (1), 7-24.

Young, Kate (1993) *Planning Development With Women,* London, MacMillan.

Zheng, Yingqin & Stahl, Bernd (2011) *Technology, capabilities and critical perspectives: what can critical theory contribute to Sen's capability approach?*, Ethics of Information Technology,   Vol.13:69–80.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

633

THE QUEST FOR AUTONOMY IN THE WORKPLACE: ICT-MEDIATED ACTIVITIES BY PROFESSIONALS WITH SENSORY IMPAIRMENTS

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Abstract: Sensory impairments may alienate many individuals from fully participating in the workplace. Purposefully designed information and communication technology (ICT) tools have opened up opportunities for blind and deaf professionals to accomplish their work activities. Despite the advantages that these tools promise to sensory impaired professionals, organisational policies and practices have been devised for sighted and hearing professionals. As a result, ICT-mediated activities performed by sensory impaired professional may generate tensions within the work system. Drawing on the conceptual elements of activity theory, this research-in-progress aims at understanding the misalignment and realignment of work practices in response to blind and deaf professionals' needs.

Keywords: Sensory impairments, deaf professionals, blind professionals, ICT-mediated activities, activity theory

1. PROBLEM STATEMENT

At the beginning, it was a love story. In 1808, the Italian inventor Pellegrino Turri built a typewriter machine for his blind lover Countess Carolina Fantoni da Fivizzano. However, the newly created tool was not only an expression of love; it became the first known artefact that allowed blind people to communicate in writing. Since then, a number of technical solutions have been developed to assist not only blind but also deaf people. These include Braille technology, optical character recognition systems, screen readers, and teletype writer relay service, among others. These technologies open up opportunities for people with sensory impairments to be fully participants in society, including in the workplace.

Over 5% of the world's population suffers from hearing loss (WHO, 2014a), while the number of blind people is estimated at 285 million worldwide (WHO, 2014b). The generalised perception that people with impairments are less productive than their non-impaired co-workers limits their employment opportunities (Chi & Qu, 2005; WHO, 2011). As a consequence, people with impairments are likely to have lesser job opportunities and may earn lower income than the general population (Ministry of Health, 2001). Information and communication technology (ICT) can be used to compensate for functional limitations and facilitate independent living (Bühler, Engelen, Emiliani, Stephanidis, & Vanderheiden, 2011). The pervasive use of ICT in contemporary society has prompted the introduction of assistive technology for professionals with sensory impairments in the workplace (Tikhomirov, 1999).

Very little is known about ICT use by people with sensory impairments (Babu, Singh, & Ganesh, 2010). Thus, in this research, we aim at understanding how blind and deaf professionals accomplish their work activities using ICT tools.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

634

2. IMPAIRMENTS AND DISABILITIES

Essentially, impairments are problems in body functions or structure such as a significant deviation or loss (WHO, 2002). Since impairments may lead to a limitation in the execution of certain activities, individuals with impairments have restricted opportunities for involvement in a wide range of life situations such as study, recreation and work. It is important to stress that the notions of impairment and disability are "at least partially socially constructed" (Baylies, 2002, p. 726). As such, impairments can be either reduced or exacerbated by social, technical and environmental factors. In other words, what makes an individual affected by an impairment a disabled person "is the environment… and not the person who is disabled per se" (Harnacke, 2013, p. 773).

A medical perspective dominated how disabilities were understood throughout much of the twentieth century. Through medical examination, this approach recognised an impairment as a limitation to the individual, which had to be compensated through rehabilitation (Johnstone, 2001). This focus on rehabilitation of impairments largely undermines the influence of political, economic and social factors (Michailakis, 2003). By contrast, a socially focused perspective attempts to break the causal link between impairment and disability. Even though the impairment is not denied, it is not seen as the cause of economic and social disadvantage of people with impairments. This perspective, which focuses on the ways society restricts opportunities of people with impairments to participate in mainstream economic and social activities, has been a key influence on disability policy (Oliver & Barnes, 2010). For instance, the controversy around the cochlear implant for deaf people provides an accurate picture of the contrasting approaches of these perspectives. The proponents of cochlear implants see the implant as an opportunity for overcoming a hearing condition, while deaf activists see the implant not only as an invasive procedure but also an attack on the culture of the deaf (Sparrow, 2005). A large fraction of the deaf community view themselves as a minority culture with their own customs, values, attitudes, knowledge and language (Solvang & Haualand, 2013) and utterly reject the idea of deafness as a disability (Gonsoulin, 2001).

Nevertheless of ongoing debates, the prevalent misconception that people with vision or hearing impairments are less productive than their non-impaired counterparts have been identified as one of the biggest barriers to their employment. The most frequently obstacles cited by employers are the lack of knowledge about how to make accommodations, stereotypes of people with impairments by managers and co-workers, the additional cost of training and supervision, among others (Paez & Arendt, 2014). In contrast, research has established that employees with impairments are more motivated to their work and demonstrate more loyalty to their organisations than their non-impaired counterparts (Chi & Qu, 2005). Autonomy – the ability to exert a degree of control in the performance of work activities (Abbott, 1988) – is the key driver of motivation and loyalty for professional workers (Janz, Colquitt, & Noe, 1997).

With this understanding of the challenges people with sensory impairments face, we wanted to explore in more detail – through a pilot study – how they perform their work activities, with a focus on ICT-mediated routines. The engagement with participants in the field would eventually allow us to analyse how the existing organisational practices harmonise with their needs.

3. PILOT STUDY

In this section, we explain our data collection and present the key themes that emerged from our preliminary analysis.

3.1. Data Collection

In New Zealand, where this pilot study was conducted, an estimated 484,000 people, which represent 12% of the population, are affected by sensory (hearing and/or vision) impairments (Statistics NZ, 2014). We followed a purposive sampling strategy and interviewed eight

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

635

individuals with vision or hearing impairments between August and September 2014 in Auckland. In addition, we also interviewed one line manager of two of our blind participants to learn about workplace policies and practices. Table 1 gives an overview of our participants; in order to protect their confidentiality, we use pseudonyms here.

Participant	Impairment	Gender	Occupation
Marilyn	Deaf and mute by birth	Female	Housewife, casual jobs
Sean	Blind by birth (retinopathy due to premature birth)	Male	Casual jobs
Sharon	Tunnel vision by birth (inherited retinitis pigmentosa and cataracts when she was 4 years old)	Female	Disability advisor
Natano	Tunnel vision by birth	Male	Disability advisor
Steve	Became deaf when he was 5 years old due to meningitis; has conversational speech	Male	Senior systems engineer
Sylvia	Became blind when she was 25 years old; born with retinitis pigmentosa	Female	Part time worker for the United Nations Convention on the Rights of Persons with Disabilities
Miriam	Blind by birth (Leber's congenital amaurosis)	Female	Disability advisor
Peter	Blind by birth	Male	Disability advisor
Sophie	Miriam's and Peter's line manager	Female	Community development programme manager

Table 1. Participant information

3.2. Data Analysis

In the course of the interviews, our participants expressed that work activities that are straightforward for their non-impaired co-workers represent a challenge for them. In fact, when individuals with sensory impairments join the workplace, they become part of a work community with its own rules and work responsibilities around areas of specialisation. In the case of blind individuals, the use of assistive technology (e.g., text-to-speech software) is of little or no use when they are presented with pdf documents or charts. Additionally, the blind cannot read simple, taken-for-granted email communications that include smiley faces, which are usually inserted to convey emotional cues in the written message. In the case of deaf individuals, verbal communication – either on the phone or at meetings – denies them the opportunity to participate in, what otherwise would be, a trouble-free interaction. As opposed to the needs of blind people, deaf workers require their co-workers to put simple information that can be easily communicated verbally in writing. This practice deviates from conventional communication practices in the workplace. As Steve lamented, if it is not in writing, it is hard for him to know what is going on when his colleagues share information orally. He then has to put in efforts to do what he refers to as "chasing information".

Under the circumstances previously described, ICT becomes a tool that makes communication possible between non-impaired and impaired professionals. ICT tools are also helpful to accomplish other work activities for impaired professionals. Natano highlighted the almost unlimited utility that ICT offers to his work activities: "We will always find other ways to do things [with ICT]". However, there is no one universal ICT tool that allows them to perform different work activities. The combination of tools with different functionalities allows our participants to be prepared to engage in different activities. For instance, Miriam stressed that she carries her multiple ICT tools (i.e., refreshable Braille display, laptop, smartphone and audio player) along wherever she goes – see Figure 1.
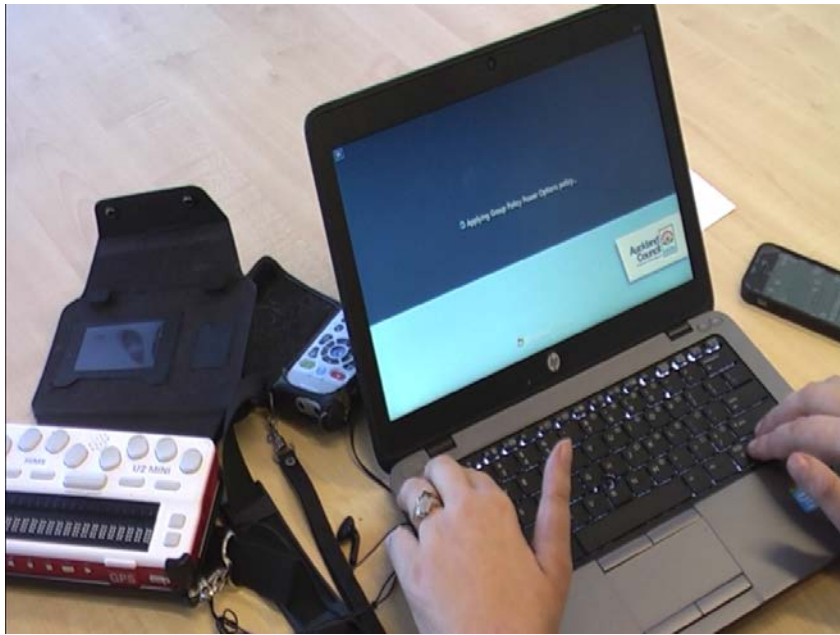
Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

636

Figure 1. Miriam's ICT tools: Braille display, audio player, laptop and smartphone

As every other person, individuals with sensory impairments have an aspiration for autonomy (cf. Sen, 1999). They want to be able to perform well and prove themselves that they can be productive members in an organisation. Unlike non-impaired individuals, the first hurdle that people with sensory impairments need to overcome is to build skills that make them attractive to employers. As Sharon reflected, "We have to prove ourselves [in order to get a job]". Similarly, Steve, who felt he was "held back" and "looked after by others" during his 10-year tenure at a large organisation, decided to start a career as an independent contractor in the IT industry. As an independent contractor, he carefully built up a portfolio of skillsets that allowed him to be employable. Now it has been five years since he has been working as a senior systems engineer at a large telecommunications company.

Within an organisational environment, job responsibilities tend to be clearly defined. For instance, Sophie shared with us that at her organisation they use document templates for internal and external communications (e.g., newsletters, reports), which have specific formatting details (e.g., headings, bullet points, colour, font size). While she requires all her collaborators to produce these documents at a high standard in terms of content and presentation, she realises that it is unrealistic to expect this level of embellishment from Miriam and Peter. Instead, she takes on the additional responsibility of formatting the documents that Miriam and Peter produce. Sophie also shared how training is organised for them. She explained that the training material, originally in the form of presentations, is converted into text documents: "Administration helps put the data into a Word document and label it into 'slide 1', 'slide 2'… In terms of the delivery of the contents… I would ask [the instructors], if they are cooperative enough, to put 'dings' or whistles when they change the slides, so Miriam and Peter can follow the presentation".

What these examples demonstrate is the importance of accommodating and supporting activities that professionals with impairments cannot accomplish by themselves according to the organisational expectations. Similarly, professionals with sensory impairments expect this kind of support to be available for them. Peter referred to this as "reasonable accommodations" in the workplace. This idea of reasonable accommodations requires a redefinition of job responsibilities, which may have implications on rules and norms that shape how work is organised among a community of workers. Peter elaborates with an example of a job description that requires an employee to be able to drive:

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

637

> "This is problematic… Do you really need to drive? Or do you need to be able to visit different sites? And that can be done in a whole different ways: you can have a driver, you can use a taxi or you can have a volunteer driver, you know. There is a whole lot of different ways you can do that without driving, I think".

Based on our preliminary analysis, we observe that ICT use by professionals with sensory impairments in the workplace is integrated into broader organisational work systems. The way they perform their activities may generate tensions with other members of the workplace who subscribe to existing organisational practices designed for sighted and hearing individuals. Since the ICT-mediated activities performed by sensory impaired professionals are part of a complex activity system, we believe activity theory provides the lens for understanding the misalignment and realignment of the different elements of a work system.

4. ACTIVITY THEORY AS A LENS

We believe that activity theory provides the conceptual elements needed to analyse and understand ICT-mediated work practices and contexts at a great level of detail by scrutinising work activities as part of an activity system. An activity system is a system of social relations constituted by the interaction among human beings, artefacts and their social environment (Kuutti, 1996).

Activity theory recognises that tools are mediators of purposeful human actions (Engeström, 2015; Engeström & Miettinen, 1999). Moreover, activity theory postulates that human activities are enmeshed in a network of social relations that can only be properly understood by analysing their historical-cultural development within a specific context. Activities are not isolated units but nodes in crossing hierarchies and networks which are in turn influenced by other activities (Scanlon & Issroff, 2005). Cultural-historical activity theory assumes that human activity is always a materially and socially mediated object-oriented practice, whereby the object of activity is constantly modified and the object itself modifies the activity system (Engeström, 1999a, 2015; Vygotsky, 1979). An activity performed by a subject and a tool used to achieve her goal, within a social context that has rules and is organised by division of labour, constitute the key elements in an activity system (Bedny & Karwowski, 2004). By recognising an activity as a process entailing communication, cooperation, conflict and negotiation, activity theory shifts the focus of analysis from organisational units or individuals to the activities they perform (Blackler, 2009).

Activity theory stresses how human intentionality orients purposeful actions. Activities are complex, collective and motivated by the need to transform a material or abstract entity into desired outcomes (Blin & Munro, 2007) – e.g., producing chairs from timber, solving a mathematical problem. The motive is the object, which stimulates or motivates a subject to carry out a set of activities. The set of activities carried out by the subject is ultimately aimed at attaining the object (Kaptelinin & Nardi, 2006). Tools constitute the mediating artefacts that help to achieve the outcomes of the activity. These tools can be physical – e.g., a hammer – or mental – e.g., an equation (Jonassen & Rohrer-Murphy, 1999). We conceptualise ICT as a mediator in the sense that it connects its users to the world (Nardi, 1996). However, we do not assume that ICT substitutes or delegates human agency. Instead, ICT supplements human agency by acting as functional organs "that support and complement natural human abilities in building up a more efficient system that can lead to higher accomplishments" (Kaptelinin, 1996, p. 50). In this sense, we assume that ICT, instead of isolating an individual with sensory impairments, contributes to make him/her an involved participant in the workplace. Figure 2 shows a tool, in this case the document magnifier that Sharon uses to read documents on a day-to-day basis at work. She emphasised that, in her world, the concept of "skim reading a document" simply does not exist. In order to complete her job, she needs the document magnifier, which allows her to read every word to make sense of the content of the document.
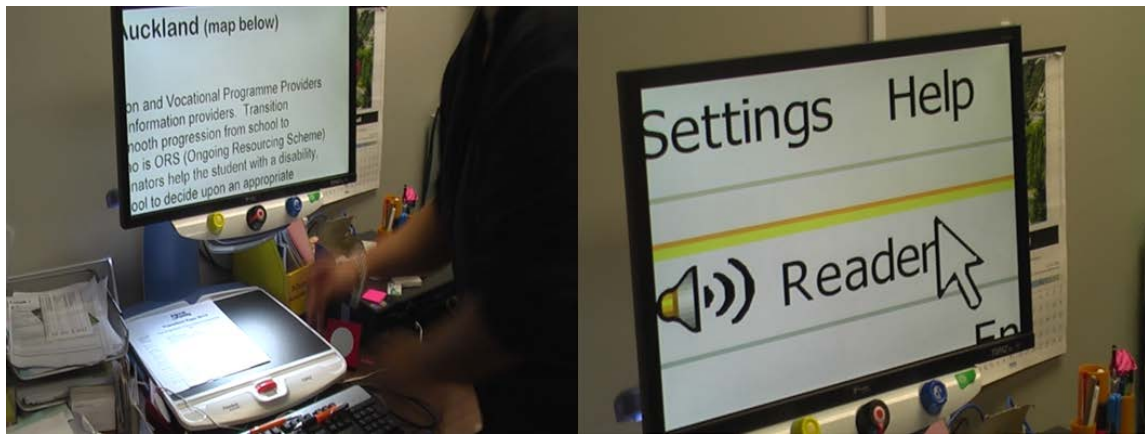
Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

638

Figure 2. Document magnifier (left) and magnifier / reader software package (right)

The mutual and dynamic relation of elements in an activity system suggests that activities are socially and contextually bound and can only be described in the context of the community in which it operates (Engeström, 1999b). Consequently, purposefully oriented, tool-mediated activities are embedded in a community that represents the social and cultural context (Mwanza, 2001). This community has its explicit rules and implicit conventions that guide or constrain actions and interactions within an activity system (Jonassen & Rohrer-Murphy, 1999). The allocation of responsibilities to the subjects as they carry out the activity in the community is defined by division of labour (Mwanza, 2001). In summary, an activity is driven by an object-related motive and shaped by the existing circumstances (Engeström & Miettinen, 1999).

When it comes to understanding an activity system and its changes, the principle of contradiction is key. Contradictions refer to the misfit within and between the elements of activity systems that are manifested as problems, conflicts or clashes, which may disrupt the flow of work (Engeström, 2015). Since activity theory rejects the taken-for-granted assumption of actions and artefacts used to perform those actions (e.g., using emoticons in email communication), it has the analytical power to discover the contradictions inherent in the work activities. By paying attention to contradictions, we gain insights into how conventional organisational norms and practices may or may not accommodate the needs of employees with sensory impairments. It is important to emphasise that contradictions are not always negative but can offer opportunities for change and innovation. According to Engeström (2001), contradictions are increasingly being regarded as fuels for change and have started to gain "due status as a guiding principle of empirical research" (p. 135). In the context of our study, we expect to find misfits between existing organisational norms and expectations of work practices and the way individuals with sensory impairments perform their work activities.

Table 2 presents key conceptual elements of activity theory that guides our theorising of how blind and deaf people use ICT tools in work activities.

Unit of analysis	A collective activity system, where the subject, tools and objects are immersed in a social assembly
Mediation	Tools shape and are in turned shaped by human experiences
Socio-cultural interaction	No activity system exists of its own accord; it is situated in other activity systems
Contradictions	Tensions that may disrupt the flow of work

Table 2: Key conceptual elements of activity theory

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

639

5. FUTURE WORK PLAN

With the understanding of the problem that the pilot study provided and the conceptual tools supplied by activity theory, we plan to conduct a full-fledged fieldwork. A purposive sampling strategy will be applied in order to recruit participants that can offer rich insights into ICT-mediated work activities. Two groups of participants will be included in this study: people with sensory impairments who are currently in the workforce, their non-impaired co-workers and their line managers. For employees, data will be collected through interviews and observations of work activities on a typical day. These observations, which may be video-recorded, will be supplemented by in-depth, semi-structured, one-to-one, face-to-face interviews before and after the observation. For employers, in-depth, semi-structured, one-to-one, face-to-face interviews will focus on practices and policies in place to support employees with sensory impairments.

The conceptual elements of activity theory will enable us to discover how employees with sensory impairments, through their ICT use, navigate the work system, which is primarily designed for sighted and hearing employees. This examination will reveal contradictions that may exist in the activity system and what changes, if any, are implemented to ensure that employees with sensory impairments can fully participate in the workplace.

6. REFERENCES

Abbott, A. (1988). *The system of professions: An essay on the division of expert labor*. Chicago, IL, USA: University of Chicago Press.

Babu, R., Singh, R., & Ganesh, J. (2010). Understanding blind users' web accessibility and usability problems. *AIS Transactions on Human-Computer Interaction, 2*(3), 73-94.

Baylies, C. (2002). Disability and the notion of human development: Questions of rights and capabilities. *Disability & Society, 17*(7), 725-739.

Bedny, G. Z., & Karwowski, W. (2004). Activity theory as a basis for the study of work. *Ergonomics, 47*(2), 134-153.

Blackler, F. (2009). Cultural-historical activity theory and organization studies. In A. Sannino, H. Daniels, & K. D. Gutiérrez (Eds.), *Learning and expanding with activity theory* (pp. 19-39). Cambridge, UK: Cambridge University Press.

Blin, F., & Munro, M. (2007). Why hasn't technology disrupted academic teaching practices? Understanding resistance to change through the lens of activity theory. *Computers & Education, 50*(2), 475-490.

Bühler, C., Engelen, J., Emiliani, P. L., Stephanidis, C., & Vanderheiden, G. (2011). Technology and inclusion - Past, present and foreseeable future. *Technology & Disability, 23*(3), 101-114.

Chi, C. G.-q., & Qu, H. (2005). A study of differential employers' attitude towards hiring people with physical, mental, and sensory disabilities in restaurant industry. *Journal of Human Resources in Hospitality & Tourism, 3*(2), 1-31.

Engeström, Y. (1999a). Activity theory and individual and social transformation. In Y. Engeström, R. Miettinen, & R.-L. Punamäki (Eds.), *Perspectives on activity theory*. Cambridge, UK: Cambridge University Press.

Engeström, Y. (1999b). Innovative learning in work teams. In Y. Engeström, R. Miettinen, & R.-L. Punamäki (Eds.), *Perspectives on activity theory* (pp. 377-406). Cambridge, UK: Cambridge University Press.

Engeström, Y. (2001). Expansive learning at work: Toward an activity theoretical reconceptualization. *Journal of Education and Work, 14*(1), 133-156.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

640

Engeström, Y. (2015). *Learning by expanding: An activity-theoretical approach to developmental research*. New York, NY, USA: Cambridge University Press.

Engeström, Y., & Miettinen, R. (1999). Activity theory: A well-kept secret. In Y. Engeström, R. Miettinen, & R.-L. Punamäki (Eds.), *Perspectives on activity theory* (pp. 1-18). Cambridge, UK: Cambridge University Press.

Gonsoulin, T. P. (2001). Cochlear implant / Deaf world dispute: Different bottom elephants. *Otolaryngology Head and Neck Surgery, 125*(5), 552-556.

Harnacke, C. (2013). Disability and capability: Exploring the usefulness of Martha Nussbaum's capabilities approach for the UN Disability Rights Convention. *The Journal of Law, Medicine & Ethics, 41*(4), 768-780.

Janz, B. D., Colquitt, J. A., & Noe, R. A. (1997). Knowledge worker team effectiveness: The role of autonomy, interdependence, team development and contextual support variables. *Personnel Psychology, 50*(4), 877-904.

Johnstone, D. (2001). *An introduction to disability studies*. London, UK: David Fulton.

Jonassen, D. H., & Rohrer-Murphy, L. (1999). Activity theory as a framework for designing constructivist learning environments. *Educational Technology Research and Development, 47*(1), 61-79.

Kaptelinin, V. (1996). Computer-mediated activity: Functional organs in social and developmental contexts. In B. Nardi (Ed.), *Context and consciousness: Activity theory and human-computer interaction* (pp. 45-68). Cambridge, MA, USA: The MIT Press.

Kaptelinin, V., & Nardi, B. (2006). *Acting with technology*. London, UK: MIT Press.

Kuutti, K. (1996). Activity theory as a potential framework for human-computer interaction research. In B. Nardi (Ed.), *Context and consciousness: Activity theory and human-computer interaction* (pp. 17-44). Cambridge, MA, USA: The MIT Press.

Michailakis, D. (2003). The systems theory concept of disability: One is not born a disabled person, one is observed to be one. *Disability & Society, 18*(2), 209-229.

Ministry of Health. (2001). *The New Zealand disability strategy: Making a world of difference – Whakanui oranga*. Wellington, New Zealand: Ministry of Health.

Mwanza, D. (2001). Where theory meets practice: A case for an activity theory based methodology to guide computer system design. Symposium conducted at the meeting of the 8th IFIP TC 13 Conference on Human-Computer Interaction, Tokyo, Japan.

Nardi, B. (1996). Activity theory and human-computer interaction. In B. Nardi (Ed.), *Context and consciousness: Activity theory and human-computer interaction* (pp. 7-16). Cambridge, MA, USA: The MIT Press.

Oliver, M., & Barnes, C. (2010). Disability studies, disabled people and the struggle for inclusion. *British Journal of Sociology of Education, 31*(5), 547-560.

Paez, P., & Arendt, S. W. (2014). Managers' attitudes towards people with disabilities in the hospitality industry. *International Journal of Hospitality & Tourism Administration, 15*(2), 172-190.

Scanlon, E., & Issroff, K. (2005). Activity theory and higher education: Evaluating learning technologies. *Journal of Computer Assisted Learning, 21*(6), 430-439.

Sen, A. K. (1999). *Development as freedom*. New York, NY, USA: Alfred A. Knopf, Inc.

Solvang, P. K., & Haualand, H. (2013). Accessibility and diversity: Deaf space in action. *Scandinavian Journal of Disability Research, 16*(1), 1-13.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

641

Sparrow, R. (2005). Defending deaf culture: The case of cochlear implants. *The Journal of Political Philosophy, 13*(2), 135-152.

Statistics NZ. (2014). *Disability survey 2013*. Retrieved June 19, 2014, from http://www.stats.govt.nz/browse_for_stats/health/disabilities/DisabilitySurvey_HOTP2013.aspx

Tikhomirov, O. K. (1999). The theory of activity changed by information technology. In Y. Engström, R. Miettinen, & R.-L. Punamäki (Eds.), *Perspectives on activity theory* (pp. 347-359). Cambridge, UK: Cambridge University Press.

Vygotsky, L. S. (1979). *Mind in society: The development of higher psychological processes*. Cambridge, MA, USA: Harvard University Press.

WHO. (2002). *Towards a common language for functioning, disability and health*. Geneva, Switzerland: World Health Organization.

WHO. (2011). *World report on disability*. Geneva, Switzerland: World Health Organization.

WHO. (2014a). *Deafness and hearing loss - Fact sheet No. 300*. Retrieved September 15, 2014, from http://www.who.int/mediacentre/factsheets/fs300/en/

WHO. (2014b). *Visual impairments and blindness - Fact sheet No. 282*. Retrieved October 28, 2014, from http://www.who.int/mediacentre/factsheets/fs282/en/

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

642

THE FORMALISING REGIME AND ITS FORMALISING TECHNOLOGY: THE CASE OF INFORMAL TRADE IN RECIFE

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Abstract: The purpose of this paper is to consider the role of ICT within the formalisation programme put forward by Recife's City Council to regulate the informal trade that pervades the city's popular squares and streets. This formalisation takes shape by issuing formal licenses to give informal workers 'permission' to sell pre-determined items at specific sites. Drawing on Foucault we will argue that ICT is a formalising technology, which serves this formalising regime to control, discipline and survey informal traders. We will argue that the technology's disciplinary intent was shaped by: a) the ways by which the socio-political context, rather than a technical rationality, affected how both control and surveillance were performed and disciplinary decisions were enacted; b) how its appropriation by licensed workers facilitated the reach of the regime's surveillance but in some cases also sabotaged the programme's disciplinary intents, c) how the information system reinforced the marginalization of informal workers and strengthened the position of the municipality.

Keywords: Informal work, formalisation, ICT, regimes of truth, control and surveillance, Foucault, Brazil.

1. INTRODUCTION

Informal street commerce is a prevalent across the Global South. However it has become subject to increasing formalisation policies that seek to regulate what is sold, who is selling and where trade can be conducted. Such policies derive from a view of informal work being in opposition to many countries and municipalities' visions of security, orderliness and development that make up what the modern civilised city should be (Turner & Schoenberger, 2012). However, commentators have argued that rather than being disruptive, informal street commerce is an integral part of the socio-economic context in many developing nations. They argue that formalisation policies can marginalise and disempower informal workers by not only threatening their livelihoods but also excluding them from opportunities to negotiate how they may be part of the municipality's future plans. (Musembi, 2007; Siegel and Veiga, 2009; Cousins, 2009). This has led to formalisation often being contested and negotiated on the ground during encounters between the state officials and informal workers (Pinheiro-Machado, 2008; Cross 2000).

With regard to information systems (IS), the focus of this paper, it is typically used by state agencies to formalise work through the issuing and monitoring of licences and the issuing of penalties to illegal traders. Our paper reports on Recife's municipal authority (Brazil) ongoing implementation of a formalisation programme that seeks to regulate informal street traders through the issuing of licenses. These licences provide traders with formal 'permission' to sell specified items from pre-determined sites.

We primarily draw on Foucault's ideas pertaining to regimes of truth (Foucault 1978) to help us better understand how this 'formalising regime' and its 'formalising technology' put in place

relate to the processes of control, surveillance, discipline and punishment. Specifically we looks at: a) the macro dimensions pertaining to the ways in which the socio-political context shaped how these processes unfold; b) the micro dimensions relating to how the workers' appropriation of the system facilitated and/or constrained the municipality's disciplinary intents and c) the specific features of the ICT that was used by government officials in Recife to regulate and control informal work.

2. INFORMAL WORK AND THE POLITICAL AIM OF FORMALISATION

Informal work is an activity that comprises "the production and exchange of legal goods and services that involves the lack of appropriate business permits, violation of zoning codes, failure to report tax liability, non-compliance with labour regulations governing contracts and work conditions, and/or the lack of legal guarantees in relations with suppliers and clients" (Cross, 1999 p. 580 as cited in Cross 2000). Over the decades informal work in the Global South has been conceptualised differently. In the 50s and 60s, in line with the dominant modernist visions of capitalist development, informal work was seen as backward and inefficient and therefore detrimental to national development schemes (Cross, 2000). However this became contested by two schools of thought. The neo-liberal approach argued that the rise of overarching regulations that modernisation often put in place to regulate formal work forced informality to grow by building an entrepreneurial incentive to pass by the regulatory hand of the state (de Sotto, 1989, 2000; Wenar 2008). The neo-Marxist approach is critical of capitalism itself, and has argued that modernist schemes that aim to 'develop' the third world have failed and have resulted in the Global South becoming dependent on the Global North. Indeed, marginalising informal work was integral to the ways by which corporations maintained their profitability (Castells & Portes, 1989; Portes & Sassen-Koob, 1987; Portes & Schauffler, 1993; Portes et al., 1989; Sassen-Koob, 1989).

Despite these criticisms, governments in the Global South have often persisted in problematizing informality as a force that acts against development (Bromley, 2000; Seligmann, 2001; Brown, 2006). What in the modernist era had tried to be 'solved' through crackdowns and raids on street vending, in the post-modernist era becomes the target of formalisation policies (Cross, 2000). Such policies typically advocate the need for greater public order and state control. As such, formalisation takes shape through what Cross (2000) has called - formalomorphism, analysing the problem of informal work by reducing it to being a 'bad' copy of its formal counterpart. Consequently, its operationalization consists of implementing formalisation regulatory schemes that aim to manage and change its 'informal' characteristics.

Many have been critical of attempts to formalise economic activity, arguing that it acts as a mechanism to enforce modernist ideologies of structured governance associated with what civilisation is to be (Scott, 1998). This consequently marginalizes informal workers out of negotiations about what their 'formalised' lives are to become (Siegel and Veiga, 2009; Kaarhus et al., 2005; Sjaastad and Cousins, 2008) and ends up instead formalising the existing structures of inequality (Benjaminsen et al., 2006). Further, while informal work is central to livelihoods, it is is yet to be recognised by governments as integral part of the formal economic system. Despite policies and regulations, a clear distinction between informal, illegal and formal becomes blurred (Pinheiro-Machado, 2008).

What is apparent from the introduction and this literature review is first that there is no agreed definition on what exactly constitutes informal work. Instead formalisation can be conceived as a power-constituted process which involves the constant negotiation of what is to be considered as 'appropriate' or 'inappropriate' economic behaviour (Cross 2000) in specific settings. Second, little literature has sought to understand the ways by which the formalisation of informal trade is enforced by municipal authorities. Third, little literature has discussed the ways in which ISs are developed and used to support formalisation processes.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

644

3. THEORETHICAL FRAMEWORK

This research draws on Foucault's (1982) idea of relational power. Power from this conception lies not in its positive or negative effects, but instead in its effectiveness to change or reproduce itself in the ways a community tends to accept it as a civilising force (Foucault, 1977). Power / knowledge are inextricably interlinked and as such power can be understood by researching the processes by which certain knowledges come to be legitimised as truth within a certain community. Such truth claims recursively enable or constrain people's capacity for action by reproducing or changing the dominant knowledges and therefore maintaining or reconfiguring the existent power relations (Foucault, 1980). This is what Foucault refers to as regimes of truth (Foucault 1978, 1980). A regime of truth is characterised by: (a) the types of discourses it accepts and makes function as truth; (b) the existent mechanisms and instances used to distinguish true form false statements; (c) the means by which one is sanctioned by non-accordance with the truth; (d) the techniques and procedures put in place for acquisition of truth and (f) the status of those in accordance with the truth (Introna, 2003 as cited in Willcocks, 2006). We will argue that it is through on-going power-relations that the formalising regime configures both the knowledge of the 'problem' - the need for formalisation, and its 'solution' – the specific techniques, laws and monitoring systems. Further, not only did the information system become established to support such claims of knowledge but also reinforced the dominance of such claims. We also draw on Foucault's (1977) panopticon, which refers to the potentiality that technology has to make human behaviour apparently transparent, and how this leads to the surveyed regulating their own behaviour. Transparency is also shaped by the system's information structure (Suchman, 1987). Poster (1990) highlights that the database has come to emerge as the main language by which power discursively constitutes subjects by applying a grammar that 'manipulates symbols (segments of information) to form a picture of the individual' (p.87) which acts upon himself.

With regard to the focus of our paper, a formalising regime, the IS put in place acts as a formalising technology that augments the visibility of informal work by structuring it according to the regime's knowledge of the 'problem' and 'solution', in order to control informal traders and survey their deviances to the formalising processes.

4. METHODOLOGY

We report on Recife City Council's formalisation programme and specifically the ways in which the information system put in place configures and disciplines (or not) this process. Our data derives from interviews, observation and secondary data undertaken between April to October 2014. This data was gathered from the Department of Mobility and Urban Control of Recife (CSURB) and the streets and squares in Recife where formal and informal work was undertaken and regulated.

Twenty semi-structured interviews were undertaken with department officials, fiscals responsible for the control of informal trade on the streets as well as with informal traders in order to understand their views on informal work and on the formalisation programme. We also observed the ways staff in the CSURB department used the information system to manage the processes of formalisation. We observed fiscals' identifying and registering informal traders and their monitoring of the traders compliance. We also observed and asked questions about how this information was captured on the registration forms and later into the information system. Secondary data such as CSURB official documentation was also collected and analysed.

5. RECIFE'S FORMALISATION PROGRAMME

Recife's CSURB is currently implementing a formalisation programme that seeks to regulate informal traders through the issuing of licenses that provides them 'permission' to sell specified items from stipulated sites. These sites currently take the form of 'disciplined' streets that are regulated, and where only the licensed workers can perform street trading. Further, these traders

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

645

have to comply with different regulations such as: perform their activities solely in the specific space allocated to them, respect specific space limits in relation to the positioning of their stalls and products, only sell a specific category of product such as food and beverages, mobile phone covers, clothes, etc. The medium / long term objective is for traders to be licenced to operate from City Council provided standardized stalls; or 'kamelodromos'- which are specific small sized malls aimed to be spread around the city to accommodate licensed workers. The objective being that traders become gradually familiarized with the norms pertaining to the usage of the envisioned kamelodromos and standardized stalls allowing for a smooth transition upon their implementation.

The processes put in place by CSURB have three main aims:

1) *Control existing informal work.* This is operationalized by fiscals on the streets who register (on paper forms) who the sellers are, what are they selling and where do they sell.

2) *Register this data in a database.* This allows for the easy retrieval and filtering of information such as what is to be sold, where, and by whom. Rules specify that a trader can only be licenced for one specified commercial activity, one location and have only one stall. Further it checks that licenses are not issued to more than one member of a family. Satisfying these rules is required for traders to be provided with a license and for its annual reissue.

3) *Survey and control deviations.* Fiscals patrol the streets to detect any licensed workers that are not following the regulations, traders without a license operating in disciplined streets, and / or other illegal trading activities. This is registered and traders may be instructed to modify their trading practices, pay a fee, and have their products confiscated and/or have their licenses revoked.

6. FINDINGS

6.1. The Problematisation of Informal Trade

One of the problems that the formalisation of informal traders sought to address was making the streets easier for pedestrians and cars to navigate. Government officers would often complain to street vendors that they leave little space for pedestrians to pass: *'they complain but we need to ensure mobility'* (CSURB Fiscal). Recife's citizens encountered problems with its infrastructure. Streets were often flooded due to poor drainage systems, there were open sewers, and broken pavements and poorly secured electric cables. Consequently, many citizens were supportive of the CSURB officials' attempts to make sure that traders were not blocking the streets. Indeed, even some of the street vendors were supportive: *'I know I speak against myself but it's true. I mean... look at that (pointing the finger to a overcrowded sidewalk with stalls). It's chaos'* (Unlicensed Trader).

The street traders often found novel ways to compensate for some of the flaws of the urban infrastructure. This not only maintained their trading activities but also assisted mobility across the city. For example, they would clear the floods on the streets by sweeping the water away, clear the drains, provide shelter from the sun and the rain, and provide seating in public spaces. In hospitals, banks and public offices they sold low cost food for the people waiting (for hours) in queues and even provided chairs for elderly citizens.

Further to mobility, the CSURB's policy was to 'regulate' informal traders so they could offer 'standardised' products and services from 'legitimate' stalls in 'disciplined' sites. As such, the processes put forward by the government had an implicit acknowledgement of informal trade as a 'bad copy' of its formal counterpart (Cross 2000). This discourse gained increasing acceptance amongst citizens such as non-pedestrians and car drivers that had little direct contact with street traders. This wealthier population saw informal traders as one more of the aesthetically unpleasant and backward aspects of Recife. Such view was reinforced by CSURB officials and street fiscals often referred to the streets where informal trade was conducted as 'dirty' and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

646

claimed there was a need to 'clean' them: *'We will remove them to leave the sidewalks clean'* (CSURB Mid-Manager). Or more strikingly, to 'humanise' them: *'our plan is to humanise the streets'* (CSURB Fiscal). Not surprisingly, this was not well accepted by informal traders: *'a person worthy of his work need not be mistreated. But the City Council does not want to know that'* (Unlicensed Trader).

Crucially, while the objectives were typically formally stated as a way to help clear the streets and thus enhance the mobility of citizens, CSURB had an underlying and longer term objective of extending their reach of control: *'It is difficult to control the streets because they (informal traders) are very scattered. This (reallocating them to specific stalls and malls) makes it easier to monitor. To do everything.'* (CSURB Mid-Manager). Such a view highlights that the process of formalisation was not a means to an end, but in fact the end in itself. Once in these new sites CSURB would not only reduce informal trade but also gain greater control: "*It is a palliative measure. Once they're there (in the disciplined sites), no new licenses will be issued.*" (CSURB Mid-Manager).

6.2.   The Role of Information Technology

The information system used by CSURB to support its formalising processes was not a robust relational database but an Excel spreadsheet. The spreadsheet supported the formalisation programme by: (a) the metadata on the Excel sheets provided the basis for the printed forms used to collect data from the streets; (b) this data became standardised according to rules within the spreadsheets which filtered the issuing of licenses; (c) the spreadsheets made visible the number of deviations from the formalisation regulations, and thus were central to the discipline and/or punishment of both informal and licensed workers within specific sites.

The paper forms were an important technological artefact. When fiscals walked past the traders on the streets with the forms in their hands, they would become the centre of attention for some of the informal traders. The workers would ask them if their names were on the lists, the names of their family members, when their licenses would be issued, when the kamelodromo was to be built, etc. When asked why a fiscal responded: *'first they did not believe it (that the CSURB would clear informal traders from the streets) but when they realised they had no alternative they began to run after us to register'* (CSURB Fiscal). Thus, these printed 'formal' documents with their structured lines and check boxes facilitated the fiscal's data collection processes. However, the fiscals did not always welcome this attention from informal traders as it became intrusive and distracting. Consequently they would often leave the 'formal' printed version in the office, and hand-write on a piece of paper whatever information was needed to survey the streets that day. This hand-written paper would attract less attention form informal traders.

The paper forms were too structured to capture the reality of informal trade. Fiscals often had to write a lot of information in the "other" category as well as in the blank spaces as what they observed did not fit a predefined category. Examples included workers selling products or services that couldn't fit into any of the pre-defined categories, stalls with more than one worker responsible, traders who had no fixed location, etc. This data would then be typed up and recorded in the 'other' column in the excel spreadsheets. When questioning the officials why so much data collected on the streets had no specific category on the spreadsheets they claimed it was because they *'don't know how to do that in excel'* (CSURB Fiscal*).*

In fact, changing the spreadsheet design to accommodate the categories for 'deviant' behaviours was difficult as 'deviances' usually related to workers which sold more than one product, in more than one stall and/or were active in different locations. Consequently, for 'deviant' behaviours to be registered it required a one-to-many relational database design. However, the spreadsheet provide for a one-to-one relationships as each line on the spreadsheet corresponded to one worker and the corresponding columns to their type of stall, product/service category, location, etc. If a worker sold a combination of products that fit into two categories, this could

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

647

only be registered by entering his name again or, as was typically the case, filling it in the 'other' column. Interestingly, many fiscals considered this to be one of the system's strongest points: *'why would we change the 'other' column - that's where we find out everything'* (Fiscal who digitised forms).

Fiscals would often try to discursively coerce informal traders to change their activities when they didn't align with the 'appropriate' behaviour prescribed by the formalisation programme. Specifically, such coercion arose from their need to be able to complete the columns in the spreadsheet without too much recourse to the 'other' column. The "other" column in the Excel sheets made 'deviant' data to look contrary to the 'structured' rest of the data that was captured in the specified columns. It was the spreadsheet that subtly made the fiscals aware that a particular behaviour was 'inappropriate' which then led them to require informal traders to change their activities so that they conformed to the spreadsheet and consequently, with the formalisation programme.

Such coercion thus was not driven necessarily by their tacit agreement with the modernistic ideals of the formalisation programme. Indeed, Fiscals would often purchase food or products from them. While some of the fiscal's would show sympathy with the informal traders, the CSURB managers did not. They believed that when traders did not comply, it was because they did not want to, or were unable to comprehend the rules of the formalisation programme. CSURB managers did not consider the formalisation programme may have been inappropriately designed and thus the rules, processes and solution remained unquestioned. They saw informal trade as being backward and against the 'formal' and modern way of doing business: *'Some may want this, but they are not prepared to work in a formal way. They're used to the streets'* (CSURB Mid-Manager). Consequently, surveillance and punishment were seen as important mechanisms which could solve the recurring 'deviances' found on the streets and ensure the programme's success: *'Inspection and seizure is the only weapon we have'* (CSURB Mid-Manager). When deviances were found in 'disciplined' sites, the trader would be highlighted in red in the spreadsheets. This applied to licenced traders who could lose their licence or pay a fee but also to unlicensed ones conducting illegal activities such as selling pirated CDs/DVDs. Another deviance seen as 'critical' was the one-license-per-family-member. However, given that many workers were unaware or didn't believe in this rule, they would often be the ones giving fiscals the names of their family members still unlicensed in an attempt to get them formalised as well: *'I don't know... and I don't believe it. Everyone is doing it (trying to get as much family members as possible in the licensing process). You have to be one for the other right?!'* (Unlicensed Trader). Interestingly, fiscals would rarely issue penalties in such cases, as they feared that by issuing a high number of fines it could lead to the traders protesting which could threaten the formalisation programme as a whole. This was especially the case of the one-licence-per-family-member rule. Issuing fines to single traders in dispersed sites thus was a safer way to ensure the success of the programme overall.

Some informal traders felt the programme was overly aggressive: *'they say: You're out today! Tomorrow we're gonna take it away! After tomorrow you'll get a notification!' You see? It's this psychological pressure'* (Unlicensed Trader). However, as already noted, others driven by fear and/or expectations of a better life would run after the fiscals when noticing they were collecting data for the licensing process: *'They're just doing their job. I'm always nice to them and I never had any problem. I would just like if they could be faster in giving me the authorisation you know?!... My license.'* (Unlicensed Trader). Further, some of the newly licenced traders working in 'disciplined' streets, afraid of losing their hard-gained licenses, would actively cooperate with the fiscals' surveillance activities and report any unlicensed traders found on their sites: *'If anyone out there puts a stall here I'll report it'* (Licensed Trader).

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

648

7. ANALYSIS

Recife's Formalising Regime and its Formalising Technology		
Truth claim	Informal work is a problem and it needs to be solved	
	Problem	**Solution**
	Informal work affects the 'citizens mobility', it is dirty and inhuman	Informal work needs to be formalised
Build on the premises	'Citizens' don't interact with informal work and are against it because it affects their daily urban experience.	Its informal structure needs to be 'ordered' by means of 'regulating' the workers and 'standardising' the stalls and products offered
Which implies	Informal traders are not citizens	Licensed workers are citizens
Materialised in	The need to 'clean' and 'humanise' the streets	The need for 'control' and 'surveillance' in order to 'discipline' and 'punish' the workers' 'inappropriate' behaviours
Political aims	Gain political acceptance by relating informal trade to Recife's mobility problem	Achieve total control through the formalomorphism approach to informal work
	Disempower informal traders through the un-citizenship discourse	Impose the acceptance of disciplinary tactics by relating 'formality' to 'citizenship'
ICT role within the acquisition of 'truth'	Surveying the deviances, registering them into the system and applying disciplinary or punishing measures as appropriate	Controlling informal work through the collection of data into paper forms later translated into the excel sheets to filter the availability of candidates for licensing
Distinction between 'true' and 'false' statements within ICT	If there are registries in the 'other' column or a worker name is highlighted in red.	There are no registries in the 'other' column and no red highlight in the worker's correspondent line
Implications of 'true' and 'false' statements	Not being licensed; payment of fee; license revoked; products apprehension	Availability of the worker to get the regime's license of approval

Table 1 - Recife's Formalising Regime and its Formalising Technology

Recife's 'formalising regime' camouflaged the CSURB's overarching ambition of eradicating informal work through processes aimed to control, survey and discipline the existent informal trade infrastructure on the streets (Foucault, 2007, 1977). This was achieved through a legitimation of the need for formalisation to improve 'citizen's mobility'. Framing the nature of informal work in this matter served three political objectives: 1) by relating informal work to the citizens' concerns about mobility, the programme built a normative authority that facilitated its acceptance; 2) by placing informal work in opposition to responsible 'citizenship' it diminished

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

649

the traders' capacity to have a voice in the formalisation processes while simultaneously positioned formalisation as the only means by which 'citizenship' could be 're'-gained; 3) by seeking to formalise trade, it restricted some of the local solutions that traders put in place to alleviate some of the infrastructural problems such as floods, pavements, umbrellas for sun and rain and chairs in public squares, etc. Further, low-income citizens would be hit especially hard if informal trade was formalised due to the increased prices of products and services.

CSURB's conceptualization of informal work was strongly based on a modernist ideology that placed informal work as marginal and as a force against development (Bromley, 2000; Seligmann, 2001; Brown, 2006; Turner & Schoenberger, 2012). This was noticeable in the ways by which the formalisation discourse placed informal traders as non-citizens that needed to be controlled and surveyed in order to discipline them to become 'ordered', 'standardized', and 'licensed', this is, 'citizens'. In this context, formalisation was not implemented to solve a particular problem of informal work, but rather it served as a crucial mechanism to enforce a transition towards a modernist vision of socio-economic order where informality had no place to exist (Scott, 1998). Accordingly, the peculiar disciplinary methods imposed on informal traders followed a formalomorphist approach (Cross 2000) based on a specific conceptualization of civilization in relation to structure, order and truth (Mitchell, 1991) which consequently made their 'informality' to be the target to be 'changed' towards its 'formal' counterpart, this is to say - erased. It was within this apparatus that the information system assumed a crucial political role and acted as a 'formalising technology' crystalizing the unequal power given to informal traders by reinforcing the regime's truth claims and formalising their existent inequalities (Scott, 1998, Benjaminsen et al. 2006).

The design of the system's information structure reinforced the regime's proposed formalomorphist solution. This was achieved by placing all 'informal' characteristics into the 'other' column' and in so doing signalling its inappropriateness (Bowker and Star, 1999). Consequently, this information structure acted as a 'grammar' (Poster, 1990) that constituted informal work as a subject made up of 'deviances' to be solved, which were seen in the 'other column' and/or highlighted in red. Thus, because this 'grammar' didn't afford any space for the 'deviances' to be structured in predefined categories with their own columns, it made it difficult to envision alternative possibilities for the reality of informal trade beyond the one put forward by the formalising regime. For example, if one could associate one worker with the various types of products and services it sells, a different and more appropriate categorisation could potentially be found. Or if one could associate a worker with different locations, possibly one could find some patterns in relation to workers' paths and products sold and consequently form a better picture of an appropriate urban infrastructure to be built on top of the existent practices.

Further, this 'grammar' and its constitution of the subject primarily in relation to its 'deviances' influenced the coercive disciplinary actions that fiscals adopted towards the informal traders. Such coercive actions were not necessarily driven due to the fiscals' agreement about the programme's modernist ideals, but rather as a means to facilitate a smoother transition between the physical and the digital sides of their work. Because the information structure, relied more on a vision of what the formalisation aimed to achieve – one-to-one relations, rather than what it actually was - many-to-many relations, it caused a friction between the necessary digital registering of data and the reality of the data on the streets. This friction ended up as being one of the main vehicles that shaped how a tacit exercise of control was performed by fiscals on the ground in order to 'solve' the system's strong reading of an imposition between what was to be considered 'appropriate' and 'inappropriate' behaviours.

However, both the macro-dimension of the socio-political context and the micro-dimension of the informal traders' appropriation of the regime's intents affected how its disciplinary actions were performed. For instance, the context affected how decisions to take punishing actions were not linearly derived from the system's individual signalling of deviances but by its capacity to show the ratios between those affected by such actions and those not in particular sites

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

650

(Attewell, 1991). This was particularly noticeable in the case of the one-license-per-family rule, which given it was such a pervasive 'deviance' in particular sites, the decision to take the necessary disciplinary action would often be cancelled given the risks its implementation could cause in relation to a potential sabotage of the programme. Further, as the informal traders freely provided data about their family members to fiscals, which led to the high number of deviances recorded, they were central in subverting the regime's disciplinary intent (Lyon, 1993). On the other hand, the appropriation by licensed workers in disciplined sites facilitated the regime's intent in the ways by which, driven by fear of loosing their licenses, they implicitly expanded the regime's reach of control by partnering with municipal authorities surveying their own sites (Foucault, 1977).

8. CONCLUSION

The urgency of this study lies in the fact that something as pervasive as Recife's informal work is under threat and may disappear by virtue of modernist developmental agendas which aim to turn the social, cultural and economic diversity into a normalizing gaze easier to control. This paper has suggested that the formalisation of informal work is a power-constituted regime where the information system used assumes a critical political role in the negotiation of the regime's disciplinary intents. Conceptualising Recife's formalisation program as a 'formalising regime' helped to illuminate the ways by which this regime imposed modernist developmental ideologies, and was implemented not to solve a particular problem of informal work, but rather to enforce a transition towards a modernist vision of socio-economic order where informality had no place to exist. Within this apparatus an information system acted as a 'formalising technology' where 'formalising' came to mean the formalisation of the existent inequalities enacted through the application of an information structure which facilitated the regime's disciplinary intents while at the same time obstructed alternative solutions to emerge. To conclude, we hope this research has helped to illuminate both the urgency and richness of this particular area of study and the need for more in-depth research to explore how technology is shaping the nature of informal work more broadly.

9. REFERENCES AND CITATIONS

Attewell, P. (1991). Big Brother and the Sweatshop: Computer Surveillance in the Automated Office, in C: Dunlop and R. Kling, eds, *Computerization and Controversy: Value Conflicts and Social Choices*, Academic Press, Boston.

Benjaminsen, T.A., Holder, S., Lund, C. And Sjaastad, E. 2006. The emerging formalisation agenda and some empirical evidence from Africa. Paper presented to symposium, At the Frontier of Land Issues: Social Embeddedness of Rights and Public Policy, Montpellier, France, 16–19 May.

Bromley, R. (2000). Street vending and public policy: a global review, *International Journal of Sociology and Social Policy*, 20(1), pp. 1–29.

Brown, A. (2006). Contested Space: Street Trading, Public Space, and Livelihoods in Developing Cities. *Intermediate Technology*.

Castells M, Portes A. (1989). The world underneath: the origins, dynamics, and effects of the informal economy, in *The Informal Economy: Studies in Advanced and Less Developed Countries* Eds A Portes, M Castells, L A Benton (Johns Hopkins University Press, Baltimore, MD) pp 11 ^ 40.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

651

Cousins, B. (2009). Capitalism obscured: the limits of law and rights-based approaches to poverty reduction and development. *Journal of Peasant Studies* 36(4):'893–908.

Cross, J. (2000). Street vendors, and postmodernity: conflict and compromise in the global economy. *International Journal of Sociology and Social Policy*, 20(1/2), pp.29–51.

de Sotto, H. (1989). *The Other Path: The Invisible Revolution in the Third World* (Harper and Row, New York).

de Sotto, H. (2000). *The mystery of capital. Why capitalism triumph in the west and fails* everywhere else. New York: Basic Books

Foucault, M. (1977). *Discipline and Punish: The Birth of the Prison.* Penguin, London.

Foucault, M. (1978). *The Will to Knowledge: The History of Sexuality, volume 1*. Penguin, London,

Foucault, M. (1980). *Power/Knowledge: Selected Interviews and Other Writings* 1972-1977. Prentice Hall, New York.

Foucault, M. (1982). "The subject and power," in *Michel Foucault: Beyond Structuralism and Hermeneutics,* H. Dreyfus and P. Rabinow (eds.), Harvester Press, Hemel Hempstead, 1982, pp. 208-226.

Foucault, M. (2007). *Security, Territory, Population: Lectures at the College de France 1977-1978* (Picador, New York).

Hart, K. (1973). Informal Income Opportunities and Urban Employment in Ghana. *The journal of modern African studies*, 11(01), pp.61–89.

Kaarhus, R., T.A. Benjaminsen, A. Hellum and I. Ikdahl. (2005). Women's land rights in Tanzania and South Africa: a human rights based perspective on formalisation. *Forum for Development Studies* 32: 443-482.

Lyon, D. (1993). An Electronic Panopticon? A Sociological Critique Of Surveillance Society. *The Sociological Review*, 41, 4, 653-67

Mitchell, T. (1991). *Colonising Egypt*. Berkeley, CA: University of California Press.

Musembi C. (2007). De Soto and land relations in rural Africa: breathing life into dead theories about property rights. *Third World Quarterly* 28(8): 1457–1478.

Pinheiro-Machado, R. (2008). China-Paraguai-Brasil: uma rota para pensar a economia informal. *Revista Brasileira de Ciências Sociais*, 23(67), pp.117–133.

Portes A, Sassen-Koob S. (1987). Making it underground: comparative material on the informal sector in western market economies, *American Journal of Sociology* 93 30 ^ 61.

Portes A, Castells M, Benton L A. (1989). *"Introduction", in The Informal Economy: Studies in Advanced and Less Developed Countries* Eds A Portes, M Castells, L A Benton (Johns Hopkins University Press, Baltimore, MD) pp 1 ^ 7.

Portes A, Schauffler R. (1993). Competing perspectives on the Latin American informal sector *Population and Development Review* 19 33 ^ 60.

Sassen-Koob S. (1989). New York City's informal economy, in *The Informal Economy: Studies in Advanced and Less Developed Countries* Eds A Portes, M Castells, L A Benton (Johns Hopkins).

Scott, J. (1998). *Seeing like a state: How certain schemes to improve the human condition have failed*. New Haven: Yale University Press.

Seligmann, L. J. (Ed.) (2001). Women Traders in Cross-cultural Perspective: Mediating Identities, Marketing Wares. *Stanford, CA: Stanford University Press*.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

652

Siegel, S. & Veiga, M.M. (2009). Artisanal and small scale mining as an extralegal economy: de Sotto and the redefinition of 'formalization'. *Resources Policy* 34:51-56

Sjaastad, E. And Cousins, B. (2008). Formalisation of land rights in the South: an overview. *Land Use Policy* 26:1-9.

Suchman, L. (1987). *Plans and situated actions : The Problem of Human-Machine Communication*. Cambridge University Press, New York.

Turner, S. & Schoenberger, L. (2012). Street Vendor Livelihoods and Everyday Politics in Hanoi, Vietnam The Seeds of a Diverse Economy? *Urban Studies*, 49(5), pp.1027–1044.

Wenar, L. (2008). Property rights and the resource curse. *Philosophy and Public Affairs* 36(1):2–32.

Willcocks, L.P. (2006). Michel Foucault in the Social Study of ICTs Critique and Reappraisal. *Social science computer review*, 24(3), pp.274–295.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

653

UNDERSTANDING EMPOWERMENT THROUGH TECHNOLOGY DRIVEN POWER STRUCTURES: CASE FROM MOTHER AND CHILD TRACKING SYSTEM IN INDIA

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Abstract: In this paper, I examine the question of "how are ICTs implicated in processes of empowerment?" This question has been examined in the context of field health workers in India who are confronted with a new software application (called Mother and Child Tracking System) to help her work in providing outreach care to pregnant women and children for immunization. This paper builds upon James Scott's (1998) argument of "Seeing like a State" where often the purpose of large-scale state ICT initiatives is to standardize and simplify complex social phenomenon, with broader intentions to control better the population. My empirical analysis concerns the study of a large scale Indian government ICT initiative to track every pregnancy and immunization related activity relating to every mother and new born in the country. The case is studied through the conceptual lens of opportunity structure, agency and technology viewed as a "conversion factor". The analysis leads to the inference that the space for empowerment of the health worker was constrained rather than being enhanced, raising questions about the value of the initiative.

Keywords: Empowerment, Opportunity Structure, Agency, Health Worker, India

1. INTRODUCTION

Frontline health workers arguably provide the foundation for health systems and health information systems (HIS) strengthening efforts in most developing countries. They are responsible for providing care to the outreach population under their catchment jurisdiction, fill up multiple registers on services provided, do different administrative tasks (like collecting salaries, forms, registers and drugs and supplies from the nearest health facility) and various others. They have over the last decade been flooded with new kinds of Information and Communication Technologies (ICTs) technologies such as computers, Personal Digital Assistants, mobile phones and in current times, laptops, tablets and smart phones. As these technologies are introduced, they are promised with improvements in their reporting capabilities, reduction in workloads and the ability to provide more effective and focused care. This has been the case also in India where these workers called Auxiliary Nurse Midwife (ANMs) are supposed to carry out a multiplicity of tasks involving large travel over villages covering a catchment population of 5000-7000. Various ICTs have been introduced in their settings, one such being the web-based application called the Mother and Child Tracking System (MCTS) which is the focus of analysis of this paper. To understand the implications of this application, it is first important to understand the everyday work of the ANM, and its underlying informational content.

An ANM manages a daily Out Patient clinic at her facility (called the Sub Centre) with a primary focus on providing preventive care and identifying referrals to the next higher level facility (called Primary Health Centre – PHC). Her primary focus is on the mother and child, providing health services related to antenatal and pregnancy care, and immunization services to

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

654

the new born. Typically, she provides clinic based services during the first half of the day and in the second half conducts   household visits in her assigned villages to provide outreach care. During outreach, she records the services she provides first in her field diary, from where data for each patient is transferred to respective registers (she maintains about 23 registers.), and then aggregates manually the statistics at the end of the month to produce the monthly report which is physically carried to the PHC (often a few hours away of travel) for submission and review. A key element of the review, in addition to verifying data quality by the supervisor, is to keep track of every pregnancy and childbirth for scheduled follow-up heck-ups, and ensuring all high risk cases are referred to PHCs in time.

Over the last two decades, governments, NGOs and other actors have introduced different types of ICTs (computers, laptops, PDAs, and mobile phones) to help enhance the work efficiency of the ANM. All these ICT tools are aimed at supporting her recording, reporting and tracking functions including for registering details of patient encounters, generating monthly statistics, enabling searching of patients, organising notes, identifying patients needing follow-up, giving reminders to patients, and attempting to reduce her work burden and improving documentation. However, as Scott (1998) has argued, these efforts framed within structures of bureaucracy (Lewis 2011) often turn out to be as instruments as control (rather than support) as these ICTs tend to enhance visibility of actions of those in the field, which are often resisted by field people to reduce control. In the context of the Indian health system, Ranjini (2009) made an in-depth anthropological study of the introduction of state wide ICT interventions in the context of ANM work, but found this added to their work and fear of control which led to the discontinuing of the system and a huge loss of investment.

Managers have typically been sceptical of the quality of the data being reported by ANMs, believing she would be inflating service numbers in order to show achievements of their targets. The supervisors are themselves under pressure from their superiors to show progress against their respective targets. To break this cycle of lack of 'trustworthy' data, newer and more modern ICTs are being deployed.

The outcome of these technological interventions are indeterminate, shaped by the underlying logics or motives for their introduction; to support or control work?. In this paper, I empirically examine how the MCTS initiative played out practically from the perspective of ANM work. Specifically, I draw upon the lens of "empowerment" to understand how ICTs can (or not) become agents of control or are they able to help the ANM break some of existing shackles of control and be empowered. The specific research research questions this paper addresses are:

- How do large ICT initiatives shape individual processes of empowerment (or not) of ANMs?

- How can implications of ICTs be positively channelled towards strengthening empowerment?

The rest of the paper is organized as follows. In the next, I discuss relevant literature to the topic of ICTs and empowerment relationship, and the role of power. In section 3, a brief overview of the methods employed in this research is presented. In section 4 on the case study, in the first part I provide a broad sketch of the health context in India with a focus on the maternal and child health status and the background of MCTS. In the second part, I discuss field work carried out with ANMs to understand from their perspective of what difference MCTS made for them. In section 5, I present my analysis and discussions drawing from an empowerment lens. Finally, some conclusions are presented.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

655

2. RELEVANT LITERATURE AND CONCEPTUAL PERSPECTIVE

2.1. Relevant Literature

'Empowerment' is a widely contested and complex notion, defined by various authors. In his framework of the capability approach, Sen (1999) defines development as the expansion of opportunities (named capabilities) together with process freedoms (agency). Empowerment is conceived as the expansion of agency (Ibrahim & Alkire, 2007). Alsop et al (2006) define empowerment as a process of enhancing capacity to make effective choices, and transform them into desired actions and outcomes. Samman et al (2009) sees empowerment as a multidimensional, culturally grounded and relational concept.

Kabeer (2009) brings power in the frame, seeing it as the ability to make a 'choice', and being disempowered is to be denied 'choice'. Empowerment then is inescapably bound up with conditions of disempowerment and refers to processes by which those denied the ability to make a choice acquire such ability. Empowerment refers to a 'process of change'. People who exercise a great deal of choice in their lives may be very powerful, but not necessarily be 'empowered', because they were never disempowered to start with.

And this process of 'increasing-power' and 'gaining choice' is conceived as the result of interaction between two building blocks of agency and opportunity structure. While agency is the ability to act on behalf of what we value, opportunity structure reflects preconditions for exercising (or curtailing) effective agency, emphasizing their inter-linkages. Empowerment is hence not only the expansion of agency but also expansion of the "opportunity structure" (formal and informal institutional context in which people operate) and their interaction shapes empowerment (Alsop and Heinsohn 2005). In this light, empowerment is seen as both a process and an outcome.

Sen (1985) defines agency as what a person is free to do and achieve in pursuit of goals or values that he or she regards as important. Alsop and Heinsohn (2005) view agency as a person's ability to envisage options and make meaningful choices. Opportunity structure represents the formal and informal contexts within which a person operates. Working together, these factors give rise to different degrees of empowerment, which depends on i) whether a person has the opportunity to make a choice, 2) whether a person actually uses the opportunity to choose, and 3) once this choice is made, whether it brings the desired outcome. Kabeer's (2009) analysis of choice highlights individual's possibilities of alternatives, and the ability to have chosen otherwise. And agency concerns whether people themselves are significant actors in processes of change" involving not only choice but also resistance, bargaining and negotiation, and reflection, their sense of the 'power within'.

Samman et al (2009) sees empowerment as being 'relational' and not occurring in vacuum. Groups are empowered or disempowered in relation to others with whom they interact, and involves becoming more capable agents. Alkire's (2007) categorisation of power enumerates different types of gains from empowerment – whether they have power over (resisting manipulation), power to (creating new possibilities), power with (acting in a group) and power within (enhancing self-respect and self-acceptance). Kabeer (2009) points to both negative and positive meanings of agency, where in a positive sense, 'power to', refers to people's capacity to define their own life choices, while in a negative sense of 'power over' is the capacity of an individual or group to override agency of others. Power also operates in absence of agency, for instance norms and rules governing social behaviour.

2.2. My Conceptual Perspective

I seek to understand empowerment as a process by which a person gains ability to make a choice, with a presumption that this ability was earlier denied, qualitatively understood within a concrete domain of action. It is an expansion of human agency that enhances options of 'choice',

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

656

within the framework of agency and structure, shaped by the interplay of power and disempowerment. To be empowered you must have experienced disempowerment, and this process of change takes place in relation to agency of 'power to' and 'power over'.

In line with Walsham's argument about agency, and integration or a thousand flowers (2005), I view technology to enable multiple and co-existing perspectives on agency. On one hand, there are inherent material features of technology (such as the ability to send a SMS through a mobile phone) which can have me seen as a technology or machine determinist. In Sen's vocabulary this material ability can be seen as a "capability," which to be converted into a realized functioning, humans must have the knowledge and expertise to be able to use the SMS facility for something that they inherently value. This represents a social deterministic stance. The perspective of "capability to use ICTs" represents a conversion factor inscribing elements of both machine and social determinism, supporting Walsham's thousand flowers argument. To illustrate by drawing from Robeyn's example (2005): we are not only interested in a bicycle because it is an object made from certain materials with a specific shape and colour, but because it can take us to places where we want to go, and in a faster way than walking, to realize a functioning of mobility (or others, like the love of speed). So, I conceptualize the capacity to use technology as a conversion factor with the potential to convert the capability to participate to an actual functioning. So, while technology serves as a resource, the ability to use it towards choices one values is conceptualized as a conversion factor with implications to convert an existing situation from being disempowered to be empowered. This relies on conditions of 'power to' and 'power over', for example whether I had a bicycle before, and whether I have resources and access to buy one. In this way, technology serves as a mediating condition between opportunity structure and agency with implications on empowerment.

3. METHODS

My study is based on a case study of the use of the MCTS (in one Indian state) drawing on interpretive methods. Firstly, I have tried to understand the broad context of the case, including the challenges faced in the health system of the state and new ICT initiatives being taken, including MCTS. I have been an active participant in the Health Management Information System (HMIS) strengthening processes of this particular state since 2007, which has helped develop a fair understanding of the context of the health system, and the historical processes of change. Since 2007, I have been part of a local NGO involved in strengthening state HMIS, including integration of report formats, software support and capacity building. For this paper, I have carried out 25 interviews with ANMs in their offices or outreach locations asking them specific questions about MCTS and its relation to their work.

While the primary source of data collection for this case has been interviews, I have also drawn upon my extensive experience of working in this state as a frame of reference to make sense of the interviews. In addition, I have had access to letters the state authorities have written to ANMs to promote the use of MCTS, typically including reprimands for not achieving targets. I have drawn upon press clippings about MCTS, which undoubtedly is of national significance. For data analysis, drawing upon my focus on empowerment, and related concepts of agency and structure, I have tried to understand the field data within this conceptual framework to make sense of it. I have shares my interpretations with my NGO colleagues and research supervisors to further enrich my analysis.

4. CASE CONTEXT

The case study is divided into two broad sections. The first part includes an overview of the case context relevant to the understanding of the intentions and outcomes of the MCTS application. The second part details the interviews with ANMs to understand their perceptions of MCTS and what it has meant for their everyday work. This taken together has helped me to understand the

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

657

ICT-empowerment relationship and the mediating role of ICTs within an agency-structure perspective.

4.1. Maternal and Child Health in India

India ranks 10th in the world on GDP growth rate, China ranks 2nd and Bangladesh ranks 57 (United Nations Statistics Division, December 2013). Surprisingly, India, a country trying aggressively to become a global economic powerhouse, has extremely weak health indicators, especially relating to maternal and child health, accounting for 19% of global maternal deaths (WHO 2012). The maternal mortality ratio (MMR) is 212 (in 2009) against its MDG target of 109, and compares poorly with Bangladesh (MMR 194 in 2010 from 322 in 2001) and China (MMR 26 in 2011 from 80 in 1991). Similarly, infant mortality rate (IMR) in India is 40 (in 2013) against MDG target of 27 and for the same neighbours the figures are 43 and 12.1 respectively. Bangladesh is only one of the 9 countdown countries on track to achieve the primary target of MMR by 2015 (Lancet 2014). Indicators on nutrition in India are not encouraging, with high prevalence of underweight children, which is amongst the highest in the world, and nearly double of some Sub-Saharan African countries.

Only about 4% of the GDP is allocated on health expenditure in India, which while being lower than China (5.6%) and higher than Bangladesh (3.6%), both of whom have superior health indicators than India, supporting Sen (2009) argues that it is not the amount of money which is important, but on how the money is spent and where.

The government of India in 2005 launched the National Rural Health Mission (NRHM) to undertake architectural corrections of the health system to strengthen public health delivery (NRHM Framework 2005). Further the framework document noted: "Designing a fully functional two way communication system leading to effective decision making. Enhance use of information and communication technology to improve health care and health systems performance" (p5). In taking the framework to implementation, the ministry went through an extensive process of redesign of the HMIS, and in 2008 provided states with revised reporting formats, and a web-based software platform on which the forms were configured. States started with reporting district level aggregate figures, and over time as the software evolved, reporting was decentralized to sub-district (blocks) and facility levels (by 2010).

While the HMIS strengthening process was ongoing, the health minister announced in 2009 that aggregate numbers are not good enough for monitoring immunization, and hence name-based reporting must start with immediate effect. A Government of India notification announced:

> *It has been decided to have a name-based tracking system whereby pregnant women and children can be tracked for their ANCs and immunisation along with a feedback system to ensure that all pregnant women receive their ante-natal care check-ups (ANCs) and post-natal care (PNCs); and further children receive their full immunisation. An online module for the name based tracking system is being developed and direction of use will be given soon. ….*

States were mandated to start collecting data on the formats given, and ANMs were to report this on MCTS. Small teams from all states were called to the national level for training to enter facility names, health worker names, and assigning codes in MCTS. Trainings were designed with a cascade model where state trainers further trained district teams, who then trained sub-district teams and then they the ANMs. From April 2010, data started to flow into the software, and system usage was monitored based on 'number of women and children registered yesterday and expected', which was communicated daily by SMS to the State health secretary first thing in the morning. These messages over time added state rankings, telling how your state ranked vis-a-vis others on registrations, and how the effort was not enough. Approval of state budgets

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

658

slowly became conditional to the achievement of registration targets. Along with this, monthly letters to states from the centre for enhancing registration. For example:

> *On close analysis of the data available in MCTS, it is noticed that only 77% of the mothers and 12.5% of the live births are registered in MCTS till date. More over the services given to mother and child are not seen updated regularly.*
>
> *(Government of India DO Letters, dated 10.02.2012)*

Two years into the implementation, the ministry was still struggling to get full registration, and the health minister announced:

> *Information is collected to track every mother and child by name, address and telephone for which a call centre has been set up in the ministry to verify the data and inform women of the check-ups and the immunization schedule, health minister said. The Minister also made sample verification calls to registered women under the MCTS database to verify the database entries today.*
>
> *(Press Information Bureau, Government of India, October 2011)*

The word 'verify' echoed the same 'trust level' which was at the foundation of the launching of the massive tracking system. Such press releases were sent by the ministry each month:

> *Over 99.5% districts, 96% health blocks, 88% health facilities (other than Sub Health Centres (SHCs) and 94% SHCs are reporting data in MCTS. Total 2.3 lakh ANMS are registered in MCTS, of which 2.2 lakh (ANM are registered with phone number). Total 8.4 lakh ASHAs are registered in MCTS, out of which 6.9 lakh (82.9%) ASHAs are registered with phone number. Everyday approximately 7-8 lakh SMSes are being sent to the beneficiaries.*
>
> *(Press Information Bureau, Government of India, May-2013)*

In November 2013, the ministry advertised a new request for proposal for setting a 'Mother and Child Tracking Helpdesk (MCTH)' to strengthen validation of data as well as a single platform for information exchange.

> *MCTH shall validate records of health worker, pregnant women and children registered under MCTS by making outbound calls to the health beneficiaries and health workers. Errors / deviations that are generated in the validation exercise must be reported back to MCTS so that corrections can be made. Minimum 70-calls (outbound) and minimum 6-hours of actual calling in a day by individual helpdesk agent. The average calling time per call is expected to be 5 minutes.*
>
> *Tender Document No:NIHFW/WS/20-18/2013, National Institute of Health and Family Welfare, MOHFW*

Four-years into the programme, the ministry was still at the stage of validating the data, and states unable to generate all required reports. The only figures/data the states received was what the ministry sent with them (via morning SMS, letters or press releases). From 2012, the state could generate reports on facilities not entering data, district-wise monthly data entry, verifications done and services tracked. In state review meetings, the issue of insufficient capacity building came-up as a reason for low registration, and the Population Research Centres (PRCs) were notified as the nodal agency for monitoring MCTS. PRCs are research units set-up

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

659

by the Ministry of Health, and the country has 19 PRCs covering 29 states and 7 union territories. The PRCs immediately started the process of review for each district. Here are some excerpts from the a few states:

> *The MCTS coverage is almost complete in all the centres under study. Most of the staff involved in HMIS/MCTS data entry complained about the inadequacy of number of available computers and slow internet connection.*
>
> *Wayanad district, Kerala*

> *District monitoring and evaluation officer is in charge of the MCTS. The status of proportion of pregnant women information uploaded in MCTS is 66 percent till September while that of the children is 48 percent.*
>
> *Hissar district, Haryana State*

> *Under the MCTS in every sub-centre, there is a separate register for MCTS. There is big problem of internet connectivity.*
>
> *Mandi district, Himachal Pradesh*

> *At district hospital there is no separate computer for HMIS/MCTS entry. It is found that data entry operators required training for HMIS entry. PHC ANMs are used the MCTS generated report to track mother and child. As expressed by the DPMO all ANMs have received the training on HMIS/MCTS, still they are unable to perform the task efficiently due to multi reasons.*
>
> *Bidar district, Karnataka*

4.2. What has the MCTS Meant for the ANMs?

I discussed with some ANMs on their experience with MCTS application and implications on their work, especially with respect to workload and quality of care. ANMs expressed concerns about their increased workload with each case (pregnant woman or child) needing to be entered in detail. Data entry could not be completed even with a whole day of work, and ANMs needed to line-up at cybercafés close to their homes to update data entries in the evening after work hours, which they go to with family members for reasons of security. Some ANMs even contracted cybercafés to enter data into MCTS with personal usernames and passwords. An ANM said:

> *I return from work by 5.30pm, rush into kitchen to get dinner ready and finish whatever I can to leave home by 6.45pm to reach cybercafé by 7pm. The shop closes at 8pm. Only if I put in one hour of data entry everyday can I complete my workload for registration. Am not fast at using computers and my son does not understand the data. So we both try to complete as much, as cannot afford salary cuts.*
>
> *ANM, Punjab*

The letters from centre to state giving the state ranking snowballed into letters to districts from the state, with district-wise ranking, and further to each ANM with health-worker-wise ranking. No incentives were given if registration was below 90%, and poor performing workers were publicly shamed by names being displayed on notice boards, letters called for explanations for low registration, and negative performance remarks were recorded in service books which are the basis for annual confidential appraisals and other benefits.

> *I am always lagging in my registration targets and I am lowest performer in my district. This has been told to everyone in every meeting. But what's not told is that I have seven big villages under my area with highest load of*

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

660

mother-child registration in my block. It is always a race to complete data entries – my son and daughter help me complete, but they have college in the day and internet shops is far from home, which does not leave much time for them. Now I have contracted internet shop operator to complete my entries. I pay him from my pocket, which of course does not get reimbursed. We are larger joint family to support and diverting the resources is not helping. But all this still does not help, as I have been now been labelled worse performer, which is extremely demotivating.

<div align="right">

ANM, Punjab

</div>

While the centre made percentage of MCTS entries a condition for state budget approvals, the state made salaries of ANMs conditional to registration percentage:

State has also started with salary cuts for not meeting targets and I have had three continuous salary cuts due to not meeting the targets. I cannot afford this. PHC has only one data entry person and the load is too much so most of us have been asked to find our own ways to completing entries. I am 58 years and I don't know computers. I don't have computer shops near my house. I am struggling with my data entry. I need to take my registers to computer shop which is far and leave the registers they for 3-4 days. But then I have back log of data entry in registers also. I had suggested using untied funds for completing data entry, which has been denied. So, all of us are using our own money to complete data entry. This is not sustainable.

<div align="right">

ANM, Punjab

</div>

While discussing the issue of low registration, one AMN pointed that while government issued the MCTS formats for reporting, the recording registers were not revised. *How do we report on data that we do not capture?*

One ANM pointed to something which was at heart of this MCTS-data relationship:

We have been dealing with pregnant women and children since I joined service (which was 30 years now). We always discussed cases at the PHC with the doctor about cases which we think to be high risk in our monthly meetings, and also discuss how to plan immunisation and nutrition days and other outreach programmes. But for three years now our monthly meetings are only about percentage of names registered in MCTS, show-cause letters issued to those not completing targets and timelines to complete entries. We do not discuss cases, data or workplan anymore.

<div align="right">

ANM, Punjab

</div>

After presenting both macro and micro level dynamics around the MCTS, I analyse it in relation to the implications on ANM empowerment.

5. ANALYSIS AND DISCUSSION

What has experience of ANMs been with regards their work, is the empirical question I have tried to explore. I analyze this with respect to my conceptual framework using key concepts relating to opportunity structure, agency, technology as conversion factor and implications on empowerment.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

661

Opportunity structure: While the MCTS has inherent potential to support improvement of maternal and child health, the various structures employed to institutionalize it reflect those of "power over" the 'participants' in the programme itself. For instance, the design of the programme was based on entry of each pregnancy and new born into an online system, but there limited assessment of computer hardware available, internet connectivity, electricity availability, staff availability to enter data, their work loads and computer literacy levels.. Whoever could work on computers were assigned to data entry work, and pressure to register data in absence of the required resources resulted into staff being pushed into using personal resources and time. While huge investments were made into software development, procurement of servers and hardware, support to ANMs (eg travel allowance, improved registers) was not given due importance, and implementation took place in a vertical manner within the logic of top-down control.

The intervention did not take into cognizance the existing reporting workload on the ANMs, while the new forms were introduced without rationalization of existing forms. There was duplication of data, as information asked for in these new formats were already sent as aggregates into the HMIS. This also undermined the HMIS strengthening process across the country which was fast gaining maturity and stability by taking away attention and resources to the more visible MCTS. Letters of reprimand, threats of salary cuts, constant attention being drawn to the "low performing" ANMs strengthened structures of "power over", providing limited scope for ANMs to use technology to exercise agency to enhance care, even though there was the existing potential to do so.

Agency: A desired agency would be to enhance the capability of the ANM to strengthen care processes to help address key maternal and child health problems the country was experiencing. However, empirically seen, this capability was not enhanced, but on the contrary was arguably undermined. The MCTS became a tool used by ANMs to control and undermine them. Data entered with great effort and cost by ANMs into the MCTS became a tool for them to be monitored leading to her own reprimand and salary cuts. Even if we assume that 'control' was not the stated objective of the system, the sheer visibility MCTS created enabled control (external and self), leading to the agency of the 'lowest level' being dominated by that of the technology and its supporting structures.

The ANM operates within her community based social system, and the MCTS may have undermined her status in that set up. For example, the MCTS format has a field for collecting phone number of the women/child and/or of the neighbour. Once the call centre got functional, verification calls often were made to the neighbour, in case the first number was unavailable. In case of a pregnant woman, the question was on the verification of the pregnancy and personal details which any women will not like to disclose on phone to a stranger. In case the woman refused to answer, this was sometimes recorded as case of false reporting by ANM. Not only did the AMN lose credibility in her community, people could not confide in her anymore, as they feared she will give their details to strangers in a call centre. The system design overlooked some important contextual/cultural details, for instance, in India a child is often not given a 'name' immediately at birth, and naming takes place after 11-days (to 2weeks) as part of a small ceremony at home. But for the entry into MCTS, the name was the first field, without which system would not let you proceed. Also each name based entry (mother and child), had to be tagged to 'husband' (for women) and 'father' (for child), and the database was often full of duplicates.

Technology as a conversion factor? The capability to use technology could potentially serve as a conversion factor to help materialize the capabilities of the ANM into functionings (providing better care). Arguably, the reverse happened, as the data she reported was used to control her, rather than facilitating her agency to strengthen care. The system design of the MCTS provided a feature of generating a monthly 'work-plan' giving details of cases, which needed to be followed-up by the ANM, based on the data she provided. However, since the computer and

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

662

printer were available at the block (sub-district) level, the ANM could not have proper access to her work-lists. Further, the work list used colour codes (red, green, yellow etc) for follow up, and this was not visible to the ANM when she received the (black and white) printout, which undermined the conversion capability of the system. Further, all print outs were in English, while the ANMs were more familiar with Hindi/vernacular which further undermined the conversion capabilities of the technology.

The primary purpose to which the technology was deployed related to the registering of a new birth or pregnancy, and various forms of verification of those numbers. While registering a new case, is indeed an important element of the work, and based on which care can potentially be enhanced, but to stay limited to that was indeed not a full realization of the conversion capabilities of the technology. Inadequate design, like examples mentioned above, went against existing social and work related practices which raised ANM's resistance towards the system. The printouts were not made available to the ANMs in time and in the right colour for her to be able to take effective action in strengthening care. Further, her work load was enhanced, as she now had to fill data for both the HMIS and MCTS and there was the added burden on her to show the figures matched, and attracted reprimand if they did not.

In conclusion, how to understand the implications of MCTS on ANM empowerment? Did the system provide additional and different kinds of choices to the ANM for providing care? The answer at this point seems to be a clear "no" as the interaction between opportunity structure and agency were clearly aligned towards strengthening "power over" and reducing the existing spaces in which the ANM acted to strengthen care in the community.

6. CONCLUSION

The field of IT for Development has been concerned about better understanding of how technology is implicated in processes of development. I have in this paper tried to understand this relationship through the lens of empowerment. While there is of course the potential that technology has to enhance development processes, whether it does so depends largely on the interaction between opportunity structure and agency, where technology and capability to use it plays the role of a "conversion factor" or a mediating influence with the potential to enhance agency and convert capability into functioning. In this case, I found technology to be not fulfilling the potential of positive conversion, and strengthening structures of "power over" the ANMs. In my future research, I will seek to further apply this framework to other empirical settings, and to further enhance and refine it.

REFERENCES

Alop, R, and Heinsohn, N. (2005). Measuring empowerment in practice: Structuring analysis and framing indicators. Washington, DC: World Bank.

Alsop, Ruth, Mette Frost Bertelsen, and Jeremy Holland. Empowerment in practice: From analysis to implementation. World Bank Publications, 2006.

Ibrahim, S. and Alkire, S. (2007). Agency and Empowerment: A Proposal for Internationally Comparable Indicators. Oxford Development Studies Vol. 35, No. 4, December 2007

Kabeer, N. (1999). Resources, agency, achievement: Measurement on Women's Empowerment. Development and Change

Lewis, J. (2011). From technology for information to information for local action: the role of participatory networks from case studies in India

Samman, E., & Santos, M. E. (2009). Agency and Empowerment: A review of concepts, indicators and empirical evidence.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

663

Robeyns, I. (2005). The capability approach: a theoretical survey. Journal of human development, 6(1), 93-117.

Ranjini, CR. (2009).Implementing public health information infrastructures in India: An ethnographic approach

Scott, J. C. (1998). Seeing like a state: How certain schemes to improve the human condition have failed. Yale University Press.

Sen, A. (1988). The standard of living. Cambridge University Press.

Sen, A. (1987). Gender and cooperative conflicts (p. 58). Helsinki: World Institute for Development Economics Research.

Sen, A. (1999). Development as Freedom. New York: Anchor Books.

Walsham, G. (2005). Agency theory: integration or a thousand flowers?. Scandinavian Journal of Information Systems, 17(1), 11.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

664

DISCOURSE AND DISCOURSE COLLISIONS: UNDERSTANDING THE EXPERIENCES OF INFORMATION SYSTEMS STUDENTS AT A SOUTH AFRICAN UNIVERSITY

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Abstract: In the South African higher education context, teaching and learning practices remain biased towards a white, middle-class, elite, and English speaking worldview. Moreover, research on teaching and learning, has a historically tendency to consider students as decontextualized and deculturalized beings, basing explanations of student success predominantly on intrinsic factors. More sociological and cultural views are, therefore, needed to study higher education practices. To address this problem situation, this paper draws from Gee's (2008) sociolinguistic theory on Discourse as a way of being, using it as a critical lens to inform the author's own teaching practices in an undergraduate module in the final semester of the IS major at Rhodes University, South Africa. The argument put forward is that learning implies a preferred or dominant type of Discourse or worldview inherent to the learning situation. For students whose home-based Discourses are similar to the Discourse of higher education, this transition is relatively smooth. However, students from minority Discourses may experience debilitating Discourse collisions. The paper contributes by presenting reflections on the how Discourses and Discourse collisions manifested in the particular setting that the author encountered. He also reflects on how social media and group work could facilitate students' acquisition of a new Discourse.

Keywords: Higher Education, Sociocultural Context, Social Media, Critical Theory

1. INTRODUCTION

Research on Higher Education (HE) teaching and learning should move beyond considering students as decontextualized and deculturalized beings, and move beyond focusing only on cognitive and personality aspects (i.e. intrinsic aspects) of a student's learning experience to also incorporate theoretical and practical views of the student's social and cultural contexts (Case, 2008; Kress, 2011; Boughey and Niven, 2012). More sociological and sociolinguistic approaches and views are, therefore, needed in the study of student learning in HE. Reflecting on some of her own work among engineering students, Case (2008), for example, highlights the need to consider the broader social context of learning – how it hinders or supports learning – and the important role of students' growing identities (as engineers in her case) or the lack thereof.

Highlighting similar issues, Kress (2011) and Case (2008) critique the roots of the positivist orientation towards learning, where the promise of prediction and control and associated simplicity and power are overvalued and under-critiqued. Reflecting on the tension between practitioners and academics, Kress (2011) takes the critique to a level where she claims that existing power dynamics in the HE situation and its positivists roots are responsible for the dehumanizing of academics and researchers to a point where they eventually join the ranks of the oppressors, and associated themselves with "better" ways of being (also see Gee, 2008). Students are taught that white middle-class ways of knowing are privileged over other ways of

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

665

knowing (Case, 2008). This, as a result, manifests in standardized curricula and high-stakes assessment (Case, 2008; Kress, 2011), which forces many students into adopting a surface approach (as opposed to a deep approach) to learning, where the aim of their engagement in HE is diluted to a point of simply "surviving" and passing exams. Positivism in education is an oppression sustaining approach where power and ethnocentric distance (Case 2008; Kress, 2011) is valued and maintained.

Kress (2011), reflecting on USA education contexts, suggests that "h[H]istorically, schools as institutions have served to 'deculturalize' or strip non-white, non-English as a first language, non-Christian Protestant, and poor students of their cultural identities." (p. 7). In South Africa, this phenomenon is in many ways intensified as a result of the Apartheid legacy (Boughey and Niven, 2012) and the fact that the early years of HE development "saw the particularly sharply divided linguistic, cultural, race and gender historical forces … deeply shaping the structure" (Cooper and Subotzky, 2001:5) of our HE system, including that disciplines, degrees, and theories were originally imported to South Africa from British universities (Cooper and Subotzky, 2001). Even post-apartheid transformation practice initially framed Black students as underprepared for HE or disadvantaged, while the "socially constructed nature of the universities" (Boughey and Niven, 2012: 647) remained unchallenged, a sentiment echoed also in Quinn and Boughey (2009) and Boughey (2012). Traditionally, the primary focus of teaching and learning research in HE, therefore, was at learning practices that aimed at "nurturing" students into an unchanging and unchallenged HE system. As a result of these historical practices and assumptions, Black students in South Africa still do worse in most disciplinary fields (Ndebele et al., 2013; Boughey and McKenna, in press).

A report by Scott et al. (2007) based on 2005 Higher Education Management Information System data shows that only 16% of students in South Africa participate in HE. When looking at the participation rates in the main population groups, of that 16%, only 12% are Black students (Scott et al., 2007). This is also confirmed in a more recent publication by the Council of Higher Education which shows that only 5% of Black African youth are successful in any form of higher education (Ndebele et al., 2013). The HE sector is not able to accommodate a higher and more equitable proportion of the majority population group (Scott et al., 2007; Ndebele et al., 2013). Despite deliberate corrective efforts by government since 1994, a bias towards a white, elite, middle-class worldview in HE practice in South Africa is still maintained (Quinn and Boughey, 2009), and it is a tendency that is not much different internationally (Case, 2008; Gee, 2008; Kress, 2011).

There are several perspectives to how and why this problem manifests in education situations. Case (2008) drawing from Mann's (2001) work, foregrounds the concepts of alienation and engagement (or disconnectedness and connectedness) as a way to explore a more contextualized view on student learning experiences. Alienation in Case's (2008) definition refers to a disconnectedness in the "context of a desired or expected relationship" (p. 323), or an isolation from a group or activity to which one should belong (Mann, 2001, cited in Case, 2008). Engagement on the other hand offers a contrasting view, that is a desired connectedness or relationship. According to Case (2008) alienation could be used as a concept to explain the experiences of minority student groups, a sentiment that is also vocalized by black academics in South Africa, arguing for transformation (Mabokela, 2002; MacFarlane, 2013; Ndebele et al., 2013).

Learning essentially shapes people in a way where they are perceived to be different afterwards by themselves and by others (Case, 2008; Merriam and Ntseane, 2008). Learning situations change students, their frames of reference, and their beliefs and assumptions. Central to what Merriam and Ntseane (2008) argue is that learning that is transformative begins, subconsciously or consciously, with critical reflections and the self-examination of one's own assumptions, taken-for-granted beliefs, and frame of reference (Mezirow, 2000 in Merriam and Ntseane, 2008).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

666

To address this problem situation, I draw from Gee's (2008) sociolinguistic theory on *Discourse as a way of being in HE*, using it as a conceptual lens to inform my teaching practices and use of social media in a six-week undergraduate module, offered in the final semester of the IS major at Rhodes University. Like with other disciplines, the IS discipline regulates (or "disciplines") knowledge and behaviour of individuals (Foucault, 1977; Brocklesby and Cummings, 1996; Myers and Klein, 2011). Also, the IS discipline originated in western, northern universities (Cooper and Subotzsky, 2001). Consequently, the tools and methods of IS are not African, and are therefore culturally "foreign" to non-mainstream students. This implies worldview collisions inherent to the education situation.

The concept of a "cross-worldview situation" builds onto the idea of cross-cultural work (Walsham and Sahay, 2006), but it takes its meaning more explicitly into the critical research paradigm as a means of emphasizing, exposing, and critiquing oppression and its causes, false ideologies, cultural entrapment and ethnocentrism, the realities of value conflicts, and inter-worldview power relations (Hammersley, 1992; Ngwenyama and Lee, 1997; Čečez-Kecmanović, 2001; Myers and Avison, 2002; Walsham, 2005; Stahl, 2008).

The critique that I put forward in this paper (this is also my ethical position (see Stahl, 2008)) is that one cannot accept or assume (whether subconsciously or deliberate) that Black African students do not have the intrinsic capability (such as IQ, motivation, aptitude and so on) to pursue academia or assume that such intrinsic factors are randomly distributed throughout the population. Student performance data, which shows that black students regardless of programme or university, consistently do less well than their white peers (Scott et al., 2007; Ndebele et al., 2013), also do not support this position. Reasons for this disparity and contradiction should be sought through critical and sociocultural theories (Gee, 1999; Case, 2008; Boughey and Niven, 2012).

Moreover, one cannot possibly expect a majority group, as is the case in South Africa, to continually blend their "subordinate" and marginalized worldview into the dominant but minority worldview of HE in South Africa, thus dominating them into valuing differently and being different in order to "achieve" according to someone else's criteria. In line with the critical paradigm, I use Gee's (2008) theory to expose this oppression sustaining phenomenon (Hammersley, 1992; Ngwenyama and Lee, 1997; Walsham, 2005), and subsequently demonstrate a position and principles for a more liberating praxis (Ngwenyama, 1991; Orlikowski and Baroudi 1991; Myers and Klein, 2011) in HE situations. I attribute reasons for learning not taking place to social context. In my critique, I turn away from a focus on individual characteristics and minds towards a focus on social and cultural interaction (Gee, 1999), arguing that the extent to which students can gain access to HE, depends on the social capital they bring to the education situation (Gee, 1999; Wright, 2008).

The paper is structure as follows; Gee's (2008) theory on Discourse as a way of being is explained in the next section. Thereafter, two sections are allocated to discuss Discourse collisions and teaching to transcend Discourse collisions. Then, as informed by Gee's (2008) conceptual framework, I present three research questions. This is followed by the study's empirical setting and teaching encounters. The paper ends with a discussion of preliminary findings on how Discourses and Discourse collisions manifested within a particular HE teaching situation. Due to limitations in length, I do not elaborate on our methodological approaches and how I analyzed data.

2. DISCOURSE AS A WAY OF BEING (GEE, 2008)

Arguing from a sociolinguistic underpinning, Gee (2008) puts forward the idea of Discourses (using a capital "D") as "ways of behaving, interacting, valuing, thinking, believing, speaking, and often reading and writing, that are accepted as instantiations of particular identities (or 'types of people') by specific groups …" (Gee, 2008: 3) for different occasions and as a product

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

667

of history. A Discourse is a set of related social practices and about "language-in-use-in-society" (Gee, 2008:2). His argument is that HE situations require from students to associate with and acculturate into particular types of Discourses or ways of being. A Discourse is about acting out the types of people we need to be for various occasions and places.

> "A Discourse is a socially accepted association among ways of using language and other symbolic expressions, of thinking, feeling, believing, valuing, and acting, as well as using various tools, technologies, or props that can be used to identify oneself as a member of a socially meaningful group or 'social network,' to signal (that one is playing) a socially meaningful 'role,' or to signal that one is filling a social niche in a distinctively recognizable fashion." (Gee, 2008:161)

The language of a Discourse does not make sense outside of the Discourse (Gee, 2008). Embedded in every Discourse that people belong to or associate with are common-sense everyday theory about the way of being in that Discourse. Socially agreed upon meaning (meaning of symbols, tools, behaviors, words, and so on) and tacit theory allows one to function and relate to others who also associated with the same Discourse.

Power plays a pertinent role in the shaping of social practices and meaning in a Discourse (Gee, 2008). The establishment of meaning comes from different social practices, consensus around values, and different interests by people or groupings of people who seek to share common ground. Negotiations can be settled for a time even if only some interests are shared or even if there are no common goals (Gee, 2008). Meaning then becomes conventional or "common-sense knowledge" for those who associated with the Discourse.

Conflicting interests play a role in the negotiation of the meaning of words. Meaning can be rooted in culture but also in relationships which are less enduring or long term, i.e. people from different cultures may group socially using a Discourse where there is a negotiation for meanings of words, concepts, or shared action, or where there is disagreement or not, conflict or not, shared interest or not, and consensus or contestation around values. People are part of shared histories, groups, and institutions which exist partly to "stabilize and conventionalize meanings so that people can get on with their lives and their interests (unfortunately, sometimes at the cost of other people's interests)." (Gee, 2008:14). Different Discourses, conflicting, contesting, and overpowering each other, manifest in the HE education situation

Gee's (2008) critical argument is that it takes energy, social work, and political action for people to police (i.e. enforce, maintain, protect, establish consensus, etc.) meaning, and there is a constant contestation for power to control meaning. "Discourses operate to integrate and sort persons, groups, and society." (Gee, 2008:4). The dominant values of Discourses may treat people from other Discourses as "others", not like us, not part of us, or non-standard. The way this manifests in the HE situation causes the values from the "other" Discourses to be damaged. However, in order to fit in, survive, achieve, and so, one may become complicit with values that damage or denigrate originating or home-based Discourses of, for example, students who do not belong to the dominant Discourse of HE. This is dominating and oppressive social phenomena, which sidelines, marginalizes, and represses.

Each Discourse incorporates taken-for-granted theories about how it is to be normal and adequately part of a Discourse, how to feel, behave, value, act, and so on. The values in academic Discourses always relate to what can count as knowledge and how that knowledge can be known (see for example Gamble, 2006). These theories may involve viewpoints on the distribution of social goods and is underpinned by the use of language. Gee (2008) claims that language is "inextricably bound up with ideology and cannot be analyzed or understood apart from it." (p. 4), and should therefore be studied and understood in this manner.

Learning in institutions of HE implies a preferred or dominant type of Discourse or worldview inherent to the learning situation. Students are subconsciously or consciously expected to

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

668

acquaint themselves with and adapt to a "new" and preferred way of knowing and valuing (Gee, 2008), associated with the HE institution and the particular type of discipline they seek to "achieve" in. For students coming from a home-based Discourse that is similar to that of the HE institutions they are going into, this transition is relative smooth and easy, with little conflict, contestation, and acculturation. However, for students from minority or sidelined Discourses or home-based Discourses that are significantly different from the Discourse of HE, the subtleties associated with making such acquisitions imply conflict, contradiction, domination, and social shaping.

3. DISCOURSE COLLISIONS

According to Gee (2008), those with more conflicts between the various Discourses they associate with and use may find themselves in a position of being the dominated group. Those that have the least conflict with the other Discourses they use, become the dominating group. Control over Discourses can lead to the acquisition of social goods (or capital). The accomplishment of social goods through using Discourses may give one power over the Discourses between which there are not much or the least conflict. For example, the Discourses I use in various situations in my world all require that I be a middle-class white male, albeit for different occasions and situations of being. There is little conflict, therefore, if I associate with another social situation that also requires from me to be a middle-class white male. However, if a Xhosa female student from a traditional community-orientated Discourse (her home-based Discourse), is required to participate in and act out the Discourse of the middle-class English-speaking white elitist institution, serious debilitating conflict may emerge, which makes her vulnerable in that she becomes part of the dominated group – or, over time, if she succeeds in acquiring the new Discourse as a secondary Discourse, she may find herself in a "better" form of being and may join the ranks of the oppressors (Kress, 2011). This conflict may be intensified for a first-generation student, which is the case for many Black students in South Africa, because there is no one in their direct communities from whom they can draw guidance on what it means to take on the intense Discourse collisions that the HE situation offers them. Conflicts may emerge as deep, many, and apparent; many home-based Discourse is consumed and over-powered (Gee, 2008).

For a student coming from a Discourse similar to the primary Discourse of HE and the particular discipline where they are going into, this may imply sufficient "educational preparations" (Gee, 2008, 165) for them to more naturally adapt to the HE Discourse. However, the majority Discourse of HE conflicts seriously (Gee, 2008) with the minority or sidelined Discourses to which many students in South Africa belong. Moreover, each discipline in HE context creates students who define themselves as better or different than their own kind (those from their originating Discourse). According to Gee (2008) this is a paradox, which sidelined students feel in their bodies and minds (also see Boughey, 2000).

Moreover, value conflicts in the South African HE context have serious and complex problems related to it. The "post-modern focus on utilitarianism, functionality and competence" (Case, 2008: 325) and a value system associated to productivity and progress is in direct conflict with what traditional African people emphasizes, namely; belongingness, connectedness, community participation, loyalty, hospitality, and people orientatedness (Krauss, 2012; Mkabela, 2005). Other perspectives on similar value conflicts can be found in Merrian and Ntseane (2008), Merriam and Mohamad (2000), and Diouf, Sheckley, and Kehrhahn (2000). These authors show that the western worldview is biased towards independence and critical autonomy, while in other cultures conforming to the group or community is more valued, and elders in a community are seen as key owners and disseminators of knowledge (Diouf, Sheckley, and Kehrhahn, 2000; Krauss, 2012).

Gee's (2008) critical argument is that people get hurt and damaged through the workings of language, power, and ideology, and he does not hold back in the way he argues the point.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

669

Usually there are tacit or hidden theories embedded in all human practices that either empower or disempower people. In HE those "hidden theories" relate to knowledge and how it can be known. Knowledge and knowing are constructed as neutral, apolitical, acultural and asocial - a myth perpetuated by the teaching of "study skills" and through "academic language" classes which might teach the passive but do not reveal the values behind why scientists use the passive (Ballard and Clanchy, 1988). Gee's (2008) value judgment (see Myers and Klein, 2011) is that one should expose and articulate (or make overt) those hidden theories and strategies when they hurt people. Gee (2008) invites his readers to make overt their own hidden theories that may repress and damage others, and he appeals to his readers to critically reflect and introspect on the implications of their own power and use of theories in the Discourses they use. His value judgment is that critical social theories should ultimately be about illuminating such complex problems in society and seek possibilities for socially just futures of people. In line with the critical paradigm, Gee (2008) argues, foregrounding the importance for ethical conduct (Stahl, 2008), that it is our moral obligation to expose taken-for-granted assumptions and theories that disempower people.

4. TRANSCENDING DISCOURSE COLLISIONS

This critical view of Gee (2008) has implications for the lecturer and the assumptions he or she are making about how Discourses and Discourse collisions are handled in the HE situation. The problem is that most lecturers are already deeply associated with the Discourse of HE and the discipline. This implies potential domination of sidelined-Discoursal students, especially if the lecturer is indifferent of the socio economic contexts, background, and Discourses that students come from. According to Gee (2008), some students choose not to disconnect language and meaning created in the learning situation from the larger home-based Discourses where they come from (see for example Boughey, 2005). It may therefore be that social practices and behaviors required in particular disciplines may be at odds with other social practices from students' originating Discourses.

Gee (2008) proposes a number of principles for dealing with non-mainstream Discourses and Discourse collisions. The first is making the culture, values, and assumptions of the HE Discourse and the particular discipline explicit and overt (Minnis 1994, in Gee, 2008). This making explicit the rules of the game of HE is complex, because there are limits as to what can be put into words about Discourses (Gee, 2008).

Gee's (2008) proposed approach to this problem is that lecturers should be facilitators of Discourse transitions, and the teaching situation should provide good balance between *learning* and *acquisition*. Discourses are like language, they are "mastered through acquisition, not learning" (Gee, 2008:170). For acquiring a Discourse, a phase of acculturation into the social practices (behaving, valuing, believing, using language, props, technologies, and so on) or apprenticeship into the Discourse is necessary. This is how one acquires ones primary Discourse; secondary Discourses are also acquired as such.

> "Acquisition is a process of acquiring something (usually, subconsciously) by exposure to models, a process of trial and error, and practice within social groups, without formal teaching. It happens in natural settings which are meaningful and functional in the sense that acquirers know that they need to acquire the thing they are exposed to in order to function and they in fact want to so function. This is how people come to control their first language." (Gee, 2008: 169-170).

> "Learning is a process that involves conscious knowledge gained through teaching (though not necessarily from someone officially designated a teacher) or through certain life experiences that trigger conscious reflection. This teaching or reflection involves explanation and analysis, that is, breaking down the thing to be learned into its analytic

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

670

parts. It inherently involves attaining, along with the matter being taught, some degree of meta-knowledge about the matter." (Gee, 2008: 170).

Acquisition (apprenticeship) should at least in some way precede learning (teaching) (Gee, 2008). If a lecturing situation does not adequately balance learning and acquisition, students who have acquired a Discourse earlier or as part of their primarily Discourses, will have a benefit. Both learning and acquisition according to Gee have benefits, though; acquisition has the focus of mastery (or proper socializing into a Discourse), while learning leads to "analytical and reflective awareness" (Gee, 2008: 171).

"It is the job of the teacher to allow students to grow beyond both the cultural models of their home cultures and those of mainstream and school culture." (Gee, 2008: 114), and essentially this is about a moral act. In some sense this implies that teaching should result in students thinking about their Discourses in a critical and reflective way. Part of this process, therefore, requires that the lecturer gives the student permission to challenge the Discourse they come from, the Discourses of HE, and the Discourses of the discipline they are going into.

Typically people are not consciously aware or reflexive about of workings of their primary Discourses. However, people who are somewhat marginal (Gee, 2008) to a Discourse may have insights into a Discourse that more mainstream people do not have. This is a benefit, in the sense that even though they are not fully acculturated into a mainstream Discourse, they have experience in transcending Discourses or escaping from cultural entrapment (Hammersley, 1992; Thomas, 1993), and subsequently have developed ways and meta-knowledge of the principles of a Discourse. For them it means that although they may not be able to, as spontaneously, create, innovate, and engage as those whose primarily and secondary Discourses do not conflict much, they will be able to contrast better with their originating Discourses.

> "Good classroom instruction (in composition, study skills, writing, critical thinking, content-based literacy, or whatever) can and should lead to meta-knowledge, to seeing how the Discourses you have already got (not just the languages) relate to those you are attempting to acquire, and how the ones you are trying to acquire relate to self and society. But to do this, the classroom must juxtapose different Discourses for comparison and contrast." (Gee, 2008:173).

So, essentially, teaching should facilitate acculturation into the Discourse of HE and of the particular discipline, giving students permission to challenge, freedom to grow beyond their originating Discourses (escape from cultural entrapment), making Discourse collisions overt, modeling or demonstrating the knowledge traditions (Discourse) of the discipline as a way of initiating socializing into the Discourse of HE and a particular discipline, and empowering students to bring their Discourses into the teaching situation.

Following from this conceptual framework and the empirical setting that I put forward in the next section, I present three research questions:

1. How do Discourses and Discourse collisions manifest in the teaching of an undergraduate IS module at Rhodes University?

2. Given the context of Rhodes University, how should teaching an IS undergraduate module facilitate the initiation of adequate acquisition of HE Discourses and the transcending of Discourse collisions?

3. How can social media and group work activities facilitate the socializing of students into a Discourse and help them transcend Discourse collisions?

5. THE EMPIRICAL SETTING

This section commences with a brief overview of Rhodes University as the specific HE context where I employed Gee's (2008) theory in my teaching practices. Rhodes University is a well-

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

671

managed research intensive university (Centre for Higher Education Transformation, 2010; Van Der Schyff and Krauss, 2014) in Grahamstown in the Eastern Cape province of South Africa. The Eastern Cape Province, however, is one of the poorest provinces in the country, with some of the lowest success rates nationally, in primary education (South African Department of Basic Education, 2013; Statistics South Africa, 2012). A large proportion of the people in the Eastern Cape are traditional Xhosa (Nkula and Krauss, 2014). Other languages spoken are English and Afrikaans. Rhodes University, in contrast with other educational settings in the Eastern Cape, has one of the best pass and undergraduate graduation rates in South Africa (Badat, 2013). Almost 65% of undergraduate students live in residences. Although Rhodes is the smallest university in South Africa, with approximately 7600 students, it is responsible for 65% of Grahamstown's GDP (Badat, 2013).

Demographics for the major population groups at Rhodes are interesting; 29% are postgraduate students, 59% female, 20% international, 80% South African, 57% Black (many of them, middle-class), 40% Black South African, and 65% of the new intake are black students (Badat, 2013). Rhodes has one of the highest rates of middle-class students, compared to other South African universities. The academic culture at Rhodes in particular is biased towards a white, elite, English-speaking middle-class worldview (Quinn and Boughey, 2009). Academic and senior and middle administrative and support staff are predominantly white (Badat, 2013). Academic staff at the Department of IS in particular is predominantly a group of white English-speaking male individuals. Our advisory board that consists of leading people and organisations involved with Information Systems is also predominantly a group of white English-speaking men.

The empirical setting constitutes a six-week IS module, named "IS Theory", that I teach in the final semester of the undergraduate IS major at Rhodes. For this study, I employed Gee's (2008) theory of Discourse as a way of being, as a critical lens to inform my teaching practices in this module. The aim of the IS Theory module is to introduce the IS student to the value and purpose of theory and using theories in IS. It thus puts IS in its broader context. A secondary purpose is to prepare students for possible postgraduate studies. Five topic areas are covered;

1. An introduction to the nature of theory in IS.

2. Putting IS in the greater context of business and business strategy (IS Strategy)

3. The Soft Systems Methodology (SSM) – an approach to understanding the problem situation in System Analysis and Design

4. User-Centeredness and different paradigms in Systems Analysis and Design (UCD)

5. The socio-political questions of IS and IS management (IS and Power)

The second semester where the IS Theory module is offered, is also a time where students are deeply involved in a practical systems development group work project. Typically, during this time, students become quite well acculturated into the Discourse of IS and the type of systematic thinking needed for what they do at undergraduate level. Many of them are either seeking jobs in industry or getting themselves ready for doing an honors degree the year following. The IS Theory module is typically introduced in mid-September when the fourth term starts. 90 students participated in this module in 2014.

The IS Theory module is unconventional, in that it does not focus on traditional IS and Systems Analysis and Design thinking and practice, but rather takes thinking to higher level. In the module I try to put IS in different types of contexts. So essentially, my approach to knowledge is about nurturing students into criticality and bringing in elements of historicity, hermeneutics of suspicion (Klein and Myers, 1999), challenging the status quo, non-performative intent, critique of technological determinism, and seeking emancipatory practices. This approach to IS teaching

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

672

is informed by earlier ethnographic work of mine (Krauss, 2012, 2013) and especially Howcroft and Trauth's (2005) five key themes or foci for shaping a critical epistemology in IS research.

Following Gee's (2008) guidance, I make explicit and overt a number of "IS Theory" Discourse principles, i.e. the assumptions, values, and culture of the particular Discourse I introduce with the module. This happens through learning (teaching) (both through written and lecture conversations) and through modeling or demonstrations, i.e. initiating the facilitation of acquisition. Gee (2008) notes the limitations of learning (as opposed to acquisition) and using words to explain the rules of the game, but also shows the value of reflective awareness that can come through teaching. In the first lecture, therefore, I primarily focus on two things, which I repeat, reemphasize, and demonstrate in follow-up lectures: firstly, focusing on *learning*, I teach on the meaning of reflexivity, I make overt the idea of IS Theory as a Discourse that needs to be acculturated into, that it comes with its own difficulties and collisions with home-based Discourses and other conventional Discourses in IS, and that IS Theory by nature is a Discourse which values the challenging of Discourses and the making overt and explicit different Discourses in IS practices. The following excerpt from the IS Theory study guide partly demonstrates how I make the principles of the Discourse overt:

> *"Reflexivity implies that meanings are made, rather than found. The readings, the reader (the student), and his/her peers (the group) are not separated, but reflexively interdependent and interconnected (Mauthner & Doucet, 2003), and they inform each other. Other ways of reading papers may infer that the student is absent or neutral from readings and teaching (Mauthner & Doucet, 2003), i.e. the student is simply a receiver of knowledge. This is something to be challenged through reflexivity.*
>
> *In this course we give students 'permission' to challenge knowledge by allowing them to also bring in their own views and perspectives, and theory from other contexts and readings (Mauthner & Doucet, 2003). Each reading or discourse has an agenda – it is not neutral. This is exposed and challenged through reflexivity. There is a difference between simply regurgitating what a reading says and being open about what you (i.e. you, your background, context, and other readings you read) bring into your interpretation of what you read. "*

In order to facilitate the making overt of Discourse and Discourse collisions, three critical cross field outcomes are incorporated in the study guide:

- *Learn about the value of reflexivity for learning*

- *Challenge dominant interpretations of IS phenomena*

- *Acquire "permission" to challenge and reflect about their Discourses and dominant Discourses in IS*

To facilitate *acquiring* of the IS Theory Discourse, I show demonstrations of the type of engagements that I, as "Discourse originator" expect from students. This acquiring aspect of the module happens by means of critical conversations (demonstrations) during lecturing and through a Facebook page. Students groups are also required to prepare presentation videos based on readings and case studies assigned to their groups, and then post their presentation videos on the IS Theory Facebook page. The purpose of uploading presentation videos to Facebook is to allow students to engage online with topic content before and during lectures. Pre-lecture preparation (i.e. reading, preparing presentations, and participating in discussions online) is therefore critical to the success of this module.

Presentation videos are based on reflexive questions on particular theories and case studies to which theories can be applied. Lecture time is then used primarily to reflect on presentation videos and the various topic areas. The Facebook page is therefore used as an online, in-class teaching support tool. For example, three student groups had to watch a YouTube video by Peter

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

673

Checkland on the origins of SSM (Checkland, 2012). They then had to "apply" his SSM principles to a case study on Requirements Engineering. Three reflective questions and grading descriptors (Table 1 shows the grading descriptors for a distinction) were used to guide the creation of the video presentations. This, however, only took care of the *learning* aspect of Discourse. The *acquisition* aspect took place as students created and posted presentation videos and as I responded to the videos and their responses to each other's videos on the Facebook page.

A: Distinction 75 – 100%

Reflection and application

- Evidence of comprehensive and deep understanding of the topic area
- Evidence of deep reflexive engagement with the topic readings
- Evidence of engaging reflexive analysis of case studies, where the students show application of conceptual frameworks and/or theory

Presentation

- Creative and entertaining video/ presentation, with a personal (or group) touch
- A message that engenders reflection in its viewers/listeners, i.e. you succeeded in making others think and reflect

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Table 1. Grading Descriptors for a Distinction, an example

In addition to video postings and responses to video postings, I also gave students a number of activities to do in the online space. For example, toward the end of the module I asked student groups to come up with any examination question that they think is relevant to the IS Theory module, and post it on the Facebook page. In their suggested question, they had to argue why the question is relevant to the module and then provide marking guidelines or a model answers. Knowledge of course outcomes, reflexive thinking, course content, and the type of engagement needed, to acquire the Discourse of IS Theory, were used as self-assessment criteria. This making explicit of grading and assessment criteria had the added benefit of making transparent assessment and ensuring constructive alignment between course outcomes, content knowledge, and assessment. Each question that was posted, gave me an opportunity to respond on its relevance to the Discourse and alignment with course outcomes. In this process students were acculturated into reflexive thinking.

Space in this paper does not allow me to go into detail in terms of the data that this study generated, the details of how I applied the methodology of participant observation, and some of the ethnographic methods I applied to make sense of my teaching encounters. What I can highlight though and what space allows, is that critical reflexivity played a key part in my methodology, both reflecting after engagements with students and during engagements with students. Data in the end took various forms. On the Facebook page I had access to video postings, responses from students, proposed questions from students, informal questions about course content, and my own and peer feedback on videos and questions.

In addition, group conversations with a total of eleven students were done towards the end of the module. In these group conversations I explicitly used Gee's (2008) theory to guide the conversations, i.e. asking questions around their transitions into the Discourse of HE, difficulties and conflicts they experienced, how the Facebook page and video presentations helped with learning and acquisition, and how much freedom and permission they felt they had to challenge Discourses. After each lecture I spent some time writing field notes on key reflexivity moments that occurred during the lecture. These reflections formed a further source of data. After the final examinations, course evaluations were done. In the end, though, I can argue that to a certain degree I lived the data for a while (Whyte, 1996) as I became intrinsically part in the teaching situation with a specific role to play in it. The focus of the paper, therefore, is primarily on the

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

674

experiences of students, but I do not exclude that my own experiences played an important part in the process. The entire data corpus now needs further analyses and follow-up work.

A number of emergent themes, especially those that stood out during my becoming-immersed-in-the-data can be highlighted. I will briefly highlight two aspects in the next section. The first relates to Discourse and Discourse collisions in the particular type of HE situation I encountered. The second aspect deals with how social media (Facebook and the particular approach I employed) assisted students in acquiring the Discourse of the IS Theory module and negotiating potential Discourse collisions.

4. DISCUSSION

Discourse collisions do exist in the teaching situation I described. However, the students that I engaged with are at a specific place in their academic careers and have mastered with varying degrees the Discourse of IS and HE. Some of them, especially Black students have acquired the Discourse of HE as a secondary Discourse. My observation is that they are in many ways bi-discoursal people; "people who have or are mastering two contesting or conflicting Discourses" (Gee, 2008:167), and according to Gee (2008), agents of change. They call themselves "born frees", i.e. born after apartheid was abolished. And although they mastered the Discourse of IS and HE, they are still in contact with many traditional people from their home-based communities. They understand the struggles of making the transition into HE and the value conflicts they have to deal with. For example, some of them noted that in their home-based Discourse it is disrespectful to oppose or question elders in the community. In the HE Discourse, however, they understand the need to ask questions and critically engage with lecturers. They experience minimal internal conflict. I felt that they embraced the notion and values of the Discourse of IS Theory and they are often frustrated with lecturing staff who are not willing or able to allow them to question and critique the status quo. Most of them noted that the IS Theory Discourse was refreshing. In the course evaluations, which I did *after* the final examination, I asked: "*How much permission (freedom) do you feel you had to challenge knowledge and perspectives?*" These were some of the responses:

> "*The self-study aspect made me come up with my own ideas and notions based upon my realities which at times deviated from the theory because the theory is Eurocentric. I had to now take that thinking and methodology and apply it to my African realities of which there are many. SSM, TAM and the 4 paradigms helped me become cognisant of the perspectives of rural and urban, poor and middle class Black Africans towards technology and how and why they differ between Africans and from the Western norms*"

> "*The permission was adequate and this made the course even more worthwhile, the feeling that you contributed your views and as long as you can justify yourself is an important thing for all people as it puts you in a position of feeling important and that your opinion actually counts.*"

Surviving the HE situation (see Case 2008; Kress, 2011), however, remained a priority, as one can see from the following response to the same question:

> "*I believe we had all the permission to challenge knowledge and perspective but needed to keep the overall view of passing at the end of the day*"

> "*freedom was given but still hard to do*"

Also, during the interviews a theme that was mentioned by almost all the student groups is that their primary aim is to learn how the lecturer thinks so that they can give the right answers in the exams. The debilitating role of high-stakes testing and limitations of learning (as opposed to acquisition) is foregrounded here (Gee, 2008; Kress, 2011). In fact, the HE system and how it manifests, makes it very difficult to incorporate any form of Discourse acquisition.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

675

Permission to challenge and freedom to grow is relative. There was a distinct moment in one of my lectures where a student subconsciously wanted to find out "how much" permission he had to challenge things. We were discussing user-centeredness and Burrell and Morgan's (1979) (cited in Zhang et al., 2005) four paradigms or fundamental sets of assumptions to information systems development approaches. The following was what I wrote in my field notes after that encounter:

> "*A student asked whether if his answer, Neohumanism, is ok, because someone in power could prescribe (or force) prescriptions/method onto people (I think it was because my earlier discussions about power and rationality and the role that power plays in dominating others' lives in terms of forcing them to be rational in a specific way, i.e. others' perspectives on rationality have been socially shaped), even though I [the lecturer] say it is in the functionalism paradigm. I explained that from the actual theory in Slide 16, one can argue that it is functionalism, because it is about 'prescribed methods' and 'prescriptions' especially if you don't bring in potential contextual understanding and that that is MY reflexive interpretation. BUT if he argues differently, giving his own contextual interpretation, it is better because he demonstrates reflexivity. I felt afterwards that he was subconsciously wanting to find out 'how much' permission I'm giving them to challenge things.*" [Field notes: 3 October 2014]

This reflective moment affected much of my way forward in the course. It is also an example of how I reflected *in* the situation. Reflecting *after* that lecture, I wrote the following in my field notes:

> "*I think I've succeeded in giving students permission to reflectively challenge the status quo and the Discourses they come from. What I attempted today and other times is to make explicit the principles from Gee: i.e. giving students permission to challenge their Discourses, and highlighting (making explicit) worldviews, values and perspectives. Part of this process is to constantly refer them to the meaning of reflexivity (which I covered in the first lecture), i.e. meaning making in context and how their own perspectives are valued by me. I believe it took them a while to realize that I'm serious about them challenging things. My feeling is that people say [they are] critical, but still education is about staying within the limits that the educator allows, which is contradictory. I suspect that lecturers generally don't know how to deal with unexpected disagreements, and for students to succeed they need to 'conform' to the lecturer's Discourse and level of understanding. This translates into a situation where learning is simply about finding out what the lecturer will allow in terms of thinking and then repeating/regurgitating that. However, in IS theory, I attempted criticality in the sense that I want to allow students to challenge, not just telling them so [i.e. learning], but also demonstrating to them and then responding affirmatively when they do so [i.e. acquisition]. One way I noted (gathering mostly from the cues and responses in class) is when I said that they must give me a question that they feel addresses the IS theory module and then tell me why they says so. I felt that it liberated them in a way.*" [Fieldnotes: 3 October 2014]

What emerged from preliminary analysis of interviews is that some lecturing staff, regardless of what the public Discourse of HE is or should be, still maintain a power-distance in the teaching situation. This makes it difficult for most students to ask questions, oppose, or challenge. I got the sense that much of the growth and transformation that is needed in HE need to occur *within* lecturers who are either oblivious of the home-based Discourses their students come from, totally ignorant with regard to Discourse collisions, or simply culturally entrapped in their own primary Discourse, unable to see, hear, perceive differently. Since they are in positions of power and in comfort zones, the tenacity to escape from this entrapment is simply not there. Self-transformation of lecturing staff should therefore precede HE transformation; self-emancipation is a precursor for the emancipation of the student (Krauss and Turpin, 2013).

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

676

The majority Discourse of HE consumes minority Discourses. Like Gee (2008) explains, students become acculturated into "better" forms of being than their own originating kind. A middle-class, English speaking, elitist, worldview becomes the norm. HE becomes an acculturation process where students participating, acquire entry into a middle-class worldview. One black student hinted towards this when she noted that when she engages with other black students who have a strong African accent to their English, they rather avoid them. In this sense that I felt that unchallenged HE Discourses consumes sidelined and home-based Discourses to the point where the dominated join the ranks of the oppressors (Kress, 2011).

Students who mastered the Discourse of HE and the discipline, battle to create and innovate with the knowledge traditions of their secondary Discourses, and thus do not "achieve" adequately. In explaining a similar dynamic, Gee (2008) refers to those who have minimal conflict with the other Discourses they use, as students with sufficient educational preparation. The following response to the same course evaluation question mentioned earlier reflects some of this:

> *"I had a moderate amount of freedom to challenge perspectives as in the end of the day all of us students are at the mercy of the lecturer's prejudice, he in the end has the means and the knowledge to teach us concepts that we yet to know. To challenge a lecturer with no background knowledge of your own, whether theoretical or based on experience is a difficult task."*

In order to explain this, I borrow some of Bourdieu's (1977) critical concepts. Bourdieu uses language to illustrate the difference between objectivist and subjectivist knowledge of social phenomena. Objectivist knowledge is portrayed as being able to model and decode language, when it has gone through the full cycle of time. I.e. the message has been concluded, the receiver and sender are known, and the context is known. Subjectivist knowledge is obtained when one has developed a feel for the language beyond decoding and translation, to being able to create with it, to come up with new words and expressions understandable by others who can also feel the language. The speaking subject – the person feeling the language – has the power of innovation and the power of adaptation, to construct language in constant changing situations and to contextualise language and acknowledge its use in a "socially structured interaction" (Bourdieu, 1977: 25). This explains one of the problems of students coming from minority Discourses who are expected to create and innovate with knowledge from somebody else's Discourse (i.e. someone else's knowledge traditions, values, expectations, criteria, and ways of being). In Bourdieu's view this is not possible if one does not get a sense of the game. Along a similar vein as Gee (2008), Bourdieu (1977) argues that it is not enough to only understand the code of language, but also to innovate with it in the context and in the situation in which it is used. Students therefore need to be given time, permission, and freedom to move beyond only modelling or decoding to a position where they can create and innovate according to a sense of the game. Similarly, to understand the Discourse of HE and the discipline, the student has to get a sense of the game of social interaction and experientially master the education situation so as to be able to create, innovate, and achieve.

The final comment I want to make on Discourses and Discourse collisions in HE is that one can no longer stereotype or generalize in South Africa. At Rhodes specifically, history is now taking us into a place where black students are second-generation or third-generation middle-class students, with sufficient education preparations. Many of them come from an English, elitist, private school upbringing. They are "born frees" and in a few cases little connection exists anymore with other home-based Discourses. It is not anymore only about racial Discourse collisions, but rather about middle-class vs. workers, first-generation students vs. second-generation middle-class students, and so forth. We are dealing with a moving target.

Using social media and group work video presentations the way I did it for this study could be useful to help students engage with course material and initiate acquisition of a Discourse. However, the facilitating technology can never be considered in a deterministic manner. The

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

677

approach fitted into a broader teaching situation (a Discourse), where 1) course outcomes and assessment criteria were aligned, transparent, and made overt, 2) the principles and values of the Discourse of IS Theory as a Discourse that aims to engender critical reflexivity and challenge and transcend Discourses and Discourse collisions in IS, were made explicit and overt, 3) criticality was demonstrated, and 4) freedom to grow and permission to challenge was granted as far as possible. Using presentation videos, as opposed to simply lecturing the course material, nurtured students into a place where they had to read and engage reflectively with course material in order to produce the videos. Posting of group work in a "public" place, furthermore, created opportunities for peer-learning and positive social pressure with the purpose of supporting socializing into a Discourse – students knew that their videos would be watched by others and in the lecture venue and therefore, they didn't want to look bad.

In the course evaluation I asked: "*In your view, how did the way in which the course was presented and structured (i.e. using readings, group video presentations, Facebook postings, lecturer summaries, etc.) help you learn and develop as a person?*" These were some of the responses on the role of using Facebook and group work video presentations in the acquisition of the IS Theory Discourse – student responses are amazingly self-explanatory:

> "*It helped me try to learn in different ways and understand that there is no one way of learning. It's very easy to forget that when you're busy trying to get the required mark. It also helped me realise that I don't need the classroom to learn. Experience is a much better teacher.*"

> "*Being put in group with people who have already bonded was quite scary as i felt like i wasn't gonna fit but it turned out to be good as i learnt more from them and also gave them my all*"

> "*It was easier for me to understand when i was listening to the videos.*"

> "*The videos where interactive and got me involved*"

> "*It was very useful especially with the limited amount of lecture time. the videos helped engage with the readings and allowed us to express our own views on the readings and then get different perspectives from other people's videos.*"

> "*It introduced a new method of teaching, where students can actually interact with the course material and not have it spoon fed to us. It allows us to buy in as to what the course is about and not just to depend on the lecturer's knowledge.*"

> "*At first when I found out that we have a module called IS theory, I was a bit put off because there are so many ways that theoretical courses can go wrong. The hands on approach where the work was presented on a different platform i.e Facebook, was in my opinion, brilliant. What I found even more brilliant was the presentations that we had to make, they were a perfect incentive or motivation to get us to engage with the work and I believe what also contributed to this brilliance is the fact that all of the learning outcomes were specified beforehand so as to prepare our brains on what exactly to expect to learn while engaging with the work.*"

6. CONCLUSIONS

In the paper's introduction I argued that research on HE teaching and learning situations should move beyond viewing students as decontextualized and dehumanized beings. Reflecting on the South African HE context and the cross-worldview dynamics of our country's HE context, and Rhodes University specifically, I highlighted that even after 20 years of democracy, the dominant Discourse of HE is still biased towards a white, English-speaking, elitist worldview. I showed that for students coming from marginalized Discourses, participation in HE implies conflict and cultural oppression. I concluded, supported by others, that a sociological and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

678

cultural perspective is necessary to adequately understand teaching and learning practices in South African HE.

I employed Gee's (2008) sociolinguistic theory on Discourse as a way of being in HE as a critical lens to inform my teaching practices and to reflect on the social dynamics of presenting a six-week module in the final semester of the undergraduate IS major at Rhodes University. Three research questions were put forward:

1. How do Discourses and Discourse collisions manifest in the teaching of an undergraduate IS module at Rhodes University?

2. Given the context of Rhodes University, how should teaching an IS undergraduate module facilitate the initiation of adequate acquisition of HE Discourses and the transcending of Discourse collisions?

3. How can social media and group work activities facilitate the socializing of students into a Discourse and help them transcend Discourse collisions?

In my discussions of the teaching situation, I showed how I attempted an adequate balance between learning and acquisition. I showed how I made overt and explicit the principles and values of the Discourse of which I was the originator (i.e. learning). I also showed how the group work and the creating of presentation videos facilitated students' immersions and socializing (acculturation) into the Discourse of critique and contextualizing (i.e. acquisition). I reflected on some of my emerging understandings of Discourse collisions as they manifested at Rhodes University, and in my teaching encounters.

Further work is necessary in this area, because I only reflect on some of the preliminary themes as they emerged from the empirical situation and my use of Gee's (2008) theory of Discourse as a way of being.

4. REFERENCES

Badat, S. (2013). *Being an Academic at Rhodes University: Scholarly Engagement*. Vice Chancellor presentation at the Academic Orientation Programme, Rhodes University.

Ballard, B. & Clanchy, J. (1988). Literacy in the university: an anthropological approach. In Taylor, G., Ballard, B., Beasley, V., Bock, H., Clanchy, J. & Nightingale, P. (Eds.), *Literacy by Degrees*. Milton Keynes: The Society for Research in Higher Education & Open University Press.

Boughey, C. (2012). The significance of structure, culture and agency in supporting and developing student learning in South African universities. In Dunpath, R. & Vithal, R. (Eds.), *Alternative Access to Higher Education* (pp. 61-87). Cape Town: Pearson.

Boughey, C. (2005). Epistemological Access to the University: An Alternative Perspective. *South African Journal of Higher Education*, 19(3), 638-650.

Boughey, C. (2000). Multiple Metaphors in an Understanding of Academic Literacy. *Teachers and Teaching: theory and practice*, 6(3), 279-290.

Boughey, C. & McKenna, S. (in press). Analysing an audit cycle: a critical realist account. *Studies in Higher Education*.

Boughey, C. & Niven, P. (2012). The emergence of research in the South African Academic Development Movement. *Higher Education Research & Development*, 31(5), 641-653.

Bourdieu, P. (1977). *Outline of a theory of practice*. Cambridge, U.K.: Cambridge University Press.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

679

Brocklesby, J., & Cummings, S. (1996). Foucault plays Habermas: An alternative philosophical underpinning for critical systems thinking. *Journal of the Operational Research Society*, 47(6), 741-754.

Case, J.M. (2008). Alienation and Engagement: Development of an Alternative Theoretical Framework for Understanding Student Learning. *Higher Education*, 55(3), 321-332.

Čečez-Kecmanović, D., (2001). Critical information systems research: a Habermasian approach. In Smithson, S., Gricar, J., Podlogar, M. & Avgerinou, S. (Eds.), *Global co-operation in the new millennium*, *9th European conference on information systems* (pp. 253–262), Bled, Slovenia. 27-29 June.

Centre for Higher Education Transformation. (2010). *Institutional clusters in higher education in South Africa*. Retrieved November 15, 2014 from www.chet.org.za.

Checkland, P. (2012). *Peter Checkland on the origins of SSM*. Online video available at https://www.youtube.com/watch?v=XA2i1n-o9L0.

Cooper, D., & Subotzky, G. (2001). *The skewed revolution: Trends in South African higher education, 1988-1998*. Education Policy Unit, University of the Western Cape.

Diouf, W., Sheckley, B. G., & Kehrhahn, M. (2000). Adult learning in a non-Western context: The influence of culture in a Senegalese farming village. *Adult Education Quarterly*, 51(1), 32-44.

Foucault, M. (1977). *Discipline and Punish: The Birth of the Prison*. London: Penguin.

Gamble, J. (2006). What kind of knowledge for the vocational curriculum? In Mjelde, L. & Daly, R. (Eds.), *Working knowledge in a globalizing world: from work to learning, from learning to work* (pp. 61-68). Bern: Peter Lang Press.

Gee, J.P. (2008). *Social Linguistics and Literacies: Ideology in Discourses*. Taylor and Francis, Kindle Edition.

Gee, J.P. (1999). The Future of the Social Turn: Social Minds and the New Capitalism. *Research on Language and Social Interaction*, 32(1&2), 61–68

Hammersley, M. (1992). *What's wrong with ethnography?: methodological explorations*. London: Routledge.

Howcroft, D. & Trauth, E.M. (2005). Choosing critical IS research. In Howcroft, D. & Trauth, E.M. (Eds.), *Handbook of critical information systems research: theory and application* (pp. 1-15). Northampton, Mass.: Edward Elgar Publishing Limited.

Klein, H.K. & Myers, M.D. (1999). A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly*, 23(1), 67-88.

Krauss, K. (2013). Collisions between the worldviews of international ICT policy makers and a deep rural community in South Africa: assumptions, interpretation, implementation, and reality. *Journal of Information Technology for Development*, 19(4), 296-318.

Krauss, K. (2012). Towards Self-Emancipation in ICT for Development Research: Narratives about Respect, Traditional Leadership and Building Networks of Friendships in Rural South Africa. *The African Journal of Information Systems*, 4(2), 46-60.

Krauss, K. & Turpin, M. (2013). The emancipation of the researcher as part of Information and Communication Technology for Development work in deeply rural South Africa. *The Electronic Journal of Information Systems in Developing Countries*, 59(2), 1-21.

Kress, T.M. (2011). *Critical Praxis Research: breathing new life into Research Methods for Teachers*. New York: Springer.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

680

Mabokela, R.O. (2002). *Voices of Conflict: Desegregating South African Universities*. London & New York: Routledge Falmer.

Mauthner, N.S. & Doucet, A. (2003). Reflexive Accounts and Accounts of Reflexivity in Qualitative Data Analysis. *Sociology*, 37(3), 413-431.

MacFarlane, D. (2013). Damning CHE report into university performance. Mail and Guardian, 20 August, [online] Available at: http://mg.co.za/article/2013-08-20-damning-che-report-into-university-performance [Accessed 27 February 2015].

Merriam, S.B. & Ntseane, G. (2008). Transformational Learning in Botswana: How Culture Shapes the Process. *Adult Education Quarterly*, 58(3), 183-197.

Mkabela, Q. (2005). Using Afrocentric method in researching indigenous African culture. *Qualitative Report*, 10(1), 178-189.

Myers, M.D. & Avison, D.E. (2002). An introduction to qualitative research in information systems. In Myers, M.D. & Avison, D.E. (Eds.), *Qualitative research in information systems: a reader* (pp. 3-12). London: Sage Publications.

Myers, M.D. & Klein, H.K. (2011). A Set of Principles for Conducting Critical Research in Information Systems. *MIS Quarterly*, 35(1), 17-36.

Ndebele, N., Badsha, N., Figaji, B., Gevers, W., Pityana, B., & Scott, I. (2013). *A proposal for undergraduate curriculum reform in South Africa: The case for a flexible curriculum structure*. Council on Higher Education (CHE). Pretoria, South Africa.

Ngwenyama, O.K. (1991). The Critical Social Theory Approach to Information Systems: Problems and Challenges. In Nissen, H-E., Klein, H.K., & Hirschheim, R.A. (Eds.), *Information Systems Research: Contemporary Approaches and Emergent Traditions* (pp. 267-280). Amsterdam: NorthHolland

Ngwenyama, O. K., & Lee, A. S. (1997). Communication richness in electronic mail: Critical social theory and the contextuality of meaning. *MIS Quarterly*, 21(2), 145-167.

Nkula, K.Z. & Krauss, K.E.M. (2014). The integration of ICTs in marginalized Eastern Cape Schools: the perceptions of in-service teachers and understanding the role of training. *Proceedings from the 8th International Development Informatics Association Conference* (IDIA2014), Port Elizabeth, South Africa.

Orlikowski, W.J. & Baroudi, J.J., (1991). Studying information technology in organizations: research approaches and assumptions. *Information systems research*, 2(1), 1-28.

Quinn, L. & Boughey, C. (2009). A Case Study of an Institutional Audit: A Social Realist Account. *Quality in Higher Education*, 15(3), 263-278.

Scott, I., Yeld, N. & Hendry, J. (2007). *Higher Education Monitor: A Case for Improving Teaching and Learning in South African Higher Education*. Pretoria, South Africa: The Council on Higher Education.

South African Department of Basic Education. (2013). *Education Statistics in South Africa 2011*. Retrieved November 13, 2014 from www.education.gov.za.

Stahl, B.C. (2008). The ethical nature of critical research in information systems. *Information Systems Journal*, 18, 137–163.

Statistics South Africa. (2012). *Census 2011: Provinces at a glance*. Retrieved November 13, 2014 from www.statssa.gov.za.

Thomas, J. (1993). *Doing critical ethnography*. Newbury Park, Calif.: Sage Publications.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

681

Van Der Schyff, K. & Krauss, K.E.M. (2014). Higher Education Cloud Computing in South Africa: Towards Understanding Trust and Adoption issues. *South African Computer Journal*, 55, 40-55.

Walsham, G. (2005). Learning about being critical. *Information systems journal*, 15(2), 111-117.

Walsham, G. & Sahay, S. (2006). Research on Information Systems for Developing Countries: Current Landscape and Future Prospects. *Information Technology for Development*, 12(1), 7-24.

Whyte, W.F. (1996). On the evolution of street corner society. In Lareau, A. and Shultz, J. (Eds.), *Journeys through ethnography: realistic accounts of fieldwork* (pp. 9-73). Boulder, CO: Westview Press.

Wright, J. L. (2008). *The Role of Discourse in the Constitution of Radiographic Knowledge: A Critical Realist Account*. Doctoral thesis, Rhodes University.

Zhang, P., Carey, J., Te'eni, D. & Tremaine, M. (2005). Integrating Human-Computer Interaction development into the systems development life cycle: a methodology. *Communications of the Association for Information Systems*, 15, 512-543.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

682

OPEN GOVERNMENT FOR PUBLIC SERVICE DELIVERY: CRITICAL ISSUES, EMERGING POSSIBILITIES

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Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

683

THE SIGNIFICANCE OF SOCIOMATERIAL INTRA-ACTIONS IN DESIGNING PUBLIC SERVICE DELIVERY: SERVICING ELECTRONIC LAND RECORDS IN BANGLADESH

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Abstract: Studying information systems (IS) and IS phenomena in public sector organizations in developing countries has remained under explored due to the lack of wider theoretical ideas and rigorous methodologies. Sociomateriality has emerged as just such an umbrella approach and wider theoretical lens. It offers theoretical tools and approaches for studying IS phenomena without any deterministic bias. The concept of 'intra-action' can be seen as one of these tools to help trace dynamic and inseparable relations between organizational contexts and process and technological design and networks. This paper applied the 'intra-action' lens to tracing underlying organizational contexts when designing land records E-services in Bangladesh. Empirical data was gathered and an interventional approach from a public sector organization in Bangladesh was traced. Research findings shows that continuous intra-actions in underlying organizational contexts configure and reconfigure these land records E-services in Bangladesh. Therefore, we argue that tracing continuous intra-actions in organizational contexts and technological networks is significant for designing effective and open public service delivery, helping to remove corruption.

Keywords: Sociomateriality, intra-action; e-service; land records; Bangladesh.

1. INTRODUCTION

Recent innovations in technology and organizations have brought complex, dynamic, distributed, mobile, transient and unprecedented ways of organizing through inter-networked and distributed relationships (Lyytinen & Yoo, 2002). However, it is challenging to interpret the ubiquitous networks between organizations and technology using the existing lens and approaches in IS. Consequently, to address this challenge, IS research has been seeking new approaches, wider theoretical lens and pluralistic methodologies (Barley & Kunda, 2001; Child & McGrath, 2001; Ciborra, 1996; Law & Urry, 2004). At the same time, sociomateriality has emerged as an umbrella approach and offers a wider theoretical lens with a number of tools and approaches for studying dynamic relations in organizations and technology. So far, evidence of applying sociomaterial lens, approaches and tools in organizational contexts are limited. Consequently, sociomateriality is treated as abstract and overly full of jargon (Sutton, 2012). This paper aims to analyze significance of 'intra-action' – an element of sociomateriality that may be used as a lens for designing electronic public service delivery, understanding entanglements and disentanglement in organizational contexts and technology (Barad, 2007; Orlikowski, 2007). To illustrate the significance of sociomateriality in designing public E-service, intra-action has been used as a lens to understand co-constitutive, mutually dependent and inseparable relations in organizations and technology in designing public electronic services (E-services) of land records in Bangladesh. The case illustrates dynamic relations in technology and organizational contexts, allowing the value of intra-action for building better design and so a better world to be established. The theme of this IFIP 9.4 2015 conference is 'Openness in ICT4D', with one of the key elements of Open Developments being 'universal over restricted

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

684

access to communication tools and information' (Loudon & Rivett, 2011). This premise is also reflected in the core rationale for the land records E-services initiative, which is to provide greater access by the citizens, via computer-based technologies.

Sociomateriality aims to understand 'inseparability' 'mutually dependent', 'constitutive entanglement' and 'imbrication' relations in technology and organization (Leonardi, 2012; Orlikowski & Scott, 2008a; Orlikowski & Scott, 2008b). Similarly, Barad (2007) has advocated 'intra-action' as a lens for understanding the inseparability between 'the social' and 'the material'. Thus intra-action has emerged as a potential lens and a useful analytical tool. Barad's (2007) argument is that the social and the material belong to one world and are inseparable. So intra-action offers the ability to trace dynamic and continuous changes in technology and organizations. Therefore, this paper applies an intra-action lens to trace the dynamic, heterogeneous and unpredictable relations between organizational contexts and processes, technological networks, organizational staff, middlemen, intermediaries and citizens. This paper is the outcome of a longitudinal study of electronic E-service of land records within a public sector organization in Bangladesh. The core objective of this paper is to present how the social and the material inseparably intra-act in the context of land records E-service in Bangladesh.

This paper is structured as follows: the first section conceptualizes the intra-action concept, followed by the research methods and data collection. Thereafter, the paper shows how E-service networks are continuously configured and reconfigured with intra-actions between technological networks and organizational contexts. Finally the conclusion provides a discussion of further implications for understanding intra-actions in technology and organizations.

2. LITERATURE REVIEW: TRACING SOCIOMATERIAL INTRA-ACTIONS

Technology and organization relations are neither deterministic nor predictable. Moreover, in the case of public sector organizations these relations are much more volatile because public sector organizations carry inherent thick bureaucratic institutions and practices that are governed by statutes, rules and regulations. For example, Freeman (1991) observed that the network feature of IT is a myth in public sector organizations. This reality is remarkably visible in many developing countries (Mansell, Avgerou, Quah, & Silverstone, 2007). Practices and contexts of public sector organizations in developing countries are highly complex, dynamic and heavily bureaucratic. Thus understanding technology and organizational relations in the public sector in developing countries remains a challenging area in the IS discipline.

Studying IS phenomena in developing countries has remained under explored even though about ¾ of the total world population live in developing countries. In many cases, theorizing IS studies of developing countries was a significant challenge for researchers. However, sociomateriality is a wider lens and suitable for IS studies in developing countries. Practices and contexts in organizations and technology in organizations are vividly present in developing countries because the contexts and processes, organizational structures and technology and behaviors and rules are themselves inseparable. Thus, an understanding that sees technology and organization as two distinct worlds will focus only on interaction and linear relationships between technology and organization. Consequently, a linear understanding of technology and organization gives only a partial picture of technology and organizational relations. Contrary to interaction, intra-action opposes any such separation. Thus, intra-action is a potential lens for the thinkers in IS who don't see any separation between organization and technology. Consequently, intra-action is a vital tool to trace heterogeneous, dynamic, and multi-dimensional relations in organizations and technology.

Sociomateriality is a broad umbrella approach to the social study of technology in which sociotechnical theories have made a significant contribution. Sociotechnical theories focus on human centered inter-actions whereby humans carry out actions with or through technology

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

685

(Introna, 2007). Focusing on human centered interactions failed account inseparable intra-actions in technology and organizations. Consequently, the recent trend of IS research has already moved from 'linear interaction' to 'dynamic interaction' (Jones & Orlikowski, 2007) and 'network' to 'inter-network' (Lyytinen & Yoo, 2002); with a view to capturing the ceaseless relations between technology and organizations. Further, Markus and Robey (1988) posit an 'emergent perspective' for understanding technology and organizations (see Figure 1), in that organizational change emerges though complex and mutual interactions between technological capacities, social contexts and human actions (Jones & Orlikowski, 2007). These attempts have led to 'sociomateriality', which focuses on the inseparability between technology and organizations, the intra-actions between them and how intra-action analysis unveils this ongoing technology and organization network.
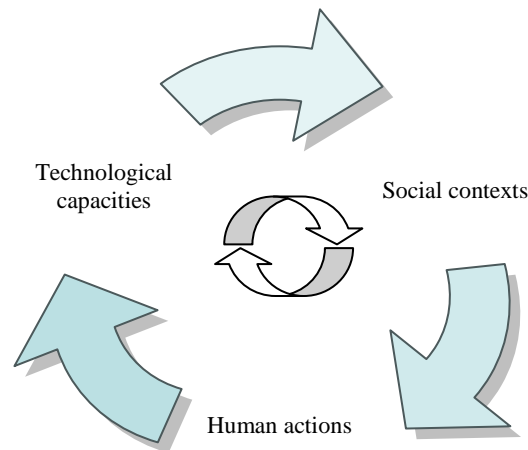

Figure 1. Emergent perspective on technology and organizations (after Markus and Robey, 1998)

This emergent perspective (figure-1) has been advanced through sociomaterial thinking. Barad (2007; 2003), a pioneer proponent of sociomateriality, contributes to sociomaterial thinking through emphasizing on inseparability and intra-actions between the material and the social. As Nyberg (2009, p. 1185) says, "Barad (2003, 2007) prefers the term 'intra-activity' to 'inter-activity', since the roles and meanings of actors are not determined before the enactment: they co-emerge." Barad has developed the notion of intra-action from diffraction analysis, a physical phenomenon. Diffraction can be seen in the behavior of a wave and is commonly used in physics to analyze the movement of light. When a wave encounters an obstruction, a range of things happen, e.g. diffraction takes place through an aperture, or overlaps and bends to show how it spreads. It can also be observed in everyday life, ie. when a stone is dropped in a pond, the ripples in the water overlap. Barad (2007) attempted to take insights from the diffraction phenomena and apply them to understanding intra-actions in the natural and the social world; human and nonhuman; material and discursive practices.

Intra-actions are seen as ongoing co-constitutive intra-relations that engender the ongoing inter-twining of meaningful possibilities (Introna, 2007). A co-constitutive intra-relation is the outcome of intra-actions between humans and technology. Barad (2007 p.179) noted intra-actions cut "things" together and apart. Even the nature of change and nature of possibilities of change have been changing continuously through intra-active dynamism (Barad, 2007). Barad's (2007) views on sociomateriality have been used in information systems (IS) and management research by Orlikowski and colleagues (Orlikowski, 2007; Orlikowski & Scott, 2008b; Orlikowski, 2010). They developed an argument around constitutive entanglement of technology and organization. In this, constitutive entanglement is used to trace ongoing intra-actions between technology and organizations, where intra-action treats technology and organizations equally without any apriori distinctions.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

686

Nyberg (2009, p.1186) identifies that "Barad, on the other hand, starts with 'micro-entanglement' to describe the temporary actors through their situational relation within practices. Barad (2007) thus uses quantum physics to illustrate that there are no clear boundaries between subject/object and object/object." This is then used to illustrate that it is the form of observation that allows the identification of the 'cut' between the entangled objects/systems, using the example of the hand holding a mug and not being clear where one truly finishes and the other truly starts. A similar argument is made here about the boundaries between the emerging 'new' technological systems and existing social and organizational systems.

Intra-actions are causal enactments, not deterministic, as their enhancements take place through 'matter-in-the-process-of-becoming' (Barad, 2007 p.170). Thus ongoing dynamic intra-actions reconfigure possibilities and impossibilities while they also entail particular exclusions (Barad, 2007). Thus, Barad (2007 p. 177) claims, "intra-actions iteratively reconfigure what is possible and what is impossible –possibilities do not sit still". Thus, intra-actions open up possibilities and impossibilities and trace constraints and exclusions. Also, intra-actions are neither causal deterministic nor arbitrary rather they are intra-actively deterministic. Barad (2007) suggested the terms 'vitality' and 'liveliness' relate to intra-actions. Therefore, the notion of intra-actions reformulates the traditional notions of causality through ongoing reconfiguring of possibilities of change (Barad, 2007).

Iterative reconfiguration take place through materiality of human, non-human, cyborg-like or any other forms (Barad, 2007). Consequently, the nature of intra-actions is producing new phenomena among workers, management, technology or other materials while different intra-actions produce different phenomena (Barad, 2007). Therefore, intra-actions configure and reconfigure intra-relations in technology and organizations.

An Electronic Service (E-service) in a public sector organization brings the organization and technology together in a complex process where many actors, roles and practices are involved (Buxton & Malcolm, 1991; Hordon et al., 2001; OECD, 2008). Advancing and widespread use of technology has unveiled advantages of E-services. Particularly in developing countries, land related service is a core and common public service. Development partners and governments have been striving for E-service of land records for the last four decades. Most of the projects on E-service of land records have failed. However, there are also a few successful examples, notably Bhoomi (meaning land), a project in the Karnataka State of India. This project aimed to digitize land records and to deliver service delivery with the help of technology (Prakash & De, 2007). Bhoomi has succeeded through digitizing 20 million land records and entangled the telecentres with the citizens and the land record service. Moreover Bhoomi has also disentangled the staff from citizens.

E-service of land records in Bangladesh is a project which is similar to Bhoomi. However, the entanglements, disentanglements and intra-actions in telecentres, organizational staff, middlemen and citizens are unique and interesting. Therefore, this paper investigates how intra-actions in technology and organization enable the tracing and configuring of the case of E-service networks in land records service delivery in Bangladesh.

3. METHODOLOGY

This paper is derived from a two year long interventional and longitudinal study of land records E-service in Bangladesh. One of the authors is a former practitioner who served in a similar organization for about five years and has gathered empirical evidence of the context where the study has been conducted. The study applied a number of methods, tools and techniques for data collection and analysis. They are mainly participant observation, interviews, focus group discussions, open ended discussions, workshops and organizational process and documents analysis.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

687

For the last two years, the E-service of land records has been observed in a district namely Khulna by the researchers and they intervened in designing and redesigning of this E-service delivery process with the collaboration of the organizational managers. This study has been conducted in a public sector organization –the District Record Room (DRR) –involved in delivering E-service of land records with the help of technological networks and telecentres. A total of 20 interviews were conducted among service recipients, service providers, middlemen and telecentre operators. Two focus group discussions were conducted; one with telecentre operators and the other with middlemen. One consultation workshop and open ended discussion were made with organizational managers, staff, telecentre operators and citizens, the service delivery recipients.

In addition to, the initial findings have been presented and discussed with the practitioners at a national level workshop. Further, the research findings have been gathered and presented in five monthly review meetings and also five consultative and evaluative workshops with organizational staff. Data has been gathered and analyzed thematically with a combination of top down and bottom up approaches. Although the theoretical lens provides themes, field findings has generated themes in different ways than theoretical themes. Thus, thematic codes are derived both from top down and bottom up levels.

4. CONTEXT: ELECTRONIC LAND RECORD SERVICE IN BANGLADESH

E-services and land records in Bangladesh is a complex case. It is inscribed by different types of actors and its context is rooted in distinct traditional and organizational cultures. A brief contextual discussion follows.

Bangladesh is a progressive developing country containing features of over population, high rates of illiteracy and remarkably visible colonial legacies and regulations. The country ranks relatively high on corruption indices. Consequently, its public sector organization carries bureaucratic rigidity, obsolete legal statutes and institutional hierarchy throughout its service delivery processes. Its land records related services were originated during the British colonial regime and these legacies are still strikingly visible in land records related services in Bangladesh. Land records service is guided and regulated by highly bureaucratic organizational processes and obsolete legal statutes. The District Record Room (DRR), a section of a Deputy Commissioner's Office, is responsible for service delivery for land records.

Land records service refers to the delivery of certified copies of land records from cadastre [1] registers preserved at the DRR. It is a is a core service for citizens because land records are required to prove ownership, manage land litigations, determine inheritance, process mortgages and plan for any development activities relating to land. Being an agro based and developing country, the majority of the population in Bangladesh is illiterate and lives in rural areas. Thus, citizens' access to this service is complicated. They need to travel a long way from rural areas to district headquarters. The result is that to mediate this service, there have developed various types of middlemen networks. To address these problems, the incumbent government has designed E-service networks to provide citizens' with easy access to this service. However, with the E-service design, the organizational processes, actors, legal statute and structures have remained the same. Consequently, there have developed different forms of intra-action in the organizational and technological networks, as the pre-existing structures begin to give way to new and emergent structures as the new technologies begin to embed themselves.

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[1] cadastre = 'an official register of the ownership, extent, and value of real property in a given area, used as a basis of taxation' (Random House Webster's College Dictionary)

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

688

5. SOCIOMATERIAL INTRA-ACTIONS IN LAND RECORDS E-SERVICES IN BANGLADESH

With the pre-existing structures, processes, statutes and newly set up E-service networks, there have developed continued forms of intra-actions between citizens, middlemen and DRR staff. In contrast, there have also developed constraints in intra-actions between citizens, E-service networks and DRR land records staff. These are discussed in the following sections.

Intra-actions in Citizens -Middlemen-Staff of Land Records Service

To mediate citizens' access to land records services, many different types of middlemen have developed over many years. The service providing staff and the middlemen are mutually dependent on one another. The middlemen mediate and expedite this service for their clients through giving 'speed money' (bribes for faster services) to the staff. Further, the middlemen have knowledge and skills in filing citizens' applications and mediating and expediting their land records. A high level of illiteracy and land records related jargons pushes citizens towards seeking help from middlemen to submit their applications. Given the complexity of land records processes, and without middlemen, citizens cannot usually access this service. Equally, without middlemen, the DRR staff do not receive 'speed money' from citizens for this service. This is how intra-actions had emerged between citizens-middlemen-the DRR staff. Through these intra-actions the flow of 'speed money' ensures an expedited service delivery. Thus, these intra-actions developed public sufferings, harassment and corruption because the middlemen and the DRR staff have been relying on one another for generating 'speed money' payments from the citizens.

Consequently, the DRR staff provide a faster service only to those applications which come through the middlemen. If citizens enter into this service without middlemen, they receive non-cooperation from the DRR staff and ultimately their application is either delayed or rejected by the DRR staff. Thus, the DRR staff act to make the intra-action between citizens and middlemen. Over time, different types of middlemen have been developed and they have developed different forms of intra-actions with citizens and with the DRR staff. These intra-actions can be broadly categorized into four: i) local middlemen, ii) traditional middlemen, iii) hidden middlemen and iv) informal middlemen (see Figure 2).
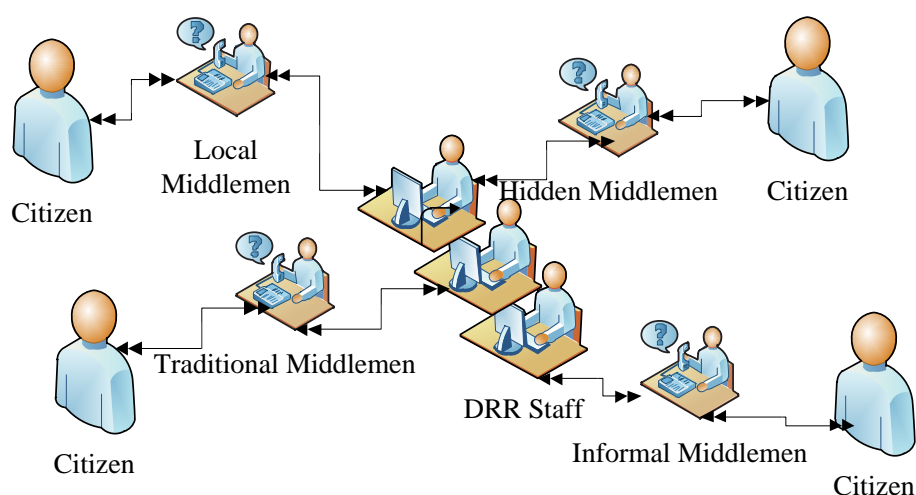
Figure 2. Intra-action between citizens-middlemen-staff

*Citizens-Local Middlemen-Staff Intra-actions***:** *Deed-writers, Muhuris and Mobile Middlemen* are local middlemen who have intra-actions with citizens from their locality, particularly in rural areas. *Deed-writers* are practitioners involved in writing land registration deeds, as land records

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

689

are required for completing land registration deeds. So the local middlemen are involved in mediating this service delivery of their clients and villagers who have started the process of land selling and purchasing. Besides, '*Muhuris'* are assistants to lawyers. Since 90% of land related suits/cases involve land records, they mediate land record service for their clients and local citizens too. Further, *Mobile Middlemen* are newly developed and a hybrid of '*Muhuris'* and 'Deed-writers'. They mediate service delivery, intra-acting with the staff through using mobile phone. The DRR staff receive information from this type of middlemen by mobile phone and submit applications and process applications on behalf of them. Thus, a large numbers of citizens' intra-act with the local middlemen to avoid complex processes and travel costs. Consequently, the middlemen intra-act with DRR staff through their professional involvements and the DRR staff intra-act with the middlemen for the 'speed money'.

Citizens-Traditional Middlemen- Staff Intra-actions: Stamp-vendors, *Court-muhuris* and 'floating middlemen' are traditional middlemen. They have been involved in this profession for long time and they take it as a profession. Stamp-vendors are licensed to sell revenue stamps that are required to pay fees for this service delivery. *Court-muhuris* are a section of *muhuris* who are licensed lawyers' assistants but work full-time to mediate this service delivery. 'Floating middlemen' are either connected with political networks or with DRR staff. They work around the DRR and run after clients (citizens who come to the DRR to receive land records) promising offers of mediation and expediting this service. Surprisingly, they have close intra-actions with the DRR staff and they are highly efficient. They are capable enough and they have mechanisms to expedite this service. For example, if any record is damaged at the DRR, they know how to reproduce it either legally or fraudulently. Some of the traditional middlemen also voluntarily helped the DRR staff. Thus, they have strong intra-active networks with DRR staff. Similarly, they also work as the last resort to deliver this service either legally or fraudulently.

Citizens-Hidden Middlemen- Staff Intra-actions: There are some land related other offices in the district, Upzilla and local Union Council levels. Also, there are land related sections in the Deputy Commissioner's office. The staff of these offices and sections work as 'hidden middlemen' in land records service. Clients of these offices and sections require land records. Since it is a complicated matter, they rely on the staff of these offices and sections. On behalf of their clients, the staff of land related offices and sections process and expedite this service. They are not easily visible and they intra-act with citizens and DRR staff from organizational hidden networks.

Citizens-Informal Middlemen-DRR Staff Intra-actions: Volunteer workers of DRR (*Umidar*), lawyers, journalists and political activists are the actors in informal middlemen network. They are occasional middlemen. They work as middlemen only for their relatives and closely connected groups of people. They use their identity to mediate and expedite this service delivery. The DRR staff are also loyal to them because actors of these network belong to or are connected to the powerful sections of the society. Besides, *Umidar* are unpaid volunteers at DRR and they mediate vested interests between the traditional middlemen networks and the DRR staff. Sometimes they also have their own clients.

The E-service aims to improve direct access and remove the various forms of middlemen networks which mediate this service from the DRR to the citizens. Thus the organizational contexts of land related sections and offices are rooted in developing and sustaining citizens-informal middlemen-DRR staff intra-actions in this service.

Constraints of Intra-actions in Citizens-E-service networks- DRR Staff

Aiming to ensure citizens' easier access to land records services, there are three access points - Union Information Service Centre (UISC), District Web Portal (DWP) and District E-service Center (DESC) (Figure 3). However, these access points were not capable of removing the middlemen networks. Further, the middlemen networks have become constraints to the

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

690

development of intra-active networks in citizens and the DRR staff. Rather, intra-actions in the middlemen and the DRR staff reconfigure the E-service networks. Moreover, the middlemen intra-act with E-service networks to expedite this service instead of UISC (telecentre) or citizens.

Constraints in Citizens-UISC-DRR staff intra-actions

UISC is a country wide telecentre network and the citizens' closest access point to receive land records service, but it has no intra-actions with the DRR staff who are ultimately responsible for processing this service. Citizens can submit their applications to the DRR through the UISCs. However, from a practical standpoint, every application requires adhesive stamps as fees along with a printed copy of the online submitted application. So, after submitting an application electronically from a UISC, the citizens needs to print it and send it to the E-service Center (ESC) along with the appropriate fees. In addition, there is the core problem of 'speed money', because the DRR staff do not receive extra fees, such as 'speed money', other than from the middlemen networks. Thus without 'speed money' citizens' applications rarely receive much attention from the DRR staff. Rather, the service delivery of these applications are delayed and lost.

Although citizens have the option to submit applications to the DRR and receive land records from the DRR through the UISCs network (see Figure 3), the existing organizational processes have not been redesigned. There are at least two steps, via the ESC and RRDC, before the citizens' application reaches the DRR staff. Thus the existing organizational processes and presence of various middlemen networks have become constraints in citizens-E-service-DRR staff intra-actions.
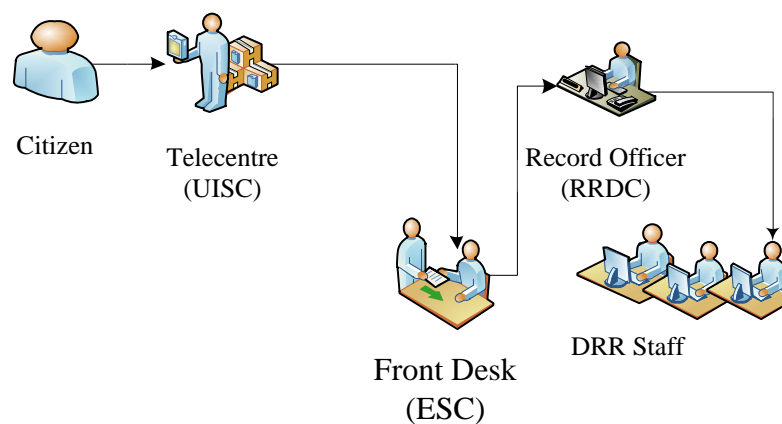
Figure 3. Citizens' interaction with the DDR through the telecenters (UISC)

Consequently, the UISC network failed to intra-act with the organizational processes and the DRR staff, merely interact. Thus the UISC-citizens-DRR staff rarely intra-act and bring any change to the organizational context.

Constraints in Citizens- DWP- DRR staff intra-actions

The District Web Portal (DWP) has been designed as an access point to enable citizens' easier access to the service (see Fig. 4). Similar to the UISC, citizens can submit their applications from the DWP to the DRR at any time. Although technologically it is possible, practically there is no option of submitting fees and other requirements through the DWP.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

691
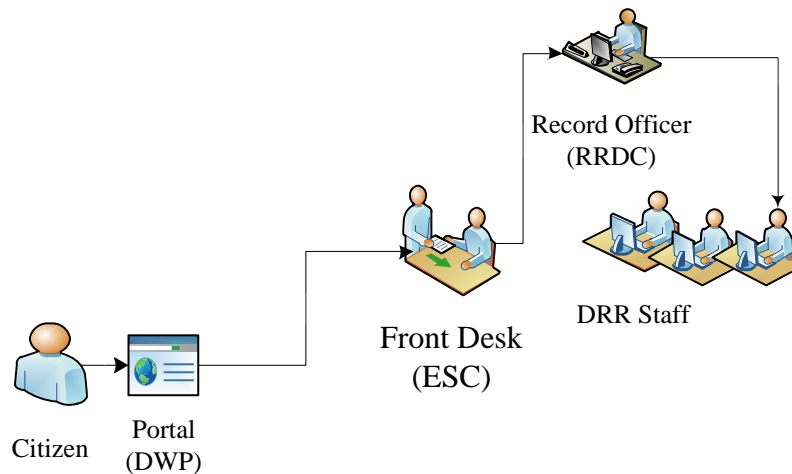
Figure 4. Citizens-DWP networks

In addition, the low literacy and electronic literacy rates, limited connectivity and lack of accessibility to computers and internet are constraints. Consequently DWP - citizens- DRR staff has remained only a technological network, because this access point has been rarely used by citizens. Therefore, the E-service has failed to create intra-action in citizens-DWP- DRR staff.

Constraints in Citizens- Front Desk (E-service Center)- DRR staff intra-actions

The E-service center (ESC) has been designed for citizens' to access this service from district headquarters. Citizens have the option to submit their applications from the ESC to the DRR (see Fig. 5). Usually, the ESC route is preferable for the citizens who come to the district headquarters for this service.
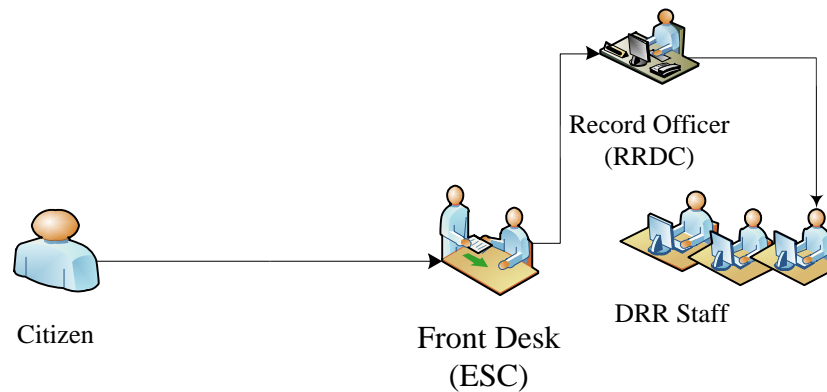
Figure 5. Citizens-ESC networks

Although citizens can submit their applications to DRR through the ESC, they prefer to use middlemen to submit their applications at the ESC and mediate with the DRR. Citizens still need to submit their applications through the paper based application format at the ESC. However, it is difficult for citizens to fill in the paper based applications format. Further, applications submitted this way do not guarantee service delivery from the DRR. Thus, citizens need to rely on middlemen to mediate their service. Therefore, intra-actions does not take place between citizens- ESC- DRR staff, rather intra-action takes place in citizens-middlemen-ESC-DRR staff.

Underlying Intra-active Contexts in the E-service of Land Records

The E-service networks have been designed with a view to creating multiple access points for easy access to this service and to remove middlemen. However, the E-service networks have merely focused on the underlying contexts, processes and practices and their interactions. Consequently, they have failed to remove the middlemen. Rather, the middlemen networks intra-

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

692

act with E-service access points through existing organizational processes and contexts. The middlemen networks expedite this service delivery through 'speed money'. Since, the DRR staff have not received speed money from any other access points or networks. Thus, the middlemen networks and the DRR staff have developed intra-actions with the E-service process.

With the E-service networks, the middlemen have emerged in the process citizens' applications submission at the ESC (see Fig. 6). While citizens come to submit applications to the ESC; they enter into this service through middlemen and intra-act with the middlemen instead of UISC or DWP. Therefore, the E-service networks intra-act with the existing processes i.e., are middlemen dependent. Citizens needs to intra-act with middlemen; middlemen intra-act with DRR staff and DRR staff intra-act with organizational processes.
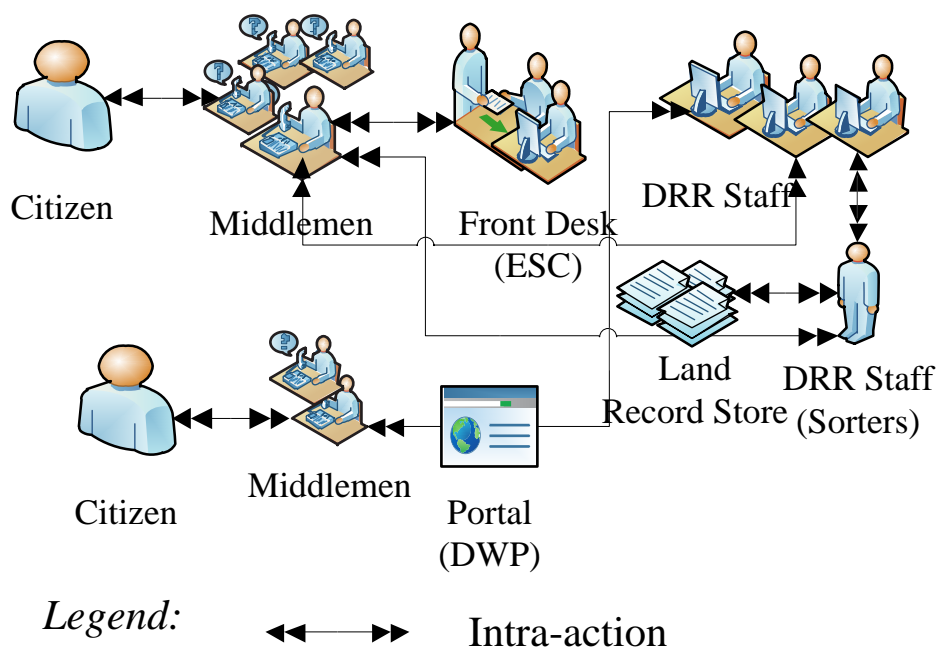
Figure 6. Intra-actions between citizens-middlemen-IT-staff

Underlying Contexts of Citizens-Middlemen Intra-actions

There are two main underlying contexts for citizens' intra-actions with the middlemen. Firstly, this is a complex service delivery process and the service providing staff try to make it more complex in order to seek 'speed money' for this service. Even for the educated citizens, it is difficult to understand the processes because it uses much legal jargon and complex application forms. Secondly, the low literacy rate and limited internet connectivity are strikingly visible as features of a developing country.

Filling in application forms for land records is complicated and contains much jargon. Even literate people avoid writing or filling in applications for land records. Similarly, calculating fees and folio papers for land records are not easily understandable by citizens. Thus citizens are compelled to intra-act (engage) with middlemen to submit and mediate their applications. After submitting an application to the ESC, the middlemen intra-act with the DRR staff to expedite their clients' applications.

Underlying Contexts in Middlemen-ESC Intra-actions

The ESC has been designed as a one stop service point and online application submission point for citizens at the district headquarters where there is no telecenter. However, although the ESC is designed for citizens' access to this service from the district headquarters, the middlemen find opportunities in this service. They have reconfigured the original notion of the ESC. Thus ESC

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

693

has become a means of middlemen's intra-action with the citizens and the DRR staff. Since the middlemen are based at the district headquarters close to the ESC, they are used to submitting citizens' applications to the ESC and mediating their clients' applications through interaction with the staff. This is how intra-actions between ESC and middlemen lead to further intra-actions i.e. 'intra-actions between middlemen and citizens' and 'intra-actions between middlemen and staff'. Consequently, these emergent intra-actions reconfigure the E-service network.

Underlying Contexts in Middlemen –DWP Intra-actions

Although District Web Portal (DWP) has been designed as an access point for this E-service, using the DWP for citizens is unrealistic because the country has very low Internet connectivity (only 3.5/1000 people are connected to the Internet). As a result, this access point has also been reconfigured by the middlemen. Since the DRR staff have good Internet connection and printing facilities, the middlemen have found this access point as a unique opportunity for submitting online applications for their clients with the help of the DRR staff. Thus, this access point also developed a new and emergent form of middlemen called 'Mobile Middleman' who use their cell/mobile phones to send information to the DRR staff for submitting and processing of their clients' applications. Thus, the DWP has developed new dimensions of intra-actions between the middlemen and the DRR staff. Thus, the intra-actions took place between the middlemen and the DWP instead of intra-actions between citizens and the DWP.

Underlying Contexts of Intra-actions in DRR Staff and Land Records

The DRR staff include land record Sorters, Copyists and the Record Keepers. Sorting staff sort and carry the land record registers from the store to the copyist tables. The Copyists write and compare with original records and the Record Keeper signs as preliminary authentication. The Record Officer (Record Room Deputy Collector –RRDC) finally attests the processed records. Throughout this process the Sorting staff and Copyists are closely involved with the land records registers. Their intra-actions with the land records have significant influence on this service delivery ie. they are able to expedite, delay and reject any application.

The Sorting staff are closely connected with physical land record registers that are preserved at the DRR's store room. They sort and carry records registers from the store to the copyists and after completion of copying the records, they return them to the store room. There are about ten thousand records registers that are stored about three hundred feet away from the copyists' room. However, the registers are not well order or well preserved. Consequently, Sorting staff use their expertise to find the specific records register from the record store and take it to be copied for this service. Without the Sorting staff it is not possible to find any land record registers from the store room. Therefore, the intra-actions between the sorting staff and the land registers have influence on this service because they have intra-actions with middlemen but they do not have intra-actions with the UISCs, DWP or citizens.

The middlemen maintain close relations with the Sorting staff because after submitting an application to the ESC, the middlemen receives the application ID number and with this information they contact the Sorting staff to find the records register from the store and put it onto the copyist table quickly. This is how intra-actions in middlemen-Sorting staff-records registers reconfigure the E-service network.

Underlying Contexts of Intra-actions in Copyists and Land Records

The Copyists are responsible for copying records from land registers to process them and carry out records service delivery for citizens. However, the land records registers are dilapidated because they are not well preserved, about half of the registers are over 100 years old. Further, about 30% of total records are damaged and 2%-5% of total records are fraudulently tampered with and/or illegible. Surprisingly, there is no list of damaged, tampered and illegible records.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

694

Thus Copyists decide whether the specific record is available and in good condition for copying or damaged or tampered. The other way around, it is the Copyist who could recover the land information even from a damaged land records register. Since there is no list of damaged and tampered records, the Copyists can reject any application on the grounds of damaged or tampered records.

Notably, Mr. Karim (not actual name), a Copyist, says "if we have speed money for any application, we tried our best to recover information even through applying magnifying glass if the record is even partially damaged. On the other hand, if we do not have speed money on any applications, we know how to reject the application on the ground of damaged or tampered." This shows that an application is being either processed or rejected by the Copyist on the grounds of damaged records is an outcome of the intra-actions between the Copyists and the records registers. Since middlemen have intra-actions with the DRR staff by paying 'speed money' to expedite this service, applications that come through middlemen receive guaranteed service rather than applications coming from E-service access points. This is how multiple intra-actions in the DRR staff-land records-middlemen-citizens have reconfigured the E-service network.

Underlying Contexts of Intra-actions in Middlemen-Land Records-ESC and the DRR Staff

After introducing E-service networks to this service, the middlemen mediate this service for their clients through intra-acting with land records-ESC-DRR staff. Citizens are compelled to intra-act with the middlemen to receive a quick and confirmed service delivery. Since, middlemen have been working as mediators in this service for a long time; they have knowledge and skills in mediating citizens' applications, from filing applications to delivering this service to citizens.

Most of the applicants do not know the jurisdiction number and/or ID number of their land records. Besides, some applicants need quite urgent service delivery while others need confirmed service delivery without any rejection. To handle all these cases, the middlemen are skillful and experienced. They know jurisdiction numbers and they know how to manage or verify ID numbers of land records with the help of the Sorting staff who have access to every record of land in the registers preserved at the store. Even then, the middlemen know which records are in a good status and which are damaged. Therefore, there are is also intra-actions between the middlemen and the land records.

In contrast, the UISC entrepreneurs who intra-act in the E-service network have little knowledge about land records. They cannot submit citizens' applications if an applicant does not have all the required information (jurisdiction number, type of record and land records ID number). Their lack of skills, experience and lack of intra-actions with the sorting staff are obstacles to land records service.

6. CONCLUSION

In conclusion, it can be said that the E-service network designed for citizens' to access land records service in Bangladesh has merely intra-acted with the organizational processes and citizens. Rather, the organizational processes have reconfigured the E-service network through citizens-middlemen-staff intra-actions. The E-service failed to account for the role of middlemen in this service and their intra-actions with the citizens and the staff. Consequently, E-services failed to intra-act with the organizational processes. On the contrary, rather than the citizens, it is the middlemen who find ways to mediate citizens land records with the E-services because they have intra-actions with the E-service access points: the DWP and the ESC (front desk). Consequently, the ongoing intra-actions between the organizational processes and the middlemen have geared up intra-actions in citizens-middlemen-the land records service as whole.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

695

Therefore, implications can be drawn from this case that focusing on standalone technological processes, without tracing underlying contexts that constitutively and continuously intra-act with organizational contexts, technological design and processes cannot improve public service delivery. Consequently, assessing continuous intra-actions in technological processes and organizational contexts is significant for designing effective and open public service delivery and removing corruption and middlemen's exploitation of public services. Thus, intra-actions are emergent, ongoing continuous processes that attempt to reconfigure every design. As can be seen in this case, intentions are one thing (those of the government to 'free' the citizens from the middlemen, and encourage the universal access to information, as in Open Developement), but underlying contexts and interests by stakeholders at all levels may be stronger.

7. REFERENCES

Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. Durham: Duke University Press.

Barad, K. (2003). Posthumanist performativity: Toward an understanding of how matter comes to matter. *Signs, 28*(3), 801-831.

Barley, S. R., & Kunda, G. (2001). Bringing work back in. *Organization Science, 12*(1), 76-95.

Buxton, J. N., & Malcolm, R. (1991). Software technology transfer *Software Engineering Journal, 6*(1), 17-23.

Child, J., & McGrath, R. G. (2001). Organizations unfettered: Organizational form in an information- intensive economy. *Academy of Management Journal, 44*(6), 1135-1148.

Ciborra, C. U. (1996). The platform organization: Recombining strategies, structures, and surprises. *Organization Science, 7*(2), 103-118. Retrieved from

Freeman, C. (1991). Networks of innovators: A synthesis of research issues. *Research Policy, 20*(5), 499-514.

Hordon, A., Boonmongkon, P., Streetfland, P., Tan, M., Hongvivatana, T., Geest, S. V. D., Gerrits, T. (2001). *Applied health research manual: Anthropology of care.* The Netherlands: Het Spinhuis Publishers.

Introna, L. D. (2007). *Towards a post-human intra-actional account of sociomaterial agency (and morality)* Paper prepared for the Moral Agency and Technical Artefacts Workshop, The Hague, Netherlands Institute for Advanced Study.

Jones, M., & Orlikowski, W. (2007). Information technology and the dynamics of organisational change. In R. Mansell, C. Avgerou, D. Quah & R. Silverstone (Eds.), *The oxford handbook of information and communication technologies* (293-313). Oxford: Oxford University Press.

Law, J., & Urry, J. (2004). Enacting the social. *Economy and Society, 33*(3), 390-410.

Leonardi, P. M. (2012). Materiality, sociomateriality, and socio-technical systems: What do these terms mean? how are they related? do we need them? In P. M. Leonardi, B. A. Nardi & J. Kallinikos (Eds.), *Materiality and organizing: Social interaction in a technological world* (pp. 25-48). London: Oxford: Oxford University Press.

Loudon, M., & Rivett, U. (2014). 3 Enacting Openness in ICT4D Research. Open Development: Networked Innovations in International Development, *53*, 33-46.

Lyytinen, K., & Yoo, Y. (2002). Issues and challenges in ubiquitous computing. *Communications of the ACM, 45*(12), 62-65.

Mansell, R., Avgerou, C., Quah, D., & Silverstone, R. (Eds.). (2007). *The oxford handbook of information and communication technologies*. Oxford: Oxford University Press.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

696

Markus, M. L., & Robey, D. (1988). Information technology and organizational change: Causal structure in theory and research. *Management Science, 34*(5), pp. 583-598.

Nyberg, D. 2009. Computers, Customer Service Operatives and Cyborgs: Intra-actions in Call Centres, *Organization Studies 30*(11), November 1, 2009, 1181-1199.

OECD. (2008). Service delivery in fragile situations: Key concepts, findings and lessons *Journal of Development, 9* (Off-print)

Orlikowski, W. J. (2007). Sociomaterial practices:Exploring technology at work. *Organization Studies, 28*(9), 1435-1448.

Orlikowski, W. J., & Scott, S. V. (2008). *Sociomaterility: Challenging the seperation of technology, work and organisation. Working paper: 174.* London: Information System Innovation Group, London School of Economics and Political Science.

Orlikowski, W. J. (2010). The sociomateriality of organisational life: Considering technology in management research. *Cambridge Journal of Economics, 34*(1), 125-141.

Orlikowski, W. J., & Scott, S. V. (2008). 10 Sociomateriality: Challenging the separation of technology, work and organization. *The Academy of Management Annals, 2*(1), 433-474.

Prakash, A., & De, R. (2007). Importance of development context in ICT4D projects: A study of computerization of land records in India. *Information Technology & People, 20*(3), 262-281.

Sutton, B. (2012). *Sociomateriality: More academic jargon monoxide*. Retrieved from [http://bobsutton.typepad.com/my_weblog/2010/10/sociomateriality-more-academic-jargon-monoxide.html].

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

697

UNDERSTANDING MULTIPLE ROLES OF INTERMEDIARIES IN OPEN GOVERNMENT DATA

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Abstract: Open government data (OGD) has been promoted as an innovative ICT-related policy that can help accomplish political, social and economic development goals, especially in developing countries. However, this paper argues that barriers emerging between governments and civil society in these nations – digital divide, data absence, lack of data quality, and lack of data provision – may impede OGD success. In order to overcome these barriers, new resources and capabilities need to be brought to the OGD arena, since governments often focus only on releasing raw data, and civil society is often unable to technically produce and disseminate information from datasets. Thus, "OGD intermediaries" are required to bridge the gap between these stakeholders by providing technical knowledge and resources that otherwise would be missed. This paper identifies five different roles that OGD intermediaries can play – acting as demanders, producers, validators, developers or communicators of data – and provides examples of these from the Latin American context. By recognizing the need for, and types of, OGD intermediary, it is hoped this paper will help improve both understanding and success of OGD initiatives.

Keywords: intermediaries, open government data, developing countries, Latin America, digital divide, data divide.

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1. INTRODUCTION

One of the latest trends in the field of digital technology and international development is the valuation of openness as a mechanism through which to improve development outcomes. Via openness, development initiatives can benefit from more information that is easily accessible or manageable and from more people who can actively participate and/or collaborate (Smith, Elder & Emdon, 2011).

The public sector has been central to this global trend of openness. Nowadays, governments across the world are looking at opening up their institutions and agencies to establish new relationships with civil society that may contribute to political, social and economic development. One relevant case is open government data (OGD): public data online, in machine-readable and open formats with no restrictions on manipulation and distribution, to support new governance practices (Davies, 2010, p. 11). Even though OGD programmes have been implemented in many different countries, OGD in the developing world has faced challenges of various kinds. In particular, data flow barriers between government and civil society have arisen, but little attention has been paid to categorize these barriers, or to look at ways in which the barriers are addressed in practice. These obstacles emerge since OGD initiatives may lack resources and capabilities to make effective use of datasets from both governments and civil society (Heeks, 2014). In an attempt to solve this issue, OGD intermediaries arise as key agents in overcoming barriers by bringing absent resources and capabilities to produce and transform

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

698

data into understandable and valuable knowledge. Yet relatively little is known about these intermediaries.

Hence, the purpose of this paper is to attempt an initial categorization of both the OGD barriers and also the roles that OGD intermediaries may perform in developing countries, complemented by examples from Latin American OGD programmes. Methodologically, data for this paper has been gathered by a combination of document analysis of relevant OGD literature including papers, reports and blog entries, observational analysis from participation in conferences and seminars on OGD and open government, and semi-structured interviews with people involved with OGD intermediaries. The paper is organized as follows: section 2 conceptualizes OGD and development, and the barriers often constraining OGD in developing countries; section 3 examines intermediaries and their roles as key agents in OGD and development; section 4 provides examples from OGD in Latin America; and section 5 presents conclusions and future work ideas.

2. BACKGROUND

OGD is a relatively new public policy, which has become popular inside and outside governments. Although much of the literature on OGD defines its nature and its objectives, understanding OGD in developing countries requires an analysis of how it can lead to development outcomes but also an analysis of the ways in which those outcomes may be constrained by data-specific barriers; aspects covered in this section.

2.1. OGD and development

Since legitimacy of traditional governance practices has been eroded by lack of civil interest and mistrust in political practices, new paradigms of relationships between governments and the governed have emerged during the last few years (Ramírez-Alujas & Dassen, 2014). Among different strategies, open government data has been promoted as an effective movement to re-engage civil society by pro-actively releasing online public data in raw, open and machine-readable formats, with no restrictions on manipulation and re-use by third parties (Davies, 2010; Heusser, 2013; Zuiderwijk, Janssen, Choenni, Meijer, & Alibaks, 2012). The underpinning idea of OGD is that public data represents a valuable public asset to citizens, who as key political stakeholders of government deserve access to the data created by the state.

OGD is gaining momentum, in part driven on by multiple benefits that OGD stakeholders have claimed regarding its potentialities. In general, four broad categories of benefits can be associated with OGD: a) better governance through data disclosure, which leads to more accountable governments and more collaborative and participatory civil societies; b) economic growth and innovation fostered by new services and products; c) technological development via innovations in interoperability, infrastructure and publishing means; and d) more efficient government through optimization of public service delivery (Heusser, 2013; Huijboom & Broek, 2011; Janssen, Charalabidis, & Zuiderwijk, 2012). Despite their relevance, most of these premises have been based upon OGD experiences in the global North, and reflect continuous progress along historical trajectories of democracy, public service delivery and technological development (Boyera & Iglesias, 2014; Schwegmann, 2013). However, are these benefits applicable to developing countries to a similar extent?

Focusing on the developing world, OGD should thus be understood as the release of public data to support the achievement of development outcomes (Boyera & Iglesias, 2014; Davies, Perini, & Alonso, 2013), and be placed within a context characterized by significant constraints on political, social and economic development. Care must be taken to recognize the highly-differentiated nature of the global South. However, at least relative to the global North, the developing world has seen a greater preponderance of unstable political processes, secrecy, and authoritarian or even dictatorial periods which have constrained access to public data and civic participation (Harrison, 2004). Some developing countries are also affected by high levels of

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

699

marginalized people, poor technical infrastructure and higher-than-global-average illiteracy rates (Hunter, 2014). Additionally, countries typically face economic disadvantages in comparison to the developed world, such as lower GDP rates, higher levels of unemployment and a relatively weaker private sector, among others (Kaufman, 2009). As a result, OGD can often be part of a politico-economic system that involves information asymmetries, lack of skills and knowledge to manipulate and disseminate data, as well as a lack of technical infrastructure which may undermine the development of OGD in scope and impact in comparison with the developed world (though acknowledging the latter may also face some impediments, see Zuiderwijk et al, 2012). In particular, OGD can be understood as facing *barriers or gaps between information producers/suppliers and end-consumers*, here simplified to governments and civil society respectively. Only if initiatives are able to overcome these barriers, can OGD then have a real impact on supporting the decrease of exposed inequalities and the achievement of related political, social or economic development goals. By reducing information asymmetries and providing accurate and meaningful data, governments may become more accountable and closer to their governed, new or existing economic opportunities may be boosted, and more people may be included in the political sphere, among others.

2.2. Barriers to OGD in developing countries

OGD can impact political, social and economic systems in developing countries; however, this impact may be undermined by barriers between governments and civil societies regarding the "information value chain" (see Figure 2). This model analyses how different resources and capabilities help data (raw and unprocessed information) progress onto information (data that has been processed to make it useful to its recipients) and knowledge (information that has been assimilated into a coherent framework of understanding) (Laudon & Laudon, 2007). Across this value chain, specific issues in data production, manipulation, dissemination and use may arise in developing countries, which may also reinforce each other and create an environment characterized by a series of handicaps at the time OGD is developed (see Figure 1).

For the information value chain to operate effectively for OGD then first (see right side of Figure 2) the relevant data must exist in the first place. But in some countries there is a *data absence*: a lack of data, often reflecting a lack of public policies that ensure digital records of citizens and public service activities are kept (Castro, 2014; Gurstein, 2011). Without this starting point, it is impossible for OGD to function since that requires the existence of digital data about particular entities and processes. This issue may also lead to the creation of a *data divide* (socio-economical inequalities that result from unequal access to data) (Castro, 2014).

Even if the data is available in digital format, some governments show *reluctance to release public data* even if they have initially agreed on policies or joined international initiatives about opening up their records (Boyera & Iglesias, 2014; Davies et al., 2013). In developing countries, procedures for data disclosure may sometimes be honoured more in the breach than the observance, with bureaucratic practices that drag out data release, or with governments refusing to divulge data on claimed grounds of national security or national interest.

Even if OGD datasets are released, a next barrier along the information value chain is a *lack of data quality* practices (Boyera & Iglesias, 2014; O'Hara, 2012). Data may be collected under non-systematic procedures which lead it to fail the "CARTA" test by falling short in terms of its completeness, accuracy, relevance, timeliness, or appropriateness of presentation (Heeks, 2006). This includes a need for some datasets – depending on nature and lifecycle – to be regularly updated and not seen simply as a one-time activity.

Finally, data might be released and of adequate quality but a recurrent obstacle in developing countries is the *digital divide*, which reflects the lack of technical skills and infrastructure impeding access to and effective use of ICT-based data (Gurstein, 2011; Warschauer, 2002). Where members of civil society do not have access to open data due to a lack of ICT resources

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

700

and/or they lack technical skills to manipulate open data, then they will not produce the new information and actions that are the intended outcome of OGD initiatives.
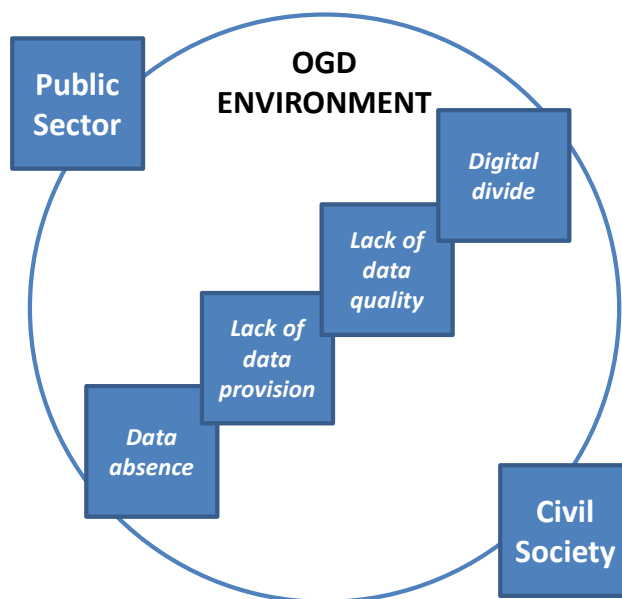
Figure 1: Barriers to OGD between public sector and civil society

There are, of course, other data-related barriers that impede the OGD information value chain from operating effectively in developing countries. However, these four are some of the most-evident and, as summarized in Figure 1, they create a schism in the OGD system between the public sector and civil society. They show – even if governments are keen to release public data – that delivery of OGD-related development outcomes can be impeded. What is required is some means to address these barriers, and close the producer-consumer gap. There are various ways in which such gap-closure could occur but we identify intermediaries as key agents in this activity, as discussed next.

4

3. INTERMEDIARIES OF OGD IN DEVELOPING COUNTRIES

In general, intermediaries can be described as any sort of actor that bridges two or more different perspectives, establishing communication mechanisms that let them interact fluently and in understandable ways (Latham, 2003; Soeparman, Van Duivenboden, & Oosterbaan, 2009). Using this concept in OGD and development, we define intermediaries as all actors that assist OGD initiatives by bridging the barriers that separate public sector data producers and civil society data consumers. They help government reach marginalized and non-skilled civil society members with accurate and meaningful open data, and help identify concerns and impediments they claim to stand in the way of effective use of OGD. Intermediaries participate in a bi-directional relationship: toward governments (supply side) and toward civil society (demand side). Intermediaries may team up with the supply side and/or the demand side to engage in OGD practices and overcome the barriers stated above.

3.1. Relevance of intermediaries in OGD

Literature suggests intermediaries play a relevant role in OGD success (Janssen, 2012; Meijer, Curtin, & Hillebrandt, 2012; Davies 2010), but in what way are they relevant? We can understand that by referring again to the information value chain model (Heeks, 2014 developed from Heeks & Kanashiro, 2009) which was followed above in order to identify some of the key OGD initiative barriers. Put simply, those barriers can be thought of as an absence of various

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

701

essential resources and capabilities necessary to turn government data into development actions and results: an absence of any data; an absence of quality data; an absence of technology necessary to access ICT-based data; an absence of skills to manipulate OGD; an absence of knowledge to understand OGD; etc.

Intermediaries therefore address these absences, providing resources and/or capabilities necessary for the information value chain to run its course from data through to results. In the most common case – where governments are committed to making public data freely available to be manipulated by third parties (Boyera & Iglesias, 2014) – the data is present and available and of reasonable quality (Heeks, 2014; Zuiderwijk et al, 2012). So, in narrow terms, it succeeds by making government data open. But it does not go further than this unless there are intermediaries who can supply the missing components in the information value chain.
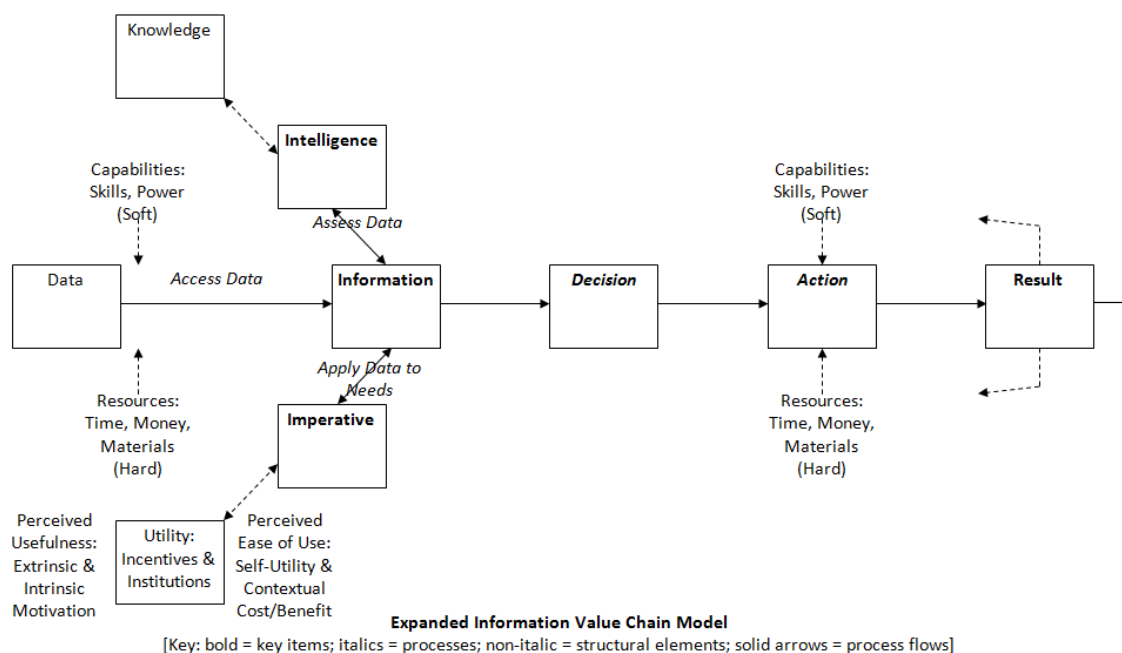
Figure 2: Expanded Information Value Chain Model

3.2. Roles of OGD intermediaries in developing countries

Beyond this general sense of what OGD intermediaries do, can we dig deeper to categorize their roles? Few attempts have been made to define roles of intermediaries in an OGD environment. Magalhaes, Roseira and Strover (2013) are an exception and they organize OGD intermediaries into three categories: civic start-ups, open data services, and infomediaries. These are valuable but they could in some cases be overlapping, and other authors suggest additional roles. For example, current research on OGD in developing countries (Davies et al., 2013; Davies, 2014) suggests that intermediaries do more than just utilize (open data services) or transform (infomediaries) datasets: they may interact with government to request new datasets be created or, in some cases, they may create those new datasets themselves. They are therefore not just consumer-facing and demand-oriented (i.e. interacting with civil society), they are also producer-facing and supply-oriented: raising issues of data quality and availability with government agencies. Considering the context of developing countries, the role of intermediaries is especially relevant as significant fractions of the civil population have neither technological, educational nor logistical means to reach governments with their concerns, and – vice versa – governments may find it hard to extend their operations to remote and marginalized areas (Davies, 2014; Web Foundation, 2014).

Thus, grounded on these perspectives, we classify intermediaries into five different types of agents in OGD systems that act in different ways to overcome OGD barriers: *demanders*,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

702

producers, *validators*, *developers* and *communicators*. While the former three are related to data production, the latter two are linked to information creation. In practice, these roles are not mutually-exclusive and intermediaries may play different tasks simultaneously in an OGD programme.
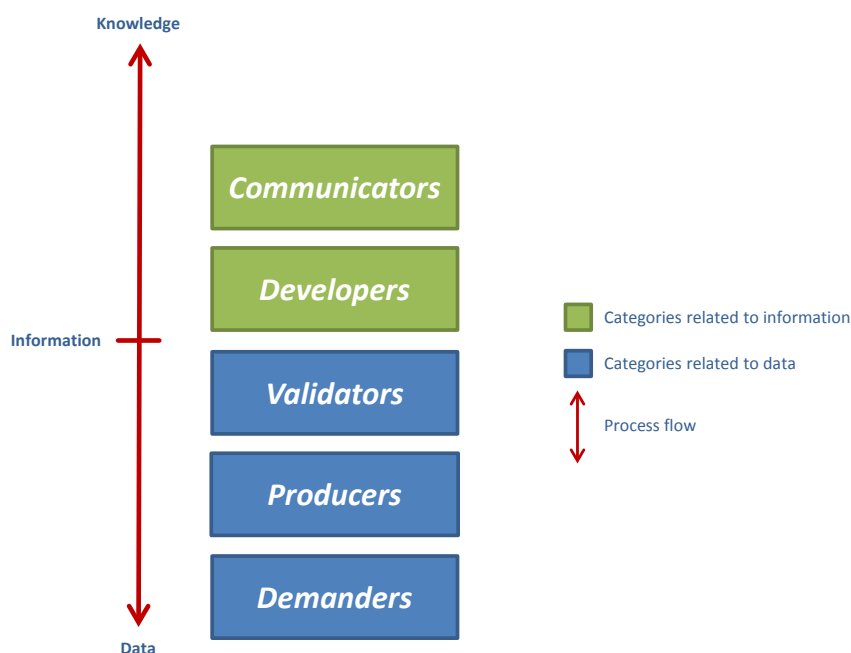
Figure 3: Roles of intermediaries in OGD in developing countries

Firstly, intermediaries can be *demanders* of data. Since releasing public data is usually guided by interpretation of local regulations, governments and individual public agencies may have flexibility to determine which data to release, according to their own criteria. With civil society in developing countries often lacking easy access channels to government, intermediaries can carry or aggregate civil society demands and request specific datasets to be released, or even lobby for particular OGD-relevant policies to be developed.

Secondly, intermediaries can also be *producers* of data. In some cases, they are located close to data sources – such as communities – and they possess technical knowledge about dataset manipulation. Intermediaries may therefore collect data in the field – sometimes merging it with existing datasets – in order to create new open government data.

The third category is *validators*. Governments sometimes see their OGD performance target as the mere availability of OGD datasets but with little regard to the quality of those datasets in terms of either content or format. So dataset selection, filtering or assessment might be required to determine which datasets or parts of datasets are useful. Intermediaries can address the limited usability of such data by validating it against on-the-ground realities, or in other ways by checking its accuracy, and thus helping improve the foundational accuracy and hence potential value of OGD.

Our fourth category is *developers*. Where the first three roles remain rooted in the data box on the left side of the information value chain, this role now pushes out towards the formation of information through the actions of intermediaries to develop the accessibility and usability of OGD. For example, tech-savvy individuals and organizations have created websites or apps based around manipulation of open government data, which renders that data more accessible to and usable by civil society.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

703

Finally, the last category is *communicators*. Communicators go beyond the mainly-technical role of developers to manipulate OGD and present it in formats, channels and contexts that are best-matched to the skills and knowledge of typical civil society consumers; for example, with a view to local digital, textual and statistical literacy levels. In this, intermediaries are indeed *infomediaries* since they will be interpreting, translating and disseminating potentially complex government datasets; turning them into meaningful, valuable information products that can be directly consumed by civil society.

Overall, this classification summarizes roles that intermediaries perform along the OGD information value chain as it progresses from data production to information use. In practice, OGD initiatives can contain different intermediaries, as can be seen next in examples taken from the Latin American experience.

4. OGD INTERMEDIARIES IN LATIN AMERICA

Considering the categories suggested above, OGD intermediaries may play different roles and thus do not solely fit into one classification. As an example, Latin American civil society organizations are undertaking one or several of these tasks across OGD development. While they may receive some external funding and support, these organizations are typically locally-organized. This combination may provide an effective basis for their activities – giving access to wider circuits of finance and knowledge, but with a strong understanding of local politics and priorities.

Currently, diverse organizations are producing and testing existing datasets. For instance, Open Data Latinoamérica[1] is an NGO which has acted as *producer* and *validator* of OGD by collecting existing datasets from governments of Argentina, Chile, Peru, Uruguay and Brazil and producing new datasets via local hackathons, meetings and workshops. In these events existing datasets are tested and corroborated, creating new data that feeds other intermediaries, such as data journalists, other hackathons or individual developers. Another relevant intermediary has been Poderopedia[2] (Chile), which has acted as a *demander* of OGD release, supporting creation of a culture of transparency in Chile and across Latin America by leading regional data journalism advocacy. But Poderopedia also acts as a *communicator* by presenting information on regional elites and their power networks.

Additionally, DATA[3] (Uruguay) and Fundación Ciudadano-Inteligente[4] (Chile) are two local NGOs which act as *demanders*, *developers* and *communicators* of OGD. By advocating transparency and free access to public information, both organizations have become relevant activists in Latin American OGD development. They have pushed national transparency agendas to disclose more sensitive data and organized different OGD conferences and action research activities. Moreover, they have developed their own apps using local datasets and have produced relevant information based on public performance for public scrutiny, such as the financial commitments of political candidates, accountability of national budget distribution, and media campaigns for OGD usage, among others. Considering the growing movement of developers or hackathons, start-ups or individuals which look at collaboratively solving social problems by using web/mobile technologies and OGD, both organizations have coordinated Desarrollando América-Latina[5]. This annual regional conference calls to a wide range of activists to solve existing social and public service delivery issues by developing apps based on OGD.

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[1] http://www.opendatalatinoamerica.org/home/

[2] http://www.poderopedia.org/

[3] http://datauy.org/

[4] http://www.ciudadanointeligente.org/

[5] http://www.desarrollandoamerica.org/

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

704

As these few examples suggest, Latin American OGD intermediaries may assume different roles and can bring OGD closer to end-consumers by producing new datasets, developing new services or informing civil society. Of course this does not provide a solution to all OGD challenges in the region. Despite the growing role of OGD intermediaries, much more action is required to overcome OGD barriers and help ensure it fulfills its potential: ensuring greater publication of data by government, improving data quality, and bridging the divide to populations that lack technology and skills and motivation. OGD intermediaries in Latin America therefore have much still to do.

5. CONCLUSIONS

OGD can be an effective tool – among many – that contributes to political, social and economic progress in nations which have traditionally been marginalized from the benefits of development. However, for OGD to be effective it must overcome barriers that exist at all stages in the OGD value chain; barriers that can be understood in terms of a lack of resources and capabilities; a lack that can run from the data itself through to elements necessary to turn that data into information, and that information into decision-making and action processes for development. These barriers can be understood to create a supply-demand gap between the government data producers and would-be consumers within civil society; a gap that undermines effective impact of OGD. In bridging this, intermediaries play a pivotal role by bringing a set of resources and capabilities to OGD that create a flow from government to civil society: producing more and better data, creating improved conditions to generate information and knowledge, and leading to more and better decision-making processes.

By conceptualizing both barriers and solutions in terms of an information value chain, we have also created a practical categorization of OGD intermediary roles. This not only helps researchers understand those intermediaries, it should also help the intermediaries themselves better understand what they do, and why.

8

Nonetheless, considering their demonstrated importance, more attention should be paid to identify how intermediaries are supporting OGD in developing countries, what practical activities they undertake, and how their roles can be enhanced to produce effective development outcomes. Even though this theoretical approach has been grounded in existing literature, practitioners' reports and an ongoing research project on OGD in Latin America, further research is required to instantiate the models presented here and to examine all the particular roles intermediaries are playing in the OGD value chain.

One starting point for this further research would be application of the models to individual developing countries. This would first apply the information value chain to trace step-by-step the resources, capabilities, processes and barriers involved in specific national OGD projects. The barriers can then be compared to the Figure 1 categorization to confirm or revise. Likewise, in-depth work with OGD intermediaries can analyze the specific operational tasks they perform, compare this to the Figure 3 categorization for confirmation or revision, and allow the intermediaries themselves to reflect on their information value chain roles.

6. REFERENCES

Boyera, S., & Iglesias, C. (2014). *Open Data in Developing Countries: State of the Art*. Partnership for Open Data. http://www.scribd.com/doc/229900006/Open-Data-in-Developing-Countries-State-of-the-Art

Castro, D. (2014). *The Rise of Data Poverty in America*. Washington D.C: Center for Data Innovation. http://www2.datainnovation.org/2014-data-poverty.pdf

Davies, T. (2010). Open data, democracy and public sector. *Master Thesis*, Oxford University.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

705

Davies, T. (2014). *Open Data in Developing Countries - Emerging Insights from Phase I.* ODDC. http://www.opendataresearch.org/content/2014/704/open-data-developing-countries-emerging-insights-phase-i

Davies, T., Perini, F., & Alonso, J. M. (2013). *Researching the emerging impacts of open data ODDC conceptual framework* (No. 1). ODDC. http://www.opendataresearch.org/sites/default/files/posts/Researching%20the%20emerging%20impacts%20of%20open%20data.pdf

Gurstein, M. (2011). Open data access vs. open data (effective) use. *First Monday*, 16(2). http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/viewArticle/3316/2764

Harrison, G. (2004). Globalisation, Governance and Development. *New Political Economy*, 9(2), 155–162.

Heeks, R. (2006). *Implementing and Managing eGovernment*. London: Sage.

Heeks, R. (2014). *The Data Revolution Will Fail Without A Praxis Revolution.* http://ict4dblog.wordpress.com/2014/08/14/the-data-revolution-will-fail-without-a-praxis-revolution/

Heeks, R., & Kanashiro, L. L. (2009). *Remoteness, Exclusion and Telecentres in Mountain Regions: Analysing ICT-Based "Information Chains" in Pazos, Peru* (No. 38). Manchester. http://www.seed.manchester.ac.uk/subjects/idpm/research/publications/wp/di/di-wp38/

Heusser, F. (2012). *Understanding OGD and addressing its impact*. Santiago de Chile.

Huijboom, N., & Broek, T. Van Den. (2011). Open data : an international comparison of strategies. *European Journal of ePractice*, 12(2), 1–13.

Hunter, R. (2014). Bridging the Digital Divide: New Route to Development or New Form of Dependency? *Global Governance*, 8(4), 443–466.

Janssen, K. (2012). Open Government Data and The Right to Information. *The Journal of Community Informatics*, 8(2). http://ci-journal.net/index.php/ciej/article/view/952/954

Janssen, M., Charalabidis, Y., & Zuiderwijk, A. (2012). Benefits, Adoption Barriers and Myths of Open Data and Open Government. *Information Systems Management*, 29(4), 258–268.

Kaufman, R. R. (2009). The Political Effects of Inequality in Latin America: Some Inconvenient Facts. *Comparative Politics*, 41(3), 359–379.

Latham, M. (2003). Democracy and Infomediaries. *Corporate Governance*, 11(2), 91–101.

Laudon, K.C. & Laudon, J.P. (2007). *Essentials of Business Information Systems*. Upper Saddle River, NJ: Pearson Education

Magalhaes, G., Roseira, C., & Strover, S. (2013). Open Government Data Intermediaries: A Terminology Framework. In *ICEGOV 2013* (pp. 330–333). Seoul: ACM.

Meijer, A. J., Curtin, D., & Hillebrandt, M. (2012). Open government: connecting vision and voice. *International Review of Administrative Sciences*, 78(1), 10–29.

O'Hara, K. (2012). Data quality, government data and the open data infosphere. In *AISB/IACAP World Congress 2012: Information Quality Symposium*. Birmingham: The Society for the Study of Artificial Intelligence and Simulation of Behaviour.

Ramírez-Alujas, Á., & Dassen, N. (2014). *Winds of Change: The Progress of Open Government Policymaking in Latin America and the Caribbean*. Washington D.C: IADB. http://publications.iadb.org/handle/11319/6400?locale-attribute=en&

9

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

706

Schwegmann, A. C. (2013). *Open Data in Developing Countries* (No. 02). ePSI. http://www.epsiplatform.eu/sites/default/files/127790068-Topic-Report-Open-Data-in-Developing-Countries.pdf

Smith, M.L., Elder, L. & Emdon, H. (2011). Open Development: A New Theory for ICT4D. *Journal of Information Technologies & International Development*, 7(1), iii-ix.

Soeparman, S., Van Duivenboden, H., & Oosterbaan, T. (2009). Infomediaries and collaborative innovation: A case study on Information and Technology centered Intermediation in the Dutch Employment and Social Security Sector. *Information Polity*, 14(4), 261–278.

Warschauer, M. (2002). Reconceptualizing the Digital Divide. *First Monday*, 7(7).

Web Foundation. (2014). *Creating a Data Revolution in Sustainable Development – Joint Submission to UN. Submission to the UN Data Revolution Group*. http://webfoundation.org/2014/10/creating-a-data-revolution-in-sustainable-development-joint-submission-to-un/

Zuiderwijk, A., Janssen, M., Choenni, S., Meijer, R., & Alibaks, R. S. (2012). Socio-technical Impediments of Open Data. *Electronic Journal of E-Government*, 10(2), 156–172.

10

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

707

STRENGTHENING TIME BOUND SERVICE DELIVERY THROUGH ICT ENABLED OPENNESS: A CASE STUDY FROM INDIA

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Abstract: Sakala is a flagship program of the Government of Karnataka, India, to guarantee time bound delivery of services to its citizens. The emphasis has been to 'Standardise' and 'Simplify' citizen service delivery systems and to make the government more transparent and accountable to its citizens. Karnataka Sakala Services Act, 2011, was enacted by the State Assembly to enable citizens to avail a sleuth of public services in a time-bound manner and claim compensation for any delays or defaults from the defaulting offices. The Act mandates the delivery of 669 services across 50 departments within a stipulated time. Sakala in two years has delivered over 4.8 crore services. This paper aims to understand how an innovative public service delivery model is being orchestrated. The contribution of this research is largely associated with unearthing and understanding the combinative and explicit declaration of 'guarantee of services', coupled with attempts to bring about systemic changes and accountability on part of the government. Specifically, the authors focus on the Revenue Department that offers the largest number of services. Root cause analysis is adopted to understand the problem of over-dues and rejections of applications within the Revenue Department. Finally, the analysis reveals six key issues for successful implementation of this ICT-enabled public service delivery legislation.

Keywords: Public Service Delivery, Accountability, Revenue Department, Right to Public Services

1. INTRODUCTION

Arjit Chakravorty, an apartment owner at Mahadevpura in East Bangalore, and his wife Kavita had little clue that their application to the Bruhat Bangalore Mahanagara Palike (BBMP) for "A Khata" (a property document) would end up in a marathon run. Despite applying for khata under the Sakala scheme and submitting all the necessary documents, this couple was made to visit the BBMP office numerous times for over two months. But they did not succumb to the delaying tactics of BBMP officials, as they wanted to get the document without paying any bribe.

The couple applied for khata on February 28, 2014 and received an SMS that their application has been accepted. This was even reflected on the Sakala website on April 7. Yet, Palike officials made the couple run around BBMP offices in different parts of the city. Kavita told that BBMP officials harassed them by seeking unnecessary documents. "One day we were snubbed by revenue officers in Palike office for three to four hours saying that they are unable to find our files. They even asked us to search for the files," she alleged.

Kavita also alleged that at the time of applying, Palike officials admitted that all necessary documents had been provided. "But later they asked us to submit a photocopy of the mother deed, which was around 1000 pages for which we had to spend money up to Rs 10,000."

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

708

The delaying tactics to issue the khata clearly showed the officials were expecting a bribe, she alleged. "However, our intention was to get the khata without paying bribe. Thanks to Sakala officials who helped us a lot, we finally got the khata," she added.

The Chakravortys got the khata in the first week of May.[1]

Citizen services are affected due to red tapeism, lack of transparency, accountability, non-responsiveness and lack of openness. When an individual approaches the government for getting a caste, income or any other certificate or a citizen approaches the urban/rural local bodies to obtain documents to build a house, their experience is similar to that of Chakravortys. People are made to run from pillar to post, sometimes harassed for illegal gratification and many times denied the services on one pretext or the other.

In many cases citizens go all the way from their villages/town to the highest level, that of the Chief Minister with their grievances, sometimes for very routine services like disability certificate or old age pensions. The State has a very important role to play in making available and delivering various essential services. Public service delivery in India is in dire straits, plagued with many systemic problems and weak accountability mechanisms. Chand (2006) identifies four sets of systemic problems in public service delivery in India: (i) heavy salary burden and under-management, (ii) weak accountability mechanisms and lack of citizens' demand, (iii) corruption and weak procedures to confront it, and (iv) political financing and rent-seeking. In the last two decades, ICT has taken root as a strong resource that can empower citizens by facilitating their participation in local governance, enabling fast access to information, giving them voice to demand transparency and accountability of government administration, and generally improving the efficiency of service delivery (ADB Report, 2013).

Many Asian economies have adopted a rights-based approach to specific social services such as right to education, information, health etc. In India, the State of Madhya Pradesh (MP) took the initiative of introducing the Madhya Pradesh *Lok Sewaon Ke Pradan Ki Guarantee Adhiniyam*, 2010. Soon after many other States have enacted their respective Public Service Guarantee Legislations. Implementation of this Act in various States is in different stages. Because of this Act the onus has now shifted on to the providers and in States like Karnataka, this has triggered process re-engineering and serious efforts to solve systemic problems. Most of these legislations aim to enforce the principles of Citizens Charters. The system implemented in Karnataka through Sakala is by far the most comprehensive.

The next section provides literature review and theoretical framework. While Section 3 is about methodology, Section 4 details the genesis, context, and working of Sakala. In section 5 the authors analyse the systemic changes post Sakala. Root Cause Analysis of Overdues and Rejections in Revenue department is taken up in Section 6 and it is followed by Discussion and Conclusions.

2. BACKGROUND LITERATURE AND THEORETICAL FRAMEWORK

2.1. Service Guarantees

Service Guarantees are studied primarily in the area of Service Marketing/Management. A large number of service guarantee studies to date are based in North America and mainly in the domain of hospitality and retail and very rarely in the area of public sector. A service guarantee is an explicit promise made by the service provider to (a) deliver a certain level of service to satisfy the customer and (b) remunerate the customer if the service is not sufficiently delivered (Gremler, 2009). According to Christopher Hart (1988), because of service guarantees,

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[1] Published in Times of India, Bangalore Edition, May 19, 2014.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

709

organisations are forced to focus on customers' want and expectation in every aspect of the service. Further, guarantees establish clear standards and organisations are required to build effective systems to generate meaningful customer feedback and develop corresponding courses of action. Also, guarantees require service organisations to understand reasons of failure and motivate them to identify and manage potential fail points.

2.2. Open Government Data

Citizens the world over have been demanding easier access to government-held information. Open Governance is a process by which public institutions engage with the various stakeholders and collaborate with them to improve the delivery of its services. The viability to access Government records is the prime criteria in deciding the openness of a Government. People are entitled to know what policies and programmes, how and why, are they being framed and followed by the Government. Open Governance initiative consists of a strong open data practice within the organization. Open data is the idea that certain data should be freely available to everyone to use and republish as they wish, without restrictions from copyright, patents or other mechanisms of control[2]. Open Governance practices, that gained momentum with the RTI Act 2005 in India, enables a culture of a robust public disclosure practice and one of the requirements of the RTI Act is proactive disclosure of information by the public authorities[3] themselves. In addition, information gathering and many of the process flows within the institution can be re-engineered to exploit the benefits of open governance for internal operations too. However, capacity to use open government (OG) data must be aided by the government. Wright (et al) (2011) in a report titled *Open Government Data Study: India*, note that large-scale administrative reforms, especially in terms of improving governmental information processes, infrastructure and interoperability, are needed if OG Data is not to be as unsuccessful as current compliance with Section 4 requirements of RTI Act.

2.3. Public Accountability

Public in Public Accountability refers to "openness" or "transparency". Bovens, Goodin and Schillemans (2014) make a conceptual distinction between accountability as a *virtue* and accountability as a *mechanism*. Two central theoretical models stand out in accountability research. In accountancy, international relations, political science and public administration the rational *principal-agent* theory (Sean Gailmard, 2014) has become the most common and most criticised dynamic theory for analysing accountability. The *social contingency* model has evolved primarily is social psychology, but with echoes more in sociological approaches of public accountability. Both theoretical models are based on a rational core, and support substantive expectations about the likely behaviour of parties in an accountability setting—although both models are highly flexible (ibid, 2014).

2.4. Principal Agency Theory

Principal-agent theory encapsulates a tradition of rational choice modelling, in which some actor(s) (the principal(s)) uses whatever actions are available, to provide incentives for some other actor(s) (the agent(s)) to make decisions that the principal most prefers. Because principal-agent theory focuses on the responsiveness of the agent's decisions to the principal's goals, and how this responsiveness is mediated by actions available to each actor as well as institutional settings in which they interact, it is a natural framework to study accountability in political institutions (Sean Gailmardt, 2002). The principal-agent framework can be used in situations in which a person, the principal, has a certain relationship with another person, the agent. An agent performs a certain task, which leads to costs on behalf of the principal. However, the principal is not able to observe the actions of the agent directly. According to Douma and Schreuder

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[2] http://opendatahandbook.org/pdf/OpenDataHandbook.pdf. (2012: Open Knowledge Foundation).

[3] Section 4 of the RTI Act.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

710

(2002:109) the principal agent theory is a part of agency theory. Agency theory, in its simplest form, discusses the relationship between two people: a principal, and an agent who makes decisions on behalf of the principal. They distinguish within the agency theory two streams: the positive theory of agency and the theory of principal and agent. In the positive theory of agency it is assumed that existing organisational forms are efficient. If they were not, they would not exist. The principal-agent theory does not assume that existing organisational forms are efficient. The principal-agent theory offers a framework for a comprehensive analysis of situations involving:

(1) conflict of interest between a principal agent, for example, between an employer and an employee, a landowner and a farmer/tenant, a minister and his civil servants;

(2) asymmetric information and uncertainty;

(3) making an agreement or setting up a contract and

(4) issues such as how contract design influences the behaviour of the participants.

In this case, we can say that citizens may hold government officials to account because of the provisions of Sakala. The Sakala model provides a *mechanism for accountability* as it enables the citizens to track their application, understand the workflow and hold officials accountable at different levels. If their grievance is not addressed there is scope for verbal interaction with the government official through the call centre.

3. METHODOLOGY

The main research question focuses on analysing the efficacy of Right to Services Act from the provider's side in terms of systemic interventions and process re-engineering. The aim of this research is to understand how the 'guarantee of services' is being orchestrated by bringing about systemic changes under the umbrella of one legislation. The objective of this study is limited in that extent to analysing internal process improvements and changes in systemic procedures and not external perceptions of citizens or evaluation of its performance. The authors adopt an interpretive case-based methodology to analyse the Sakala model of public service delivery. Root Cause Analysis is employed as a tool to understand the causes of delay in delivery of services or rejection of applications in the Revenue Department. The authors chose to conduct in-depth analysis of Revenue Department as this department offers the largest number of services under the ambit of Sakala. Root cause analysis helps identify what, how and why something happened (Livingston, Jackson and Priestley, 2001). The process involves data collection, cause charting, root cause identification and recommendation generation and implementation. One of the authors conducted focus group discussions at three Revenue offices: Bangalore South, Anekal taluk office and with Tahsildars at the Sakala Office. Focus group discussion was attended by officials of the Revenue department. Problems associated with delivery of services, reasons for delays and rejections were elicited.

Over a period of two years, one of the authors conducted observations and discussions with various stakeholders and government officials at the many events organised by the Sakala Mission. Interviews were also conducted with officials at Sakala Mission and officials at the Revenue department. Documents such as monthly reports, government orders, Call-in-programmes[4], promotional video and social media (posts on facebook) were also analysed.

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[4] *Hello Geleyare* is a weekly live call-in programme connecting Sakala Mission with the citizens aired on DD Chandana.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

711

4. CASE STUDY: CONTEXT AND WORKING OF SAKALA

Sakala – Karnataka Guarantee of Services to Citizens Act (2011) empowers citizens to avail services from the Government of Karnataka in a time-bound manner. Sakala Act was passed by the Karnataka State Legislature in December 2011, to provide guarantee of services to citizens in the State. The Act mandates the delivery of over 669 services across 50 departments within a stipulated time. In case of a delay / default of a service request, the officer responsible is liable to pay a fine of Rs 20 per day limited to a maximum of Rs 500 to the citizen as compensation. A Mission has been constituted to assist in the implementation of this Act. The main objectives of Sakala are: (1) To reform the administrative set up for ensuring good governance. (2) To create a single monitoring system for service delivery. (3) To fix time-lines for each service delivery. (4) To fix accountability on a single official responsible for the service. (5) To empower the citizen to avail of the services as a matter of right. (6) To reduce human interface by use of information technology. (7) To prevent corrupt practices and enhance government efficiencies.

4.1. Open Data on Procedure for Availing Services

Earlier, most of the applications would be delivered by hand and service delivery would be at the discretion of the government staff. Without a registered number and online application process, it was not possible to trace each application. Now, the procedure for availing a service including documents to be attached and the fees to be paid can be obtained at the department responsible for the delivery of service. Additionally, this information can be obtained by contacting the helpline or the website. Each service has a standardised workflow, fixed stipulated timelines, required documents specified and published, accountability fixed on respective officers in the process flow etc. For example, if one is applying for a Record of Rights Certificate details of service procedure and workflow are available on the website. See Annexure 1 and 2.

Whenever a citizen requests a service listed under Sakala, he or she receives a receipt / acknowledgement slip with a 15-digit GSC/sakala number. The service request is initiated and then a date is calculated automatically, taking into account specific timeframe to render that particular service and holidays. On processing the service request, the applicant is informed through an SMS and the status of the service request is updated on the website. The GSC number enables one to track the status of the application online or through Helpline.

If the application is rejected or the service is not provided within the stipulated time, then one can file an appeal to the Competent Officer / Appellate Authority or may register a complaint through the Sakala Helpline. The appeal should be filed within 30 days from the date of the expiry of stipulated time limit. The Competent Officer / Appellate Authority will hear the appeal and redress the grievance within a specified time. The applicant can claim the compensatory cost from the Competent Officer / Appellate Authority for failure to deliver the service within the stipulated time if the Designated Officer[5] has caused undue delay. The Designated Officer is liable to pay the compensatory cost, ***out of his salary***.

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[5] The 'Designated Officer' means an officer specified in the Schedule who is required to provide citizen related service. The 'Competent Officer' is an officer appointed by the Government who is empowered to redress the grievance in the service and to impose compensatory cost on the public servant defaulting or delaying the delivery of service. The Competent officer has the power to hear appeal against the orders passed by any Designated Officer. The 'Appellate Authority' means an officer appointed by the Government who is empowered with the power to hear appeal against the orders passed by any competent officer.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

712

5. ANALYSIS OF SAKALA'S ATTEMPTS TOWARDS BRINGING SYSTEMIC CHANGES

Implementation of the Sakala Act is a major improvement over other e-governance initiatives in India. ICTs have proven to be a powerful tool for grievance redressal. Apart from tracking one's service requests, public reports providing statistics on requests, disposals and pendency across all services can be viewed on sakala and e-Janaspandana[6] portals.

Figure 1
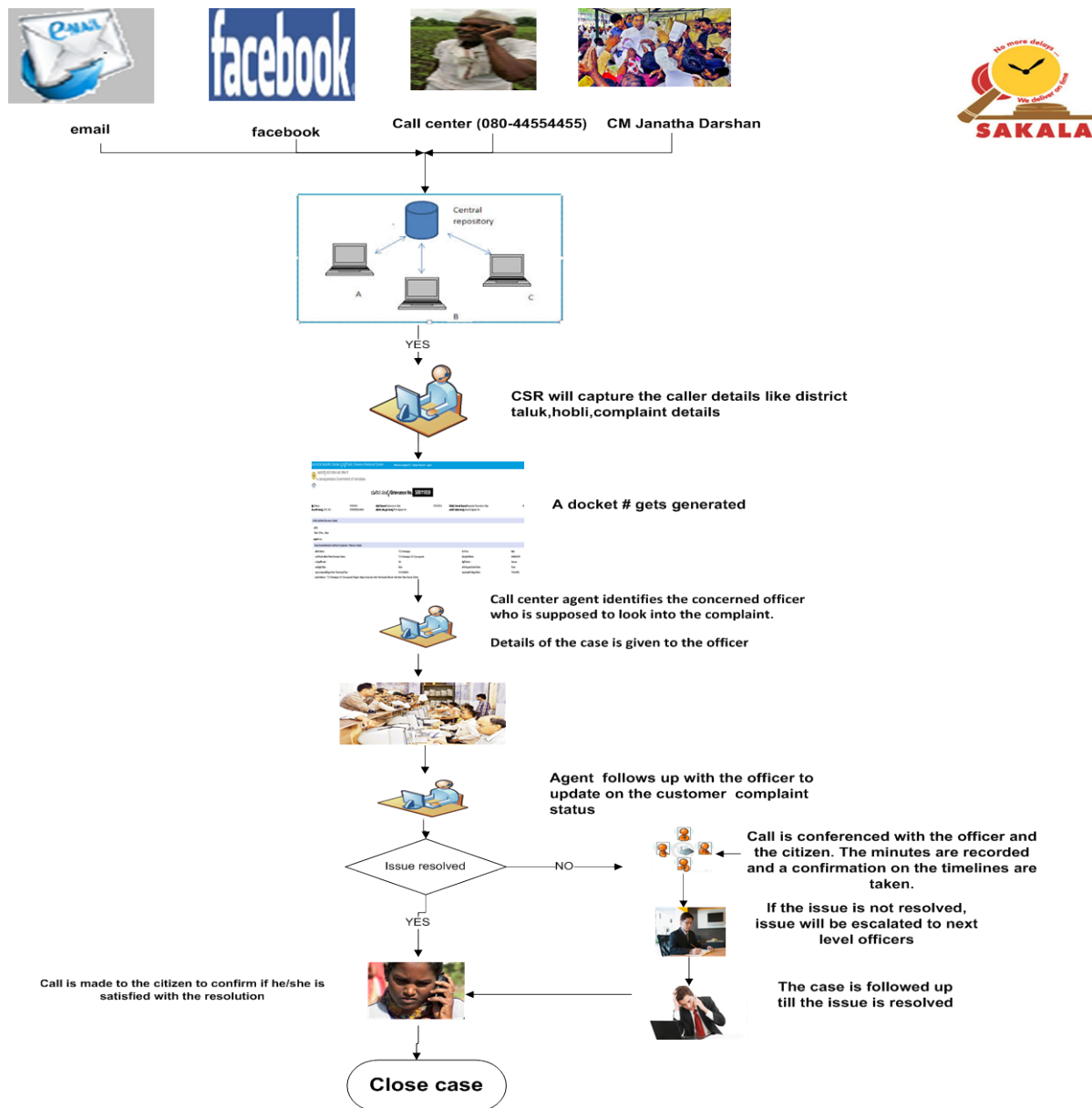
There are multiple channels for grievance redressal. Complaints can be lodged in any mode: through letters, emails, phone call, online, live-in television programme, Janata Darshan at Chief

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[6] For Sakala and e-Janaspandana:
http://sakala.kar.nic.in/gsc_home.aspx;http://www.sakala.kar.nic.in/gsc_rpt;
http://www.espandana.in

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

713

Minister's office, through helplines/call centers and helpdesks. A call centre, set up on a Public Private Partnership mode, acts as an interface between citizens and the Mission for providing information, lodging complaints and ensuring compliance. The call centre helpline not only acknowledges the complaints, but often follows up with the Nodal Officer of each department till the matter reaches a logical end. There has also been efforts to involve different organisations such as post offices or NGOs, in an attempt to eliminate the middle men and menace of bribery.

Every application can be tracked by the due date vs the stipulated time, apart from monitoring disposals done within the stipulated time, delays, rejections and appeals / complaints. Besides automated SMSs are sent to each official once in the morning about cases due on that particular day and once in the evening about total disposals that day.

Unlike many E-Governance projects in which the available information is not utilised to inform action, it is highly remarkable that data analytics are used extensively. Data can be drilled down to every GSC number, tracked and resolved. Earlier, there was no tool to locate what is happening to applications that have been submitted in government offices, in a real time basis. Sakala ICT and Software solution provides for entering all the applications received from citizens on a real time basis and monitoring the service delivery for all the departments/services in an integrated manner. Analytics software has been developed to give insights into critical managerial aspects to help in decision making process such as benchmarking performance, ranking/rating based on speed, rejections, delays, complaints & reach, besides mapping defaults to employees' service records through computerised Human Resource Management System.

Rich MIS reports helps in evaluating the performance in an ongoing manner and the Sakala Software helps to monitor and analyse a variety of trends. Elaborate Monthly Reports are prepared by the Mission. The list of poor performing offices based on pendency, rejections and complaints received and applications processed, helps the district/department heads to focus on poor performers. Some of the specific simplification procedures or systemic changes that have been brought about through Sakala are:

1.	Self-declarations in place of affidavits and notary attestations for all certificate related services
2.	NoC for passport verification by Home Department/police reduced from 120 days to 20 days
3.	Many services given at the taluk office are now being given at hobli level
4.	Caste certificate, now valid for life (earlier 1 year).
5.	Issue of Birth Certificate in Government hospitals itself.
6.	Exemption of Domicile Certificates by Housing Board for allotment of plots & houses.
7	Online application process for about 135 services.
8.	Appointment of volunteers as 'Sakala Mitras' or ambassadors.
9.	Land conversion process reduced from 120 days to 45 days.
10.	Assembly constituency-wise ranking of designated officers, apart from district and taluk based monthly performance evaluation.
11.	Reduction in the number of documents to be submitted during registration of schools
12.	Single platform for grievance management

The Analysis so far provides an overview of the efforts to bring about systemic changes under the umbrella of Sakala. In order to understand in-depth the specific issues in service delivery the authors chose to focus on the issue of delays and rejections of application within Revenue Department. Revenue department was selected because it has the maximum number of 49

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

714

services under Sakala, high demand for revenue services and has multiple problems of huge over dues and rejection of applications.

6. ROOT CAUSE ANALYSIS OF OVERDUES AND REJECTIONS IN REVENUE DEPARTMENT

As a first step the authors analysed all the monthly reports published by the Sakala Mission. The monthly reports provide performance ranking, district and taluk wise. Cumulative data for each department such as number of receipts per month, disposals, pendency as well as list of offices which have delayed services more than 7 times (defaulters) was also analysed. Analytics through the Sakala dashboard revealed that the highest delays/pendencies were found in the following services (See Annexure 3) and 42 offices (see Annexure 4) have major over dues. Further, service wise receipts, disposals and rejections were analysed for both Bangalore South and Anekal taluk offices (Annexure 5). One of the authors along with two officers from Sakala Mission visited these offices. Main issues and some solutions for timely delivery of services are:

Over Dues	In Revenue Department
	1. A majority of over dues are due to cumbersome and time consuming processes. Procedures, documentation and processes should be reviewed and simplified.
	2. Services such Khatha (Undisputed cases), conversion to non-agricultural land, Akar band and Tippan has huge pendency.
	3. Delegation of authority necessary for speedy disposals.
	4. Many services can be provided online and this can minimise over dues to a large extent.
	5. Shortage of staff.
	6. Data sync issues between respective departments and National Informatics Centre.
	7. Data integration of various departments such as Rural Development and Panchayat Raj, Bhoomi, Food and Civil Supplies and HRMS would ensure speedy disposal of applications.
	8. Digital signature cards could be opted for some services.
Rejections	1. When an applicant submits his/her application, Sakala or GSC number is not being given to the applicant.
	2. Reason for rejection is not specified in a majority of cases.
	3. In many applications, for example pensions, eligibility criteria not adhered to. Hence huge rejections.
	4. Officers/Staff sometimes are not fully aware of documents that are required and checklists not adhered to.
	5. Fake documents are submitted and hence rejected after verification.
	6. Citizens not contactable when the officials want clarifications.

The data analysed by the Sakala Mission reveals that 80% of delays are caused by 20% of the departments. More than 100 services are being delivered ahead of time (see annexure 6). For instance, Caste Certificate from the Revenue Department was delivered in an average time of 9 days against the stipulated 21 days.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

715

Root causes analysis reveals six key issues that are crucial for the success of a right to public service delivery legislation. They are: Traceability, Selection of Services, Openness, Service Innovation, Accountability mechanisms and systemic issues.

6.1. Traceability

One of the challenges which was revealed during the field visit was that when an applicant gives an application, GSC/Sakala number is neither given to the applicant nor entered into the computer. When this happens the service request does not get into the system and hence it is not possible to trace/monitor the request. Such bypass of procedures was found in services such as issue of birth certificates, death certificates, RTC corrections etc. This could be one of the reasons for zero receipts of some services in some departments.

Submission of mobile numbers are mandatory with each application. It is used to send SMS about the status of application and for clarifications. When data mining was done on mobile numbers it was interesting to note that the same number was repeated several thousand times. Further analysis and investigation revealed the involvement of middleman who file applications for a fee for various services. Action was taken against them. This example reveals that when available information is traceable, corruption can be tackled.

6.2. Selection of Services

Not all public services can be included under the ambit of 'service guarantees' without putting proper systems and mechanisms in place. Only the most sought after services by the citizens can be included in this ambit. Service guarantees can be an important tool provided the officials adopt it as part of their work practice.

6.3. Openness

Taking on from the Open Disclosure directive of the RTI Act, it has been made mandatory to put sign boards listing all Sakala in government offices. During field visits the author observed that old lists were on display and some paper posters were half torn. In spite of many efforts to create awareness about Sakala through workshops, training, media and involving NGOs, awareness about this legislation is very low across employees, citizens, departments and districts.

Although online portals of Sakala and e-janaspandana have open access, use of data analytics for management and evaluation by the employees is still very limited.

6.4. Service Innovation

The Right to Services Act itself can be a driver of innovation as this clearly shifts the onus from the public to the service provider in ensuring fulfilment of service. This can result in several re-engineering initiatives being introduced as the system and service delivery find ways to meet the challenges. ICTs as a backbone implies the important yet largely unexplored role of IT as an *operant* resource (i.e. as a trigger, initiator, or provider) in innovation (Lusch and Nambisan, 2014). Service innovation can help to develop detailed process and procedural maps, structural (re)design, end-to-end delivery process thinking, that is service innovations from the process of receiving applications to fulfilment.

6.5. Accountability Mechanisms

The Act stipulates a clear accountability mechanism and places the 'Designated Officer' as the sole person responsible for delivery of services. Accountability as well as the time-frame for each person is fixed. This information is available on the website. The government staff are also reminded through SMS/e-mail alerts. For example, it came to the notice of the Sakala Mission

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

716

that there are a huge number of deliberate rejection of applications. The designated officer sometimes rejects the service application given by the citizen citing reasons, which are not logical in nature. This is a way to manipulate the system, for reducing the number of pendencies against the designated officer. A new feature has now been added to the software that asks for the reasons for rejection. If there is a delay a compensatory cost mechanism has also been stipulated. In spite of this only a small number of people have come forward to claim compensation.

6.6. Systemic Issues

Resolution of systemic issues should be an ongoing and iterative on part of each department. There is an immediate need to adopt standard operating procedures at various levels. Standardization of procedures, workflows, timelines, check-list of documents and appeal provisions by Centre and State and simplification of procedures to reduce number of levels/documents for decision making is essential. Standardization and simplification are critical for successful implementation of the Act.

There are tremendous challenges in terms of coordination between departments, between offices within a department as well as between officers within the same office. Integration across departments and strengthening of e-initiatives are needed.

7. CONCLUSION

Public service delivery suffer from cumbersome procedures and lack of accountability resulting in inordinate delays. The demand for greater openness and accountability of public systems is becoming more and more eloquent in India. The Sakala scheme of public accountability in Karnataka seems to have created a new benchmark in raising expectation of the people.

The Root cause analysis revealed the specific reasons for delays in certain services and where there is scope for improvement. For a citizen Sakala offers multiple channels for grievance redressal. Apart from tracking one's service requests, public reports providing statistics on requests, disposals and pendency across all services can be viewed online. IT tools and mobile technology have played an important role in facilitating openness. Streamlining of processes, ability to track every application and traceability at every level, assigning specific number of days for providing particular services has helped not only citizens, but also the internal departmental officials in holding employees concerned accountable.

However, there is lacunae in its actual implementation, which can be improved over time. Although there is provision for compensatory cost, it is rarely applied. Sakala is an umbrella programme and it is upto to the respective departments to take it forward. There is an immediate need to address the innumerable systemic problems by the respective departments themselves. Awareness among citizens as well as motivating officials to incorporate Sakala as part of their work practices is important. Efforts are being made by Sakala Mission to popularise it through various publicity channels.

There are a number of issues such as network problems, electricity, meagre funding for stationery such as paper and cartridges which have affected the timely delivery of services. Training for employees as well as officers in using dashboard as an evaluation tool is required. The authors conclude that Sakala's attempts towards improving systemic procedures, internal process improvements and accountability at various levels is indeed laudable and can have a huge impact on timely delivery of services and in bringing down corruption.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

717

The present study focussed on analysing internal process improvements and changes in systemic procedures and not external perceptions of citizens or its performance. In future studies can focus on citizens' perception of Sakala; challenges of implementation at different levels and in different departments; comparison of rural and urban uptake of Sakala services and change management for timely delivery of services.

REFERENCES

Administrative Training Institute, Mysore (2013), Report, *Karnataka Guarantee of Services to Citizens Acts - 2011 (Sakala) Evaluation of Implementation and its impact on Stakeholders* (Citizens and Others).

ADB Report (2013) *Empowerment and Public Service Delivery in Developing Asia and the Pacific*. http://www.adb.org/publications/empowerment-and-public-service-delivery-developing-asia-and-pacific Accessed on August 6, 2014.

Christopher W. L. Hart (1988), "The Power of Unconditional Service Guarantees," Harvard Business Review 66, July–August 1988, 54–62.

Dwayne D. Gremler (2009), "Twenty Years of Service Guarantee Research," Journal of Service Research, 11, No. 4, 2009, 322–343.

Livingston A D, G Jackson and K Priestly (2001) Root Cause Analysis: Literature Review. Contract Research Report 325/2001, HSE Books. ISBN 0717619664.

Lusch R and Nambisan, S. 2014, "Service Innovation: A Service-Dominant Logic Perspective," MIS Quarterly (forthcoming).

Mark Bovens, Robert E. Goodin, and Thomas Schillemans (ed) in *Oxford Handbook of Public Accountability*; Oxford: Oxford University Press

Muralidharan Y G (2012) *Public Service Guarantee Laws in India. A Comparative Analysis,* Paper presented at the National Consultation on 'How Inclusive are our Cities? Implications for the 12th Five-Year Plan from the Perspective of the Urban Poor', Bangalore.

Ravindra, A (2004) An Assessment of the Impact of Bangalore Citizen Report Cards on the Performance of Public Agencies. Evaluation Capacity Development, Working Paper no 12, Operations Evaluation Department, Washington DC: World Bank.

Sean Gailmard August (2014) Accountability and Principal-Agent Theory in Mark Bovens, Robert E. Goodin, and Thomas Schillemans (ed) in *Oxford Handbook of Public Accountability*; Oxford: Oxford University Press

Vikram K Chand (2006) (ed) Reinventing Public Service Delivery in India: Selected Case Studies, New Delhi: World Bank and Sage Publications.

Secondary Sources

http://www.sakala.kar.nic.in/gsc_rpt Accessed on April 25, 2014.

http://www.espandana.in Accessed on April 25, 2014.

http://sakala.kar.nic.in/gsc_home.aspx Accessed on April 25, 2014.

http://sakala-karnataka.blogspot.in/2013/03/sakala-mission-karnataka-guarantee-of.html. Accessed on July 3, 2014.

http://karnataka.gov1.in/citizen-service/what-is-the-karnataka-guarantee-of-services-to-citizens-act/ Accessed on July 3, 2014

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

718

OGP:http://www.opengovpartnership.org/webinar-role-open-government-public-service-delivery

Open Gov Data: http://www.opengovguide.com/topics/public-services/

http://opendatahandbook.org/pdf/OpenDataHandbook.pdf

Ashok Kumar Sircar (2012) The Right to Public Services Laws, EPW Vol.XLVII. No. 18, May

Gopalkumar, K., Vivekanada, M., Paul, Samuel., Sekhar, Sita., Suresh, Balakrishnan (2004) State of India's Public Services, EPW Vol. XXXIX No. 09 Feb.

Nyamu-Musembi., Celestine and Cornwall. A (2004) What is the "rightsbased approach" all about? perspectives from international development agencies, IDS Working Paper 234, Sussex, England

Shareef, M S, Jahankhani., Hamiad (2012) E-Government Stage Model: Based on Citizen-Centric Approach in Regional Government in Developing Countries, International Journal of Electronic Commerce Studies Vol.3 No.1 pp 145-164

David Osborne, and Ted Gaebler, (1992), Reinventing the Government, Addison-Wesley.

Newspaper Articles

http://www.bangaloremirror.com/index.aspx?page=articleandsectid=10and contentid=201212252012122506364798b1a1857 accessed on 23rd Feb, 2013.

Shashikala Sitaram: September 28th 2012, Time Bound Services At Last, Deccan Herald, http://www.deccanherald.com/content/281539/timebound-govt-services-last.html.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

719

ANNEXURE 1

Details of Service Procedures for Record of Rights Certificate in Revenue Department.

ANNEXURE 2

Details of workflow for Record of Rights Certificate in Revenue Department.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

720

ANNEXURE 3

Delays/ Pendencies found in following services in Revenue Department as on 7.7.2014

DEPARTMENT	NAME OF SERVICE	TOTAL
HOME	*Receipt and Disposal of Petitions	776
	*NoC for Passport Verification	418
	*Arms License Issue and Renewal Verification	318
	*Service Verification	192
	*Police Verification Certificate for Institutions/ Companies	55
	*NOC for petrol pump, gas agency, hotel, bar etc.	20
	*Police Clearance Certificate for going abroad (Visa for studies) or Police Clearance Certificate for Foreign Nationals	
	TOTAL	1858
INSPECTOR GENERAL OF REGISTRATION AND STAMPS	Registration of Land / property	407
PRE-UNIVERSITY BOARD	Registration for Opening of new Private PU Colleges	353
REVENUE	Change of Khata (Undisputed cases)	3088
	All types of Caste Certificate	1769
	Residence Certificate	698
	All types of Income Certificate	545
	Conversion of agriculture land to non-agriculture purpose	481
	Small and Marginal Farmer Certificate	288
	Surviving Family member Certificate	164
	No tenancy certificate	147
	Domicile Certificate	114
	Landless Certificate	84
	Mutation Extract	80
	TOTAL	7810
RURAL DEVPT & PANCHAYAT RAJ DEPT	Alteration To Assessment List	147
	Maintenance Of Drinking Water	58
	Maintenance Of Street Lights	58
	TOTAL	307
SURVEY& SETTELMENT	Issue of Duplicate Copies in Survey Section (Aakar Band)	170
	Issue of Duplicate Copies in Survey Section (Tippan)	61
	Issue of Duplicate Copies in Survey Section (Atlas)	47
	Issue of Duplicate Copies in Survey Section (Index of Land Records))	30
	TOTAL	342
Grand Total		11077

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721

ANNEXURE 4

Data Analytics revealed that these 42 offices having major overdues as on 7.7.2014

Name of Office
Commissioner Of Police, Bangalore City;
Commissioner Of Police, Mangalore City
Northern Range
District Police Office Gulbarga
Madivala Police Station Police Station
J.P.Nagar Police Station
District Police Office Bangalore
District Police Office Dakshina Kannada
Subramanyapura Police Station
Sub Registrar Keruru
Sub Registrar Hosakote
Sub Registrar Banasawadi, Bangalore
Sub Registrar Dasanapura, Bangalore
Sub Registrar Soraba
Sub Registrar Attibele, Bangalore

COMMISSIONER/DIRECTOR

Taluk Office, Bangalore South
Taluk Office, Anekal
Tahsil Office, Manvi
Taluk Office, Nagamangala
Taluk Office, Bangalore East
Taluk Office, Sindhnur
Taluk Office, Mangalore
Taluk Office, Pandavapura
Deputy Tahsildar Office, Kasaba
Taluk Office, Kanakapura
Deputy Commissioner Office, Mandya
Taluk Office, Bhalki
Taluk Office, Bangalore North
Taluk Office, Krishnarajpet
Taluk Office, Bellary
Taluk Office, Magadi
Taluk Office, Yalahanka
Gram Panchayat Office, Arishinakunte
Gram Panchayat Office, Vishweshwarapura
Gram Panchayat Office, Managuli
Survey Supervisor, Taluk Offices in Anekal, Kadur, Bangalore North, Kunigal, Devanahalli, Virajpet

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

722

ANNEXURE 5

Service-wise Receipts, Disposals & Rejections at Anekal Taluk Office

Service Name	Total Receipts	Total Disposals	Total Rejections	Rejection Rate(%age)
No Objection Certificate under LRF Grant	1	1	1	100
Agricultural Labour Certificate	22	22	12	54.55
Living Certificate	6	6	3	50
Not Re-married Certificate	7	7	3	42.86
Surviving Family member Certificate	233	229	88	38.43
Solvency Certificate	25	25	9	36
Landless Certificate	60	59	20	33.9
Agriculturist Certificate	236	235	75	31.91
Indira Gandhi Old Age Pension	3707	3282	990	30.16
Destitute Widow pension	2446	2217	650	29.32
Non-Creamy layer Certificate	65	65	19	29.23
Change of Khata (Undisputed cases)	4610	3705	1068	28.83
Small and Marginal Farmer Certificate	535	535	154	28.79
Unemployment Certificate	32	32	9	28.13
Agricultural Family member Certificate	595	592	164	27.7
Sandhya Suraksha	1897	1703	346	20.32
No Government Job Certificate for Compassionate Appointments	18	18	3	16.67
Residence Certificate	1785	1768	259	14.65
Pension for disabled persons	697	611	89	14.57
No tenancy certificate	8294	8230	1179	14.33

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

723

ANNEXURE 6

Presented by the Sakala team to the Chief Secretary, Government of Karnataka. Meeting on 25th May, 2013

Service Name	Department Name	Disposals	Stipulated Time	Avg. Taken Time	Citizen saves
Modification in Existing Ration Card	FOOD AND CIVIL SUPPLIES	184020	7	1.16	5 .5 days
Registration of Land / property	REGISTRATION AND STAMPS	116121	1	1	Exactly on time
Issue of C Form declarations under the CST Act, 1956.	COMMERCIAL TAXES	75530	10	4.48	5 .5 days
Registration of Vehicle	TRANSPORT	70377	30	12.2	17 days
Learning Licence	TRANSPORT	62294	7	2.42	4.5 days
PROVIDING EMPLOYMENT TO UNSKILLED LABOURS (MGNREGS)	RURAL DEVELOPMENT AND PANCHAYAT RAJ	58905	15	2.18	13 days
Driving Licence	TRANSPORT	36427	30	10.33	19 days
NoC for Passport Verification	HOME	13656	20	9.05	11 days
Issue of copy of FIR to the complaintant	HOME	12071	1	1	Exactly on time

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

724

USING HEALTH MANAGEMENT INFORMATION FOR ACTION: A HISTORICAL ANALYSIS OF TAMIL NADU, INDIA

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Abstract: Well designed and implemented health information systems (HIS) when effectively used can play an important role in improving health sector outputs and outcomes. At the same time, it has been observed that many of these systems fail due to the dominance of a statistical rather than public health oriented approach to data with the primary focus being on generation of data for strengthening central control rather than the development of locally usable indicators for strengthening health services delivery. This paper traces the history of health information systems in the primary health care sector of the state of Tamil Nadu in India, which is well known for its positive health sector performance. The attempts of the state to integrate different data streams and introduce a web based HMIS is documented along with the current status of implementation of the new system. Finally, the paper highlights concerns regarding the upward focused, data centric features of the present system and suggests that urgent action should be taken to make the system more sustainable and robust by converting the generated data into useful information and further into knowledge that translates into local action.

Keywords: Health Management Information Systems, Tamil Nadu, web based health information systems, Local use of information

1. INTRODUCTION

Tamil Nadu is a state in India that has been recognized for its health sector performance (Muraleedharan et al., 2011), contributed to by its structure of a public health cadre at state and district levels (Das Gupta et al.,2009). With the advent of the Danish International Development Agency (DANIDA) and Reproductive and Child Health (RCH) projects in the mid 1990's, the state health department made extensive use of information and communication technology (ICTs) to streamline the Health Information Systems (HIS), with focus on the functioning of Primary Health Centres (PHCs) and provision of Maternal and Child Health (MCH) services.

This paper traces the history of health data management in the PHC system in the state over a decade, followed by integration of different data streams, and a new web based system introduced in 2008 under the Tamil Nadu Health Systems Project (TNHSP). The paper analyzes the functioning of the integrated system with respect to data needs of the State and Central governments. Existing concerns are examined with respect to making the system more sustainable and robust by increasing the use value of the HIS. More specifically, the main research question this paper pursues are:

i. What challenges are faced and steps required to effectively integrate different data streams to meet needs of different stakeholders?

ii. What impediments are encountered in using HIS effectively to cause positive change in health processes and outcomes.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

725

The rest of the paper is organized as follows. In the next section, I present literature relevant to the understanding of local HIS implementation issues. Following this, the historical evolution of PHC HIS in the state is discussed. The final section analyzes this case with reference to the research questions, and discusses challenges to make the HIS more effective.

2. LITERATURE REVIEW

While HIS have a strong potential to improve health systems performance in developing countries (Lippeveld and Sauerborn, 2000), this potential remains unrealized due to various "design-reality gaps" (Heeks, 2002), and impediments at the health system (Lippeveld and Sapirie, 2000) and organizational levels (Littlejohns, Wyatt and Garvican, 2003). Health Management Information Systems (HMIS) are typically compartmentalized, framed within vertical programmes, which impedes use of information for action, and creates sustainability challenges (Chilundo and Aanestad, 2003, 2004; Kimaro and Nhampossa, 2005).

HMIS (Health Management Information Systems) initiatives are usually designed and implemented by national ministries, focused on generating statistics, centralized and upward looking, with limited aims of nurturing local use of information for action. Such centralized systems are prone to failures with respect to promoting action (Braa et al., 2007), often seeking to simplify complexities to create social order, while ignoring local realities and needs (Raghvendra and Sahay, 2006; Sahay, 2011).

Chilundo and Sahay (2005) discuss design biases inscribed into HIS due to the dominance of statisticians and medical doctors who favour statistical methods to model diseases Data collection and reporting formats designed by such experts (Lippeveld, 2001) reinforces the design bias of upward reporting, marginalizing the use of indicators for improvement of local health services delivery

Various researchers (Kimaro & Nhampossa, 2005; Monteiro, 2003; Chilundo & Aanestad, 2003; Braa et al., 2001) have criticized donor-driven efforts which create parallel systems to meet their own information needs, contributing to overlaps and gaps in data collection as well as weak standards and huge work burden on the peripheral worker. This sub-optimal implementation limits the culture of information use and associated impact of the HIS. (Braa et al., 2007). A functional HIS, on its own, represents a necessary but not sufficient condition for information use (Cibulskis and Hiawalyer, 2002). Various institutional and management processes are needed to support it, as exemplified by the Malawi experience (Moyo et al., 2005). Most developing countries with some exceptions like South Africa can be classified to be at a preliminary level of HIS, geared primarily towards data collection and reporting, and not achieving information use to any noticeable degree (Braa et al. 2004, Sahay and Lewis, 2010).

Sahay (2011), while discussing inherent limitations of HIS in India elaborates on system related issues that are endemic at all levels of health administration which include fragmentation, lack of standardization of reporting formats, low level of use, excessive data demands on health workers who are often inadequately trained, and insufficient political commitment. There is often an over emphasis on the tool rather than the information collected. Other researchers (Bodavala, 2000; Sahay and Lewis, 2010) have also reinforced these findings, describing the Indian HMIS information flow to represent a cylinder with all data collected by sub center flowing up in raw form (as data elements) rather than as processed information (indicators) with weak feedback to the peripheral levels (Harikumar, 2013).

These examples suggest two varying perspectives on HIS with implications on understanding information use. One, which we call as the "statistical perspective" represents systems which are top-down, centrally owned, donor driven with strong statistical assumptions embedded. The other, which we call a "public health information perspective" represents systems geared

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

726

towards the generation and use of indicators to support local action. There is a need to understand these differing rationalities and power asymmetries across stakeholder groups (Chilundo and Aanestad, 2004) and resolve them through institutional and structural rearrangements, for the HIS to cause positive outcomes.

In this paper, through a historical analysis of the evolution of HIS in Tamil Nadu, I analyze the forces at play underpinning the technical interventions carried out, their implications on information use, and corrections required to nurture the public health information perspective.

3. METHODOLOGY

The present study involves an interpretive (Walsham, 1993) case study methodology wherein the author has played an important official role as the head of the health system in the state between 2008 and 2012, first as Mission Director of the National Rural Health Mission (NRHM) (2008-2011) and then as Secretary (2011-12). In these senior positions, the author was responsible for providing directions to the health sector reforms, including those related to setting up of a computerized information system. As such, there was a need to balance two specific directions: one, implementing reforms designed at the national level under NRHM since 2008; and two, continuing the state specific HIS strengthening efforts. To find this balance, it was necessary to understand the historical basis of HIS in the state, how it had evolved, the embedded challenges, and how the state could build on the positives, and make corrections where required.

This process of steering health reforms enabled the author access to various kinds of data which are drawn upon to arrive at the analysis presented in this paper. Numerous field visits were made to the health facilities to personally assess the existing recording and reporting formats and understand the work done by the commercial vendor developing the HIS under the TNHSP framework. The author also attended various meetings with the Central government to understand their vision of reforms and how the state's efforts could be synergized with them. One major initiative taken was to invite HISP India (see hispindia.org) through the National Health System Resource Centre, a national think tank for technical support to NRHM, to initially help the state with the integration of these two objectives and later to provide analysis reports to strengthen local use of information.

While wearing the dual hats of 'actor' and 'researcher' did pose a dilemma in maintaining an objective stand, the interpretive research methodology lends itself to such a situation. As a 'knowledgeable insider' the author added to this paper, her subjective interpretations and insights, developed as both policy maker and researcher, towards studying the state HIS,

4. HISTORICAL EVOLUTION OF PHC HMIS IN THE STATE.

The section describes the early efforts of the state since the late 1990s to set up a computer assisted PHC HMIS consisting of the Institutional Services Monitoring Report (ISMR) and documents the manual systems around the MCH data using Form 9. By 2008, the State was faced with dual challenges of setting up an integrated web based HMIS funded under the World Bank assisted TNHSP while simultaneously meeting the upgraded information needs under the Central NRHM reforms. Between 2008-12, the state took various steps to set up an integrated web based HMIS, which would meet both requirements, with the assistance of HISP India, using the DHIS-2 software platform. This process is discussed in the later subsections.

4.1. Institutional Services Monitoring Report

Until the late 1990's, State health data collection covered field outreach activities submitted through Form 9 to meet Central Government needs, especially for MCH. There was no consistent reporting of institutional performance and activities, especially of the PHCs, which formed the nerve system of the health system (WHO, 2009).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

727

The ISMR introduced in April 1999, was a step towards bridging this gap. Funded by DANIDA, a computer readable form was designed and introduced after careful consultation at all levels including data providers and users (PROD, 2004). The data was filled by the PHC staff on a monthly basis and sent to the statistical section of the state Public Health Directorate. The system used Optical Mark Reader (OMR) forms, which were scanned using the computer, collated and analyzed for a number of parameters. Besides collecting data on PHC performance such as IPD and OPD attendance, surgeries conducted, lab tests done etc., data was also collected on health manpower (doctors, nurses etc.), and utilization of health infrastructure (PHC vehicles, ambulances etc). The monthly data was submitted following a strict time schedule (by the 10th of the next month) which was not only analyzed and sent upwards to the policy level, but also sent as feedback to various district officials,

The major advantage of this system was its simplicity and ease of use. The process at the PHC level was manual, and no computer skills or equipment were needed. Since the forms were computer readable, the system allowed quick and comprehensive analysis and feedback which highlighted performance lapses and corrections required.

The ISMR was discussed in state, district and PHC levels review meetings which helped to increase awareness resulting in substantial increase in PHC performance levels (WHO, 2009). Between April 1999 and April 2004, the proportion of the 1413 PHCs carrying out deliveries rose from 40% to nearly 90%. Average daily outpatient attendances at PHCs rose from 68 to 116, with 60% of this increase taking place in the eight months following the introduction of the ISMR. (PROD, 2004). The system also helped to identify and resolve problems such as shortage of staff and non-functional infrastructure.

The introduction of ISMR was also accompanied by a redesign and rationalization of the registers maintained by the field personnel (WHO, 2009), resulting in a reduction in number of records by 20% through minimizing duplication and redundancy. The registers and forms, were also redesigned in consultation with both data providers and users, to enable ease of filling up of the ISMR and Form 9 formats.

The time spent in sensitization and training of staff helped in increasing the acceptability and use of the ISMR. While commenting on the initiative's success, the Policy Reforms Options Database (2004, Ref No 69, Comments) remarked: "*securing ownership of the scheme through careful preparation of personnel at all levels (was) an important contributory factor to the success of the scheme*".

The state took adequate steps to improve the computer infrastructure and staff skills at the PHC level, which served as the base for future initiatives. Initially, DANIDA provided computers to the 384 Block (sub-district unit) level PHCs, which was then extended to all PHCs. Computer training was provided to all least two staff per PHC, and later to all field workers (Village Health Nurses) in the state, who have now been provided with laptops.

The ISMR system, continued till 2010, yielding much of the data requirements of the health system. This system indicated the state's commitment to use ICTs to strengthen HMIS and facilitated the later transition into an integrated web based reporting system.

4.2. Maternal and Child Health Data-Form 9
The data covered in Form 9, originally introduced by the Central government, included details of antenatal care services and immunization provided, incidence of childhood diseases and reproductive tract infections (RTI), and information on maternal and infant mortality (WHO,2009). The form also included private sector performance on immunization and family welfare services. The entire data in this form was collected area wise[1] by the VHN, the first level

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[1] It is necessary to highlight the difference between institutional reporting and area reporting, in the context of health data. The first type of reporting represents data pertaining to the health care services provided by a particular

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

728

field functionary providing primary health care. Though Form 9 was manually filled and reported on a timely basis to the Central government, it also provided the basis of detailed reviews on health performance which strengthened the state's performance under these two programmes.

4.3. Tamil Nadu Health Systems Project (TNHSP) - Web based HMIS

The next major thrust to HIS strengthening came in 2008 with the World Bank assisted TNHSP to establish a centralized web based HMIS. This system also conceptualized making real time data, including patient records, available through the establishment of a Hospital Management System (HMS). It was initially proposed to include the PHCs under both the HMS and HMIS components (TNHSP, 2010). By early 2010, Phase I of the programme was implemented, with the HMS and HMIS established in 31 hospitals in 5 districts and HMIS introduced in 272 secondary hospitals. In addition, the HMS and HMIS were piloted in 5 PHCs. Various operational difficulties were identified during the pilot, prompting the state to postpone the implementation of the HMS in the PHCs and implement the HMIS alone. To facilitate easy transition from the legacy systems, the formats of the ISMR data collection for institutional data and Form 9 for the area based MCH data were retained. Data entry continued to be done by PHC staff for the institutional data and VHNs attached to the PHC for the MCH related data.

4.4. National Rural Health Mission (NRHM)- National online web portal for district level data entry

Introduced nationally in 2005, NRHM was charged with the responsibility of bringing about architectural corrections to the health system to help achieve the overall goal of making the health system more equitable, affordable and effective (NHSRC, 2012). Strengthening the HMIS was a key area of reform. In 2008, all states were required to upload their data (based on revised formats) onto an online web portal at the district level. Despite the fact that the state had already designed and piloted a web based HMIS under TNHSP, data still had to be entered manually at the district level for the NRHM HMIS, since 10% of data elements were missing in the existing forms with respect to the national formats (Lewis, 2011).

4.5. Path to integration and strengthening analysis –Role of HISP India and DHIS-2

Though the TNHSP pilot for web based HMIS in the first 5 PHCs had been developed after consultation with the stake holders, it did not have any flexible features, either for modifying data elements or for creating indicators. As it predated NRHM reforms, it had not been customized to meet NRHM requirements, and was not interoperable, forcing manual uploading of data to the national web portal.

At this time, HISP India was brought in as an operational partner to provide technical support to the state to integrate the data streams, meet national data requirements and strengthen data analysis (Lewis, 2011). The DHIS-2 open source software was introduced by HISP India as an integration tool, and had features of flexibility, end user control, data validation and analysis tools. Detailed consultations were held with all stakeholders including the developer of the web based system under TNHSP, policy makers as well as field level functionaries to decide the pathway to integration. Ultimately, it was decided that the web based online system would be used for collection and data entry. Data would be exported into the DHIS-2 using XML data standards which would generate and upload the prescribed reports into the national portal. The DHIS-2 portal would serve as the state data repository and carry out validation and analysis of district level data, and provide feedback. Once this web based system stabilized, the existing ISMR and the Form 9 reporting would be discontinued. Data entry screens including the 10% missing data elements were integrated into DHIS-2 making it capable of generating the

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institution (eg PHC) whereas in the case of area based reporting, the data is collected based on the services availed by the people living in a designated area, irrespective of the institution where the services are provided.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

729

completed national data reports. The HISP India team worked with the service provider and the NRHM statistical team to create a software bridge to transfer data to DHIS-2. Legacy data for April-December 2010 was imported for testing the integration and developing key performance indicators as well as for training purposes.

In order to make the new system functional, the PHCs had to start reporting online on a timely basis. Issues of internet connectivity and adequate bandwidth at the PHC level had to be resolved. A state level core team was set up to trouble shoot issues at the field level and monitor timeliness. Data was often uploaded in the wee hours of the morning to overcome bandwidth problems. Due to these focused and consistent efforts, the PHC online report became fully functional by September 2010, six months after the integration had started.

The state created a set of five master trainers for DHIS-2, trained in the HISP India office in New Delhi, who trained state level functionaries through a cascade model of training. Direct face to face training was conducted for the district staff at the state headquarters with the HISP India team. Video conferencing was also used to train the health department staff in using DIHS-2 for data quality improvement, as well as an integration and analytical tool. Training was carried out in the use of the DHIS-2 features of indicator building, analysis and graphical representation of data. Though accustomed to collection of large volumes of data, the concept of indicator development was novel to most field functionaries. For instance, they were comfortable with reporting the number of antenatal women registered in the first trimester, but were unaware of how to convert the data to the relevant indicator viz: the percentage of antenatal women registered in the first trimester, to study performance of early antenatal registration in their area. Some key indicators developed are given below:

16 KEY INDICATORS			
A	**PREGNANCY CARE**	**C**	**POSTNATAL & NEWBORN CARE**
1	ANC Registration in 1st Trimester Rate	9	% Women Discharged under 48 hours at public institutions
2	ANC 3rd Visit Coverage Rate	10	% PNC under 48 hours
3	ANC 100 IFA Coverage Rate	11	% Newborn Weight Less than 2500 gms
4	ANC TT2/ Booster Coverage Rate	12	% Newborn Breastfed within 1 hour
5	% Complicated Pregnancies Attended at institutions	13	% Measles given under 1 year against live births reported
B	**CHILD BIRTH**	**D**	**REPRODUCTIVE AGE GROUP**
6	% SBA Delivery to Total Home Delivery	14	% Post-partum Sterilization to Total Female Sterilization
7	% Institutional Delivery to Total ANC Registration	15	% Male Sterilization to Total Sterilization
8	% Caesarean section at public institutes against total public institutes deliveries	16	% IUD (including PPIUCD) against Total FP (Sterilization + IUCD)

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

730

Table 1- Key indicators for Maternal and Child Health

As part of the capacity building exercise, district level performance was analyzed against the state average for all the major indicators and presented graphically. An example of one such graph (using 2011-12 data) showing districts that functioned below the state average for one of the selected indicators is presented below.
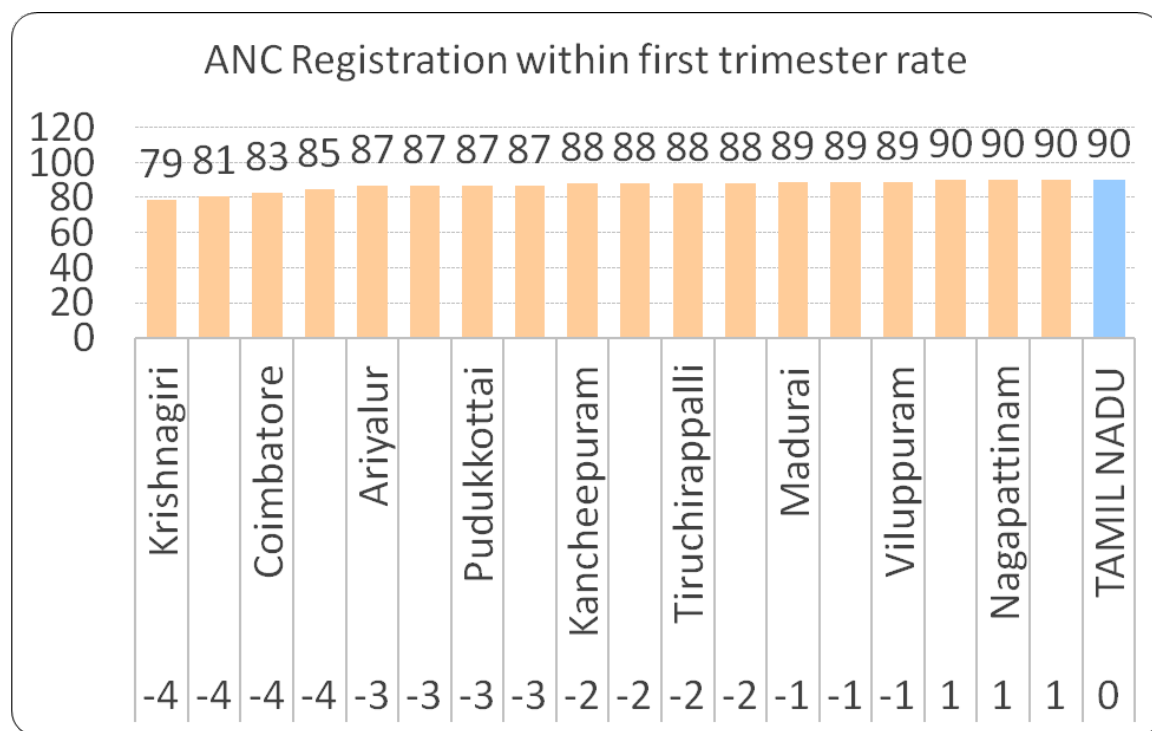
Figure 1- District level indicator analysis

Districts were also encouraged to carry out similar graphical analysis for their PHCs for use in district level planning meetings. Efforts were undertaken, in consultation with field functionaries, to develop charts and graphs for key indicators at the PHC level comparing the same to district and state performance. This visual analysis was aimed not only to improve the understanding of PHC staff but was also to widen public access to build broader confidence regarding the performance of the public health system. New concepts such as testing for completeness (number of key data elements with zero value or no entries), correctness (number of moderate and extreme outliers reported against a set of key data elements) and consistency (district ratio for identified basic indicators is within 33% of the state's ratio) of data using DHIS-2 were introduced during the training programmes.

The situation changed in early 2012, when attention to the integrated system greatly diminishing due to transfer of various key functionaries, including the author. Moreover, the Central Government insisted on exclusive use of the NRHM web portal (PRC, 2012). Hence, routing of the data through DHIS-2, and consequently its use for analysis and knowledge sharing was discontinued gradually in 2012-13.

5. PRESENT POSITION OF THE PHC HMIS IN THE STATE

5.1. Features of the Integrated web based HMIS

The state today operates a comprehensive web based HMIS, with a unified reporting platform across the health directorates (HFW, 2014). Thus, while the use of DHIS-2 was stopped, data

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

731

streams from various health programmes and facilities were successfully integrated and standardized enabling data to be used for all State and Central programmes.

The functional areas covered by the unified HMIS included the institutional PHC performance reports as well as the area based Maternal and Child Health data. Additional information such as the service registers of the PHC personnel and the status of PHC equipment have now been included in the reporting system. All state secondary public hospitals are covered by the online HMS and HMIS, now being expanded to cover the government medical colleges (tertiary) hospitals as well. Another innovative initiative is the Pregnancy and Infant Cohort Monitoring and Evaluation (PICME) system which supports a web based database tracking of nearly 1.5 million pregnant women and children. Though these initiatives show the state commitment to use modern ICTs, these databases suffer from the same pitfalls discussed with respect to the PHC HMIS.

5.3. How well does the Present PHC HMIS Function

A HMIS system is assessed by its level of use and quality of its data as well as the robustness of the inbuilt feedback mechanisms. At the state level, discussions with senior officers revealed that comparative tables are prepared district wise using the data collected for nearly thirty three data elements (not indicators!) for all aspects of PHC institutional performance which are used for policy purposes at the state level.

The districts and PHCs are ranked on seven data elements which relate to inpatient and outpatient attendance, deliveries, caesarians and sterilizations. The ranking is based on absolute numbers and no indicator based on population covered by the PHC has been developed. Thus, the development or use of district and PHC level indicators visualized through charts and graphs does not seem to be in vogue. It is anecdotally learnt that some districts use data for their PHC level review, but only as data elements and not as indicators.

The NRHM web portal (https://nrhm-mis.nic.in) shows that the district level data of the state is being uploaded with no major time delays. The central NRHM web portal checks for completeness and gives feedback to the districts on incomplete data elements and consistency of data. Though the state's web based HMIS software also has these capabilities, it is not clear if the same quality checks are done for non NRHM data elements.

The picture is not rosy when we look at feedback intended to inform and correct the health system performance in districts. The NRHM web site has now put up both district data and indicator tables for each district and state, along with analytical reports, score cards and dashboards (https://nrhm-mis.nic.in/hmisreports/analyticalreports.aspx) that triangulate HMIS data with national level surveys. However, this comparative analysis is not systematically communicated to the districts, and is left to individual states, districts and users to find and use these reports from the website.

The state is in the process of setting up a State Health Data Resource Centre as a central health data repository which can provide health facility wise data at various levels to be used for evidence based policy formulation. Software development is under progress which involves the identification of key performance indicators and establishing a state level dashboard. While these aims are laudable, it only focuses on the policy makers, excluding attention on ensuring information access to the field for local action.

6. CASE ANALYSIS AND FINDINGS

6.1. Challenges Faced and Interventions Taken: Integration

i). The entire process of integration was taken up with broad participation of all stake holders and not by mere directives from the top down. Discussions with field functionaries regarding difficulties of data collection and entry strengthened their cooperation.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

732

ii) A thorough revision of data sets was undertaken, in consultation with stakeholders, to reduce required data elements to a minimum, thus reducing field worker load. Moreover, definitions of data required was unified through a process of consensus, applying the principle of 'satisficing' (Sahay and Lewis, 2010, pg 82) both State and Central data needs taking into account field level resource constraints.

iii) The process of integration was gradual, starting with the existing systems and building on them. This evolutionary, problem directed approach helped build field level confidence and capacity.

iv) A core HIS team was created at the state level with nodal officers in each district for trouble shooting and follow up. Capacity building was provided at all levels to improve the culture of information use, with the web based technology positioned not as an end in itself, but as a means to collate and analyze data more efficiently.

v) The author herself played the role of 'champion, 'providing central leadership and motivation to make the integration process happen.

6.2. Challenges faced and interventions suggested: information use

To transform the web based HMIS into a system which can cause positive change in health process and outcomes, the following challenges have to be addressed:

i) The software should be made as user friendly and flexible as possible. All processes including data quality checking and validation as well as development of indicators and monitoring of performance should be decentralized effectively. Participatory development of software design including effective features of data visualization would facilitate easy access of information to peripheral institutions and provide tools for local use.

ii) Unless the individual PHCs and their staff understand the use of relevant indicators and how they reflect field level performance, the state HMIS will be buried under the weight of its own data. These indicators need to be connected to incentive mechanisms for PHC staff so that they would get actively involved improving their own performance.

iii) Further, visual representation of the health indicators of the PHC could be put up at the health facility itself and made freely accessible to the client public, giving them an idea of how their PHC functions with respect to the district and state. This would facilitate transparency in the management of health information as well as improving quality of reporting and HMIS sustainability.

This historical analysis of the HMIS in Tamil Nadu also provides broader implications for the development of similar systems in other states in India as well as other countries where the cry is for more action led systems (Sahay and Lewis, 2010; Sahay, 2011). The challenges faced by the state in setting up a integrated web based HMIS include dealing with historically existing systems, meeting data needs of central and state governments and overcoming the tendency to reinvent the wheel when a new system is introduced or to focus only on technical issues to achieve integration. In countries and states which are moving directly from a manual to a web based system, the issues of harmonization and rationalization associated with legacy systems may not exist. However, even in these cases, it is important to remember that it is easy to be seduced by modern technological solutions. Generating large volumes of data, which are not checked for quality and used only for centralized reporting, cannot be an end in itself. The real challenge is to build an HMIS which is robust and transparent and has a well-designed feedback system to improve local information use and action. Only such a system has the true potential for improving health outcomes. This is what history teaches us.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

733

7. REFERENCES

Muraleedharan, VR, Dash, U & Gilson, L (2011). *Tamil Nadu 1980–2005: A Success Story in India*. In D Balabanova, MMckee & A Mills (eds.). *'Good health at low cost' 25 years on - What makes a successful health system'*.

Das Gupta, M., Desikachari, B. R., Padmanaban, P., & Somanathan, T. V.   (2009). *How to improve public health systems: lessons from Tamil Nadu*. World Bank.

WHO, Regional Office for South-East Asia. (2009). *Safer pregnancy in Tamil Nadu: from vision to reality*. Retrieved from: http://whqlibdoc.who.int/searo/2009/9789290223566.pdf.

Lippeveld, T and Sauerborn, R (2000). *A framework for designing health information systems* in T Lippeveld, R Sauerborn, C Bodart (eds). *Design and Implementation of Health Information Systems*. World Health Organization

Heeks, R., (2002). Failure, success and improvisation of information systems projects in developing countries, *Working Paper no. 11 in Development Informatics series*, University of Manchester.

Lippeveld, T and Sapirie, S (2000). *Approaches to strengthening health information systems* in T Lippeveld, R Sauerborn, C Bodart (eds). *Design and Implementation of Health Information Systems*. World Health Organization

Littlejohns P, Wyatt JC, Garvican L. (2003) Evaluating computerised health information systems: hard lessons still to be learnt. *BMJ : British Medical Journal*. 326(7394):860-863.

Chilundo, B., and Aanestad, M. (2003). Vertical or integrated health programmes? The consequences for the laboratory management system in Mozambique, In *IS Perspectives and Challenges in the Context of Globalization,* Joint conference of IFIP WG 8.2 and 9.4. Athens, Greece.

Chilundo, B., and Aanestad, M. (2004). Negotiating multiple rationalities in the process of integrating the information systems of disease-specific health programmes. *Electronic Journal of Information Systems in Developing Countries EJISDC* 2004, 20, 2, 1–28.

Kimaro, H.C., & Nhampossa, J.L. (2005). Analysing the problem of unsustainable health information systems in less developed economies: Case studies from Tanzania and Mozambique. *Working paper in Information Systems group*, University of Oslo.

Braa, J., Hanseth, O., Mohammed, W., Heywood, A., and Shaw, V. (2007). Developing Health Information Systems in Developing Countries: The Flexible Standards Strategy, *MIS Quarterly*, 31-2, 381-402.

Raghevndra, R.C., and Sahay, S. (2006). Computer-based health information systems – Projects for computerization or health management?: Empirical experiences from India, (eds) Mila Gascó-Hernández, Fran Equiza-López and Manuel Acevedo-Ruiz, *Information communication technologies and human development: Opportunities and challenges*, Idea Group Inc.

Sahay, S., (2011). *Assessment of the ability of the Health Management Information System in India to use information for action.* MPH Mini thesis, University of West Cape. Retrieved   from http://etd.uwc.ac.za/xmlui/bitstream/handle/11394/3607/Sahay_MPH_2011.pdf

Chilundo, B., and Sahay, S. (2005). HIV/AIDS reporting systems in Mozambique: The theoretical and empirical challenges of representation,‖ *Information Technology for Development*, 11, 3, 245–272.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

734

Lippeveld, T. (2001). Routine health information systems: The glue of a unified health system, In Issues and innovation in routine health information in developing countries, *RHINO workshop*, March 14–16, 2001, Retrieved from: http://www.cpc.unc.edu/measure/rhino/keynote/keynote_paper.pdf

Monteiro, E. (2003). Integrating health information systems. *Methods of Information in Medicine A critical perspective*, *42*, 428 – 432.

Braa, J., Macome, E., Costa, J., Mavimbe, J., Nhampossa, J., & Jose, B. (2001). A study of the actual and potential usage of information and communication technology at district and provincial levels in Mozambique with a focus on the health sector. *The Electronic Journal on Information Systems in Developing* Countries, 5, 2, 1–29.

Cibulskis R.E., Hiawalyer, G. (2002). Information systems for health sector monitoring in Papua New Guinea, *Policy and Practice*, Bulletin of the World Health Organization 2002, 80, 75.

Moyo, C. M., Chaulagai, C.N., Koot, J., Moyo, H. B. M., Sambakunsi, T.C., Khunga, F.M., Naphini, P.D. (2005). Design and implementation of a health management information system in Malawi: issues, innovations and results, *Health Policy and Planning*, 20(6), pp. 375-384.

Bodavala, R. (2000) Evaluation of Health Management Information System in India: Need for Computerized Databases in HMIS. *Takemi Programme in International Health Working Papers 2000-2005*. Harvard University. Retrieved from: http://www.hsph.harvard.edu/takemi/rp176.pdf

S Harikumar. (2013) Evaluation of Health Management Information Systems- A Study of HMIS in Kerala, India. *Working Paper No.8* Achutha Menon Centre for Health Science Studies, Sree Chitra Tirunal Institute for Medical Sciences and Technology.

Walsham, G. (1993). *Interpreting information systems in organizations*. John Wiley & Sons, Inc.

Sahay, S., & Lewis, J. (2010). Strengthening metis around routine health information systems in developing countries. *Information Technologies & International Development*, *6*(3), pp-67.

Lewis, J. (2011) *From technology for information to information for local action: the role of participatory networks from case studies in India.* PhD Thesis, University of Oslo. Retrieved from: http://www.mn.uio.no/ifi/english/research/networks/hisp/papers-and-thesis/lewis2010.pdf

Tamil Nadu Health System Project, (2010) *Intelligent Healthcare- Health Management Information Systems,* Government of Tamil Nadu, Chennai. Retrieved from: http://www.tnhsp.org/files/HMIS.pdf

Policy Reforms Options Database (PROD) , (2004) *Reference No 69 Institutional Service Monitoring Report , Tamil Nadu.* Retrieved from: http://hsprodindia.nic.in/sear_desc1.asp?SD=18&SI=2&ROT=1&qryAll=Tamil%20Nadu

National Health Systems Resource Centre (NHSRC) 2012, *NRHM in the Eleventh Five Year Plan (2007-2012) Strengthening Public Health Systems,* Retrieved from: file:///C:/Users/User/SHDr/NRHM%20Eleventh%20Five%20Year%20Plan%20(3).pdf

Population Research Centre (PRC) (2012), Monitoring of Programme Implementation Plan of National Rural Health Mission In Tamil Nadu, Second Quarter report Retrieved from: http://mohfw.nic.in/WriteReadData/l892s/Tamil%20Nadu.pdf

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

735

THE DATA REVOLUTION IN INTERNATIONAL DEVELOPMENT

Track Chairs:

Richard Heeks
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Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

736

SPATIAL POLICYMAKING: USING LARGE, PUBLIC DATASETS TO ILLUSTRATE SPATIAL PATTERNS OF HUMAN VULNERABILITY IN NIGER

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Abstract: We report on research undertaken to address a gap in knowledge on human vulnerability in Niger. We were asked by two US government agencies to determine the key factors driving human vulnerability and its spatial distribution in the country. After a review of the relevant literature on poverty and vulnerability mapping, we chose an open-source, large dataset that contained an array of data on household livelihood systems and livelihood shocks. Using a suite of statistical and geo-statistical tools including regressions and geographically weighted regressions, we found that two large clusters or vulnerable people are located in the southeast and southwest of the country. The most common correlates to vulnerability in these clusters were gender, age, access to community services and geography (location in a specific district). We also found that translating big data and complex analysis for policy makers requires the development of storylines to explain the data processing and findings.

Keywords: big data, open-source data, Niger, human vulnerability, geographic analysis

1. LIVELIHOODS INTRODUCTION

1.1 Introduction

The "Big Data" revolution has not gone unnoticed by policymakers concerned with international development. Traditionally, large datasets pertaining to developing countries have been difficult to obtain or of such poor quality as to be unusable. Over the past twenty years, this tendency has shifted, however, as the World Bank, CGIAR system, United States Agency for International Development (USAID), Department for International Development (DFID), and many other aid donors have commissioned or supported the collection of large, representative datasets at national or sub-national scale. In the past ten years, these datasets have become increasingly spatial. The location of households or other geographic units have been collected, thus allowing advanced geographic analysis. In this practitioner's report, we describe the process of spatially analyzing a large household dataset to produce maps of human vulnerability to livelihood shocks in the country of Niger in West Africa. This analysis was conducted for the US Agency for International Development (USAID) as part of a larger decision-making process to determine how to better understand the nexus of development and conflict in the Sahel. We show here the value of mapping datasets and how this insight was used in decision-making. In the next section, we review the relevant literature on livelihoods, vulnerability and poverty mapping. Following that, we present the research problem. This research was somewhat unique in that we were presented with a nebulous research question that continuously changed scope as our stakeholders better understood our approach. In Section 3, we describe our methods, which include data

collection, data analysis and presentation of maps. We demonstrate how this research affected policy makers in Section 4 and we conclude the paper with reflections for future research.

1.2. Livelihoods, Vulnerability and Household data

Vulnerability, or its more positive inversion, *resilience*, is a common focus amongst development agencies as they strive to lift people across the developing world out of poverty. For this research, we adopted Wisner, et al.'s (2004) definition of vulnerability as, "the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard". We extend this definition to livelihood shocks that include natural hazards, but also economic, social and political disruptions to normal life. Other definitions of vulnerability link human to natural systems (Turner, et al. 2003), or examine vulnerability as it relates to exposure to coupled economic-environmental forces (O'Brien and Leichenko 2000). These latter definitions attempt to describe human, economic and environmental systems and their impact on vulnerability. Wisner, et.al. focus on the household and community level, which is more germane to this study.

Nigerien livelihoods are strongly dependent on the natural environment. The majority of the population (81%) is rural and the two main income generating activities are agriculture and pastoralism (Rovere, et al. 2008). Disruptions, or shocks, to these livelihoods increase vulnerability and volatility.

Knowing where the poor live has the distinct advantage of providing policy makers and others with the ability to identify the places where they want to target their interventions - what we call *geographic prioritization*. Until recently, mapping the location of poor and/or vulnerable people was rather rudimentary, either due to a lack of computing power and/or specific data on the distribution of the poor. In its infancy, such mapping often employed small scale (large area) and proxy variables to create maps of the uneven nature of wealth distributions within countries. Over the past decade and a half, as research progressed from simple mapping to more complex correlation and regression analysis, the focus of such analyses also shifted from poverty mapping that simply mapped the location of the poor to more complex livelihood vulnerability mapping and analysis that demonstrated correlation and/or implied causation (Grolle 2013). These methods contribute to a larger intellectual effort that has emerged from the discipline of geography in recent years referred to as "development geography"(see King and McCusker 2007). The collection of mapping and analysis efforts we discuss below also had roots in "sustainability science", which "builds toward an understanding of the human-environment condition with the dual objectives of meeting the needs of society while sustaining the life support systems of the planet (Turner, et al. 2003: 8074).

1.3. Poverty Mapping

Poverty Mapping is a relatively straightforward concept that generally involves the "measuring of incidence of poverty and food security in some predetermined area" (Davis 2003: 1). The two primary uses of poverty mapping, according to Davis, include "spatial identification of the poor" and "to create, as a by-product", explanatory and dependent spatial variables for use in multivariate analysis" (ibid. 2-3). This work is usually undertaken to inform national governments, donor agencies, NGOs or others engaged in developing and implementing poverty alleviation policies.

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

738

Robinson, et al. (2007) assert that "maps of poverty are of great use to government and development agencies alike because no matter how they propose to go about reducing poverty, they first need a 'baseline' picture of what it is they are dealing with" (2007: 205). Previous work has demonstrated such utility. For example, Deichmann (1999) demonstrated the heterogeneity of poverty at a national scale in Ecuador, while Alwang, et al. (2005) similarly showed the importance of disaggregating poverty spatially for Guatemala, Honduras and Nicaragua. Burke and Jayne (2010) extended poverty mapping to "spatial poverty trap" mapping, where households are stuck in poverty in or because of their location in particular places. Robinson, et al. (2007) analyzed data from the Uganda National Household Survey from 2002/03 and environmental data to "predict the distribution of poverty at the spatial resolution of the predictor variables" (ibid. 205). Biophysical variables have the strongest relationship to poverty, which itself is concentrated in the northeast.

As part of a special edition of the journal *Food Policy* in 2005, contributors examined the spatial dimensions of poverty in Vietnam (Minot and Baulch 2005), Malawi (Benson, et al. 2005), Ecuador (Farrow, et al. 2005), Sri Lanka (Amarasinghe, et al. 2005), Bangladesh (Kam, et al. 2005) and Mexico (Bellon, et al. 2005). One common thread through this collection was the use of the small area estimation approach. This statistical estimate technique uses "detailed household survey data to derive income /expenditure estimators, which are then applied to broad coverage census data to get estimates for a rather large number of households of the target population (Kam, et al. 2005: 552).

For Bangladesh, Kam, et al. (2005) chose variables such as landholding size, number of working age household members, and fixed assets used in production to model income for households. The analysis was conducted at the upazila scale, a sub-district geographical unit in Bangladesh. Through the use of a geographical-weighted regression they found "the pockets of high poverty incidence generally coincide with the ecologically poor areas of Bangladesh" in the northeast and northwest of the country, along the major rivers and in the Chittagong Hill tract in the southeast (ibid. 564).

In a similar study in Sri Lanka, Amarasinghe, Samad and Anputhas (2005) mapped clusters of poverty at a sub-district scale (the Divisional Secretariat) using cluster analysis and regression modeling. Derived from regression testing, the authors found that rural sub-districts where households are dependent on agriculture tend to be poorer (ibid. 508). Cluster analysis showed that access to irrigation led to clustering of less poor households, however a concentration of many smallholders leads to increased poverty.

Bellon, et al. (2005) examined the relationship between the distribution of poverty and biophysical conditions conducive to maize production in Mexico with the intent of better targeting the poor for agricultural extension services. They employed a small area estimation method to produce a map of poverty and regression analysis to determine explanatory variables. This analysis demonstrated a strong correlation between maize production and poverty. In addition, the poor did not benefit from participation in agricultural experiments. Further, the poor in Mexico are clustered in the "mountainous and indigenous areas of central and southern

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

739

Mexico" and face specific bio-physical constraints to maize production, such as slope and soil conditions.

Targeting food poor regions lends itself to mapping, as Farrow, et al. (2005) demonstrate in their study of food poverty in Ecuador. Using a panel of experts, they developed a set of variables relating to food poverty including: "social capital, agricultural productivity (climate, soil, management and tenure), labour market structure and access to markets" (ibid. 512). The authors used Moran's I statistics to measure spatial autocorrelation and geographically weighted regressions to "overcome the limitations caused by spatial dependency" (ibid. 517). The results showed a strong clustering of food poverty in the center of the country and that the greater the dependence on agriculture for income/livelihood the higher the level of food poverty.

In a study quite similar to ours, Benson, Chamberlin and Rhinehart (2005) attempted to uncover the "spatial determinants of poverty" in Malawi (ibid. 532). Using the Integrated Household Survey, a large nationally representative dataset, the authors developed a dependent variable from poverty headcount and regressed that against a set of independent variables that ranged from physical production to social status to livelihood indicators. To map this regression, they used spatial statistics including geographic weighed regression. From this analysis they discovered that "areas with higher maize yields on average will have higher levels of poverty" (ibid. 542) and that higher education levels result in less poverty (ibid. 548). Limited access to services, especially in the isolated far north, is correlated with higher poverty.

1.4. Vulnerability and Vulnerability Analysis

Poverty mapping efforts were initially descriptive, a simple representation of the location of the poor, but recent research, as demonstrated above, has begun to include more advanced analytical and geospatial methods in order to uncover underlying correlations to independent variables.

Beginning in the mid- to late- 1990s, aid donors and host governments began commissioning dataset collection that included livelihood specific questions beyond what was collected in national censuses. Informed by work from the development studies literature, these surveys, such as the World Bank's Living Standards Measurement Survey and the Integrated Household Survey, query households not only on the structure of their livelihoods, but also on recent shocks. Because such data relies on participant recall, it is limited by all the usual issues facing survey research, however, a major advantage is that individuals/households are asked directly whether or not they experienced a range of place-relevant disruptions (shocks) to their livelihoods. Thus, instead of mapping proximate variables that represent only the conditions under which a household might be vulnerable, such surveys provide insight into actual, experienced vulnerability.

Malcomb, Weaver and Krakowka (2014) modeled vulnerability to climate risks in Malawi. They echoed the limitations of traditional vulnerability approaches mentioned above when the noted that in the preparation of their study that only four out of forty-five studies "collected some form of primary data regarding socio-economic determinants" (ibid. 20). They consulted a group of experts to determine the variable set to determine climate vulnerability and used the Demographic and Health Survey, a broad based survey of the living conditions and health status of households across Malawi, as a data source for those variables. They then created and

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

740

mapped an index of vulnerability from the selected variables. Their results showed high levels of climate variability in central Malawi.

Abson, Dougill, and Stringer (2012) used Principal Components Analysis to determine the key indicators of environmental vulnerability in southern Africa using national datasets, however, most studies rely on some type of regression analysis (Fekete 2012; Kristjanson, et al. 2005) or modeling (Kienberger 2012). Preston, Yuen and Westaway (2011) review modeling approaches and distill them into social vulnerability, pressure-and-release, and expanded vulnerability models (ibid. 185-186). Yet other studies compile indices of vulnerability by combining variables using either non-statistical (Dickin, Schuster-Wallace, and Elliott 2013; Busby, et al. 2013; You and Chamberlin 2004) or statistical methods (Jakobsen 2013). Such research provides not only a more nuanced understanding of where people are vulnerable, but importantly for development donors, but also insight into the variables related to observed vulnerability.

2. RESEARCH PROBLEM AND OUTCOME

We drew upon the literature cited above to assist the United State Agency for International Development (USAID) understand the distribution of vulnerability in Niger. This analysis was a first of its kind for USAID. Our research team was provided the question: "In a region plagued by chronic poverty, instability, conflict and rising extremism, what are the strategies and resources that USAID can employ to help the region achieve sustainable, peaceful development?", and asked to provide specific, scientifically justifiable details about a) the distribution of vulnerability in Niger and b) the most important socio-economic and demographic factors that correlate to such vulnerability. Our study results were used in a development planning exercise that "gamed" possible outcomes from shifting resources between different sectors (health, environment, security, and agriculture) and places. The game results, alongside our analysis, was presented to the administrator of USAID and the head of the US Special Operations Command (USSOCOM) to inform the development of a collaborative strategy to address the twin problems of poverty and conflict in Sahelian West Africa (USAID, 2014).

USAID's recent push to use open, publicly available data and the unclassified nature of the "development game" led us to use a very large household survey dataset. While we identified two nationally representative, georeferenced datasets, the World Bank's 2011-2012 Living Standards Measurement Study (LSMS) and the 2012 Demographic and Health Survey (DHS), the DHS did not have specific modules covering household shocks or rural income generative activities. The LSMS was conducted in 2011-2012, which was an average year in terms of environmental and economic context and included over 4,000 households. Because the survey included a module on self-reported household shocks, we were able to create five shock vectors of interest to us: agricultural and livestock, weather, food price, financial, and health.

3. METHODOLOGICAL APPROACH AND AGENCY PERSPECTIVE

In formulating our methodological approach we were careful to align testable hypotheses to the major sectors and practices within the agency. For example, in assessing vulnerability to shocks we included relevant demographic (gender, age, ethnicity) and community variables that resonated well with gender and democracy and governance professionals. Accommodating rapidly changing political and fiscal realities of the agency was challenging as well. Initially, we intended to incorporate into our study data mining algorithms focused on links among vulnerability, violent extremism, and terrorism. However, fiscal tightening at DOD and territorial sensitivities severed our ties to our analytical counterparts at USSOCOM. To ensure

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

741

that our research was open, reproducible and scalable we meticulously documented all data modifications and analysis in reproducible scripts posted to GitHub, a version control system for facilitating research reproducibility (Ram, 2013).

We used geospatial analysis techniques to highlight the highly varied nature of vulnerability in the study area. Such techniques have the advantage of creating detailed maps of the distribution of selected variables and regression results over space. Given that most USAID members participating in this exercise were unfamiliar with either large datasets and/or geospatial analysis, we employed a step-by-step approach to presenting our results. We first produced simple maps showing the distribution of variables and then we moved into more complex maps of interpolated variables. We concluded by mapping the household vulnerability to each shock with insets of correlated socio-economic and demographic variables.
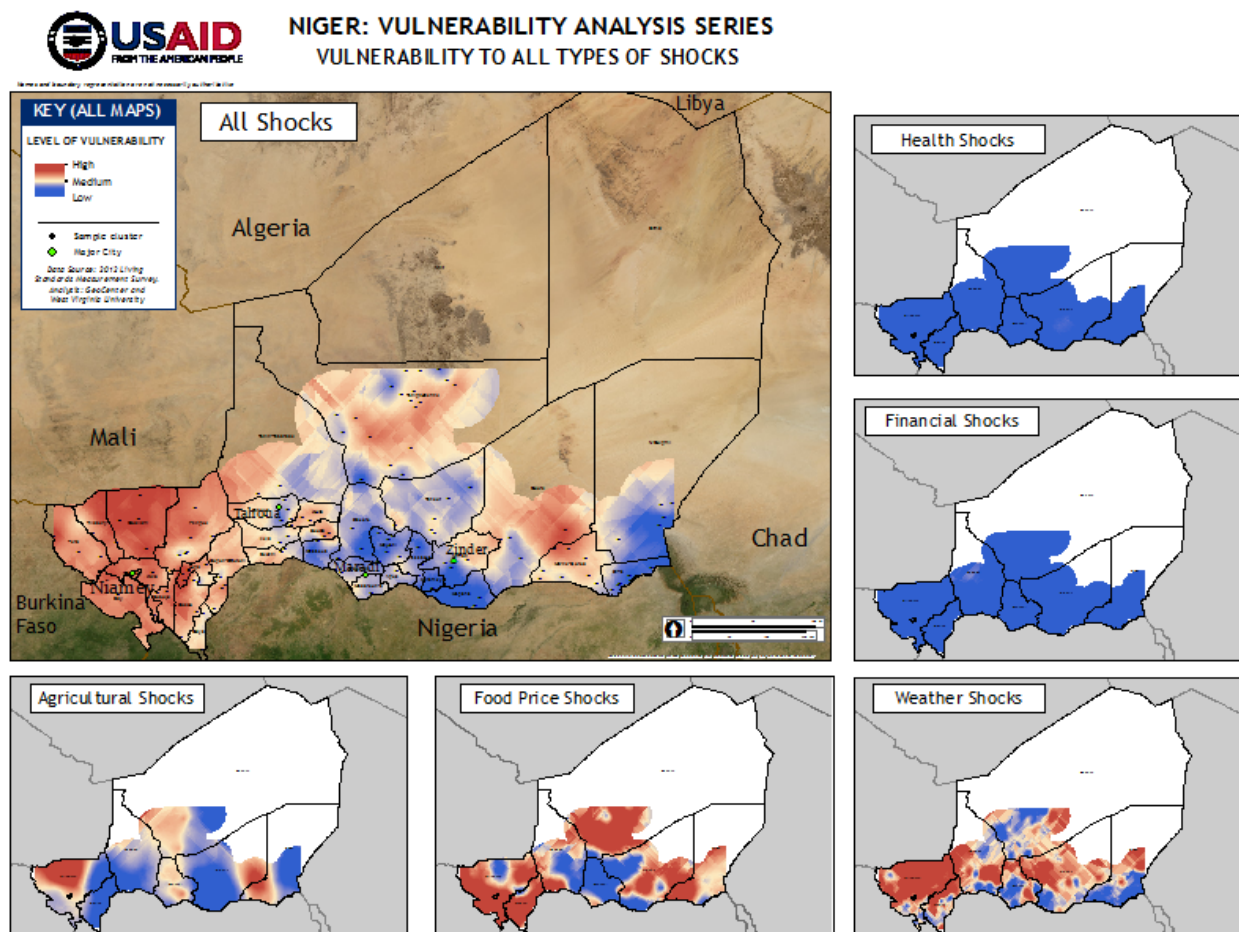
Figure 1. Composite shock surface derived from kriging estimates

Our empirical approach consists of exploratory data analysis in the form of interpolated maps, and three regression techniques: 1) logistic regression with geographic fixed-effects, 2) spatial filter models, and 3) localized geographically weighted regressions (GWR). To meet our robustness criteria, we focus on results that are statistically significant across the three approaches. Figure 1, below, depicts interpolated surfaces of the five shocks considered for zones falling within 50 kilometers of sampled households. The five smaller maps show the spatial distribution of each shock while the larger map reflects an aggregate measure of vulnerability. From the exploratory data analysis it is clear agricultural, weather, and food price shocks are the most common across the country, with apparent clustering of these shocks in the west.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

742

To estimate the log odds of a household experiencing one of the five shocks we use a logistic regression model with a linear combination of exogenous household, community, and environmental factors serving as the independent variables. We account for potential spatial autocorrelation in the errors of our logistical regression model by estimating a spatial filter model. Spatial filter models have been shown to reduce spatial misspecification error, improve the overall fit of the model, and improve the distributional shape of the model residuals which can help increase the homoscedasticity of model residuals (Thayn and Simanis, 2013). Finally, to investigate spatial heterogeneity we estimate a localized response surface using GWR. This technique differs from the others in that it estimates a local model of the dependent variable by fitting an ordinary linear regression equation to a neighborhood around each feature in the dataset. This gives us a set of regression coefficients, standard errors, and goodness of fit statistics for each household, based solely upon the surrounding area. This can elucidate spatial patterns in the data, such as isolating regions where the relationship between two variables differs from the rest of the country, suggesting the presence of unique local conditions. To estimate each model we used Stata, R, and ArcGIS 10.2 Spatial Statistics Toolbox, respectively.

4. DATA FOR DEVELOPMENT: MAPPING RESULTS TO AGENCY OPERATIONS AND STRATEGY

In presenting our results to agency practitioners and policymakers we avoided complex numerical tables and statistical jargon and instead focused on simple graphics and maps. For example, the statistical results from our regression models are presented as forest plots for easy intra and inter-model comparisons, while a thematic map is used to highlight the effect of geography on household vulnerability.
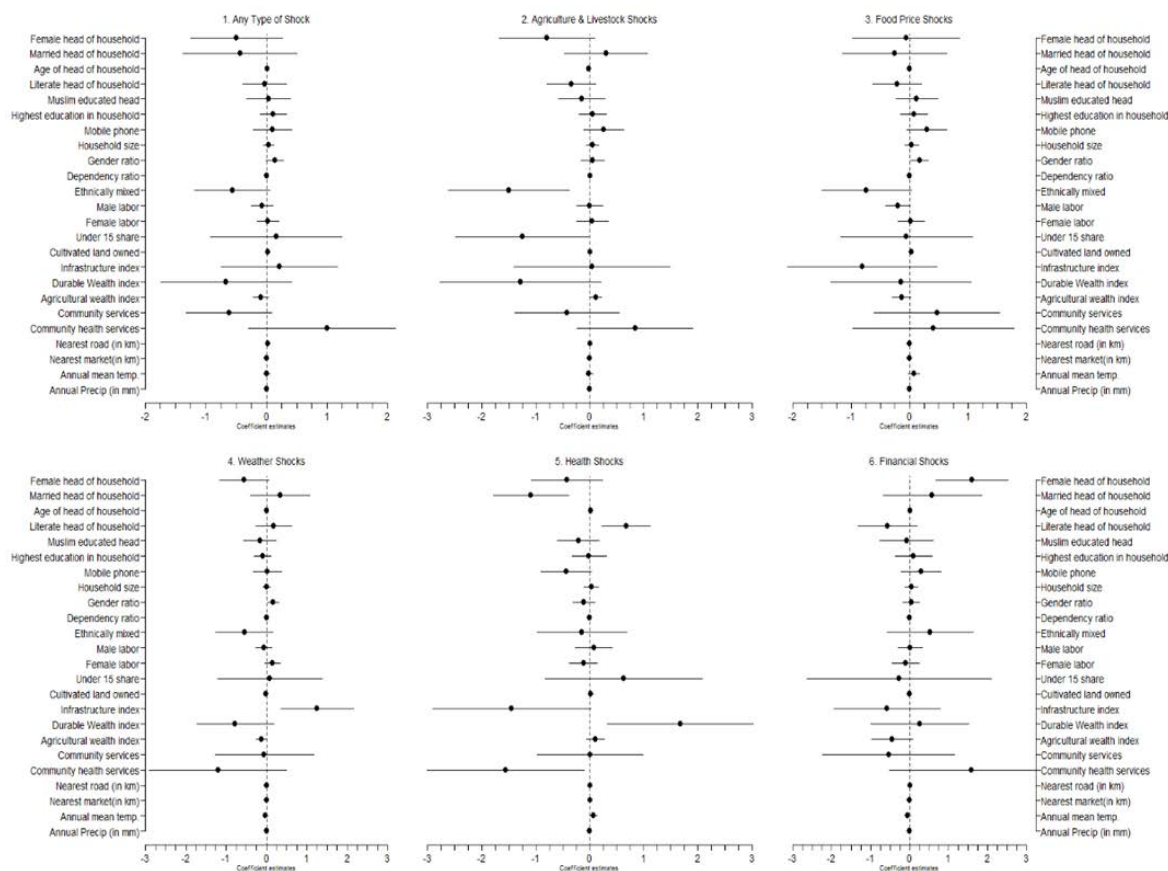
Figure 2. Summary of Logistic Regressions on Shocks

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

743

Figures 2 and 3 summarize the results from the logistic and spatial filter regression models. Certain demographic and community service variables appear to have strong, robust correlations with household shocks. That female headed households appear to be more vulnerable to financial shocks and less vulnerable to agricultural shocks was surprising to many within the agency, but is consistent with the livelihoods literature documenting that female headed households, across countries, are more likely to receive financial transfers (Winters et al., 2009). The strong negative effect of intra-household ethnic heterogeneity on vulnerability may be due to the binary variable capturing unobservable social, political and financial ties that help insulate ethnically-mixed households from the three major shocks. And the effect of being married appears be relevant in protecting against major health shocks.
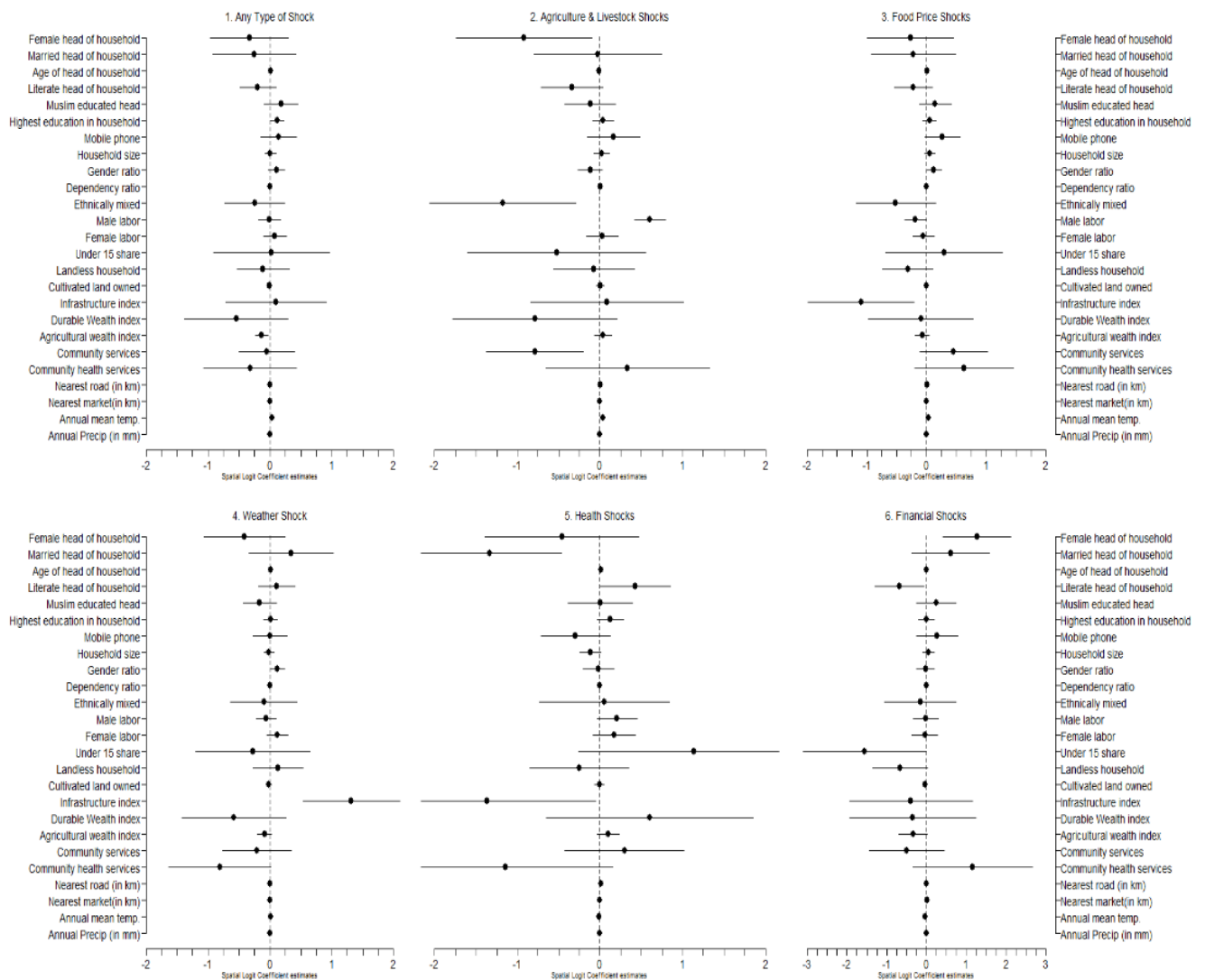
Source: GeoCenter Calculations based in World Bank LSMS 2011 Data for Niger; N = 1,752

Figure 3. Spatial Filter Logistic Regression Results.

The GWR results, of which two selected shocks are shown below, highlight the spatial heterogeneity of the conditional correlations. For example, female-headed households both east of the capital, Niamey, and near the desert town of Agadez, showed vulnerability to agriculture & livestock shocks (Figure 4).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

744
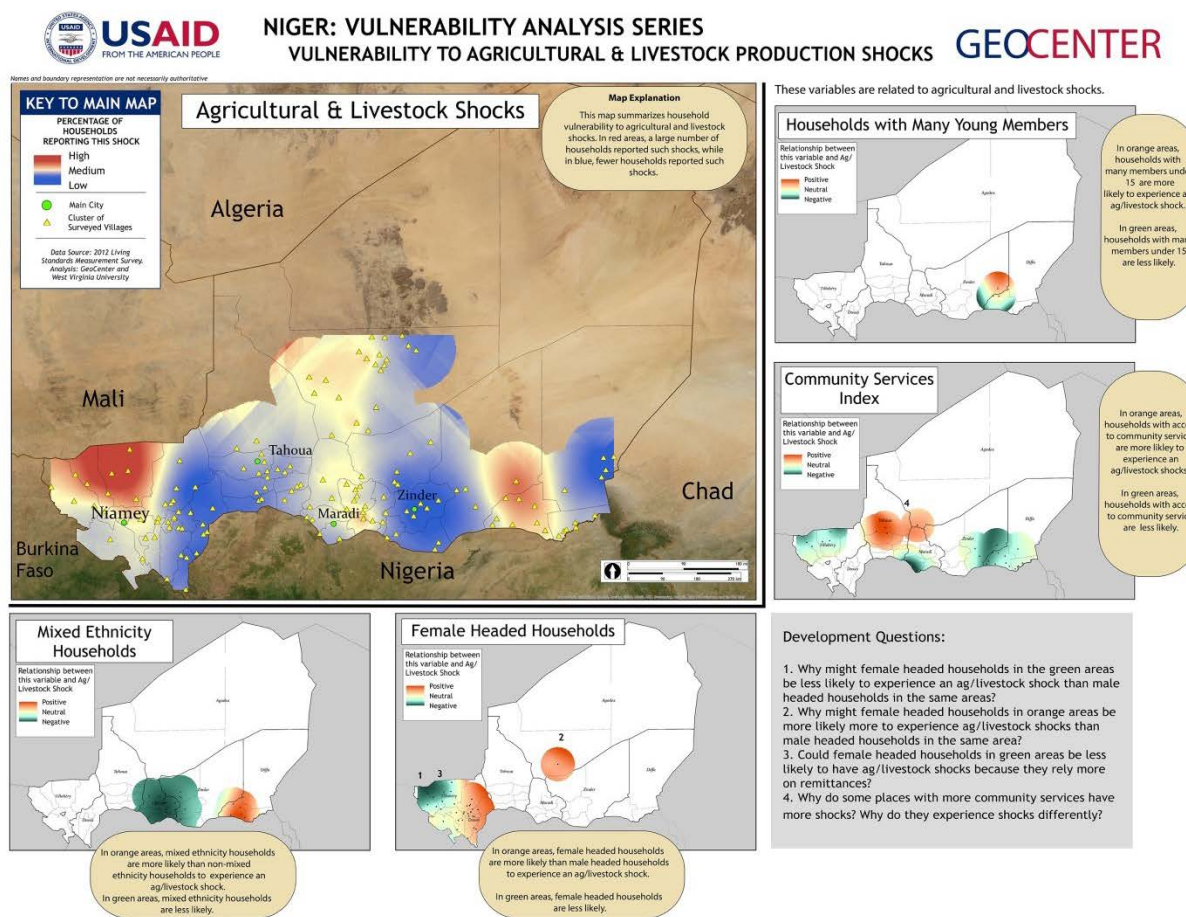
Figure 4: Agricultural and Livestock Shocks

In the east of Niger, near the town of Goure, households with many young people appear to be vulnerable to agriculture & livestock shocks (FIGURE 4). People living near Tahoua, many of whom reported having poor access to community services, also showed a higher vulnerability to agricultural & livestock shocks (FIGURE 4). Older-headed households near Agadez showed a greater likelihood to experience food price shocks (FIGURE 5).

As a final assessment of vulnerability, we also estimate a logistic geographic fixed-effects model based a composite shock variable and the standard vector of household, community, and environmental factors. Figure 6, below, depicts the geographic fixed-effects results. It clearly shows that, even after controlling for observable factors, households located in specific geographic zones in the eastern part of Niger are more than 10 times as likely to experience one of the shocks as similar households in the central part of Niger (Mayahi).

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

745
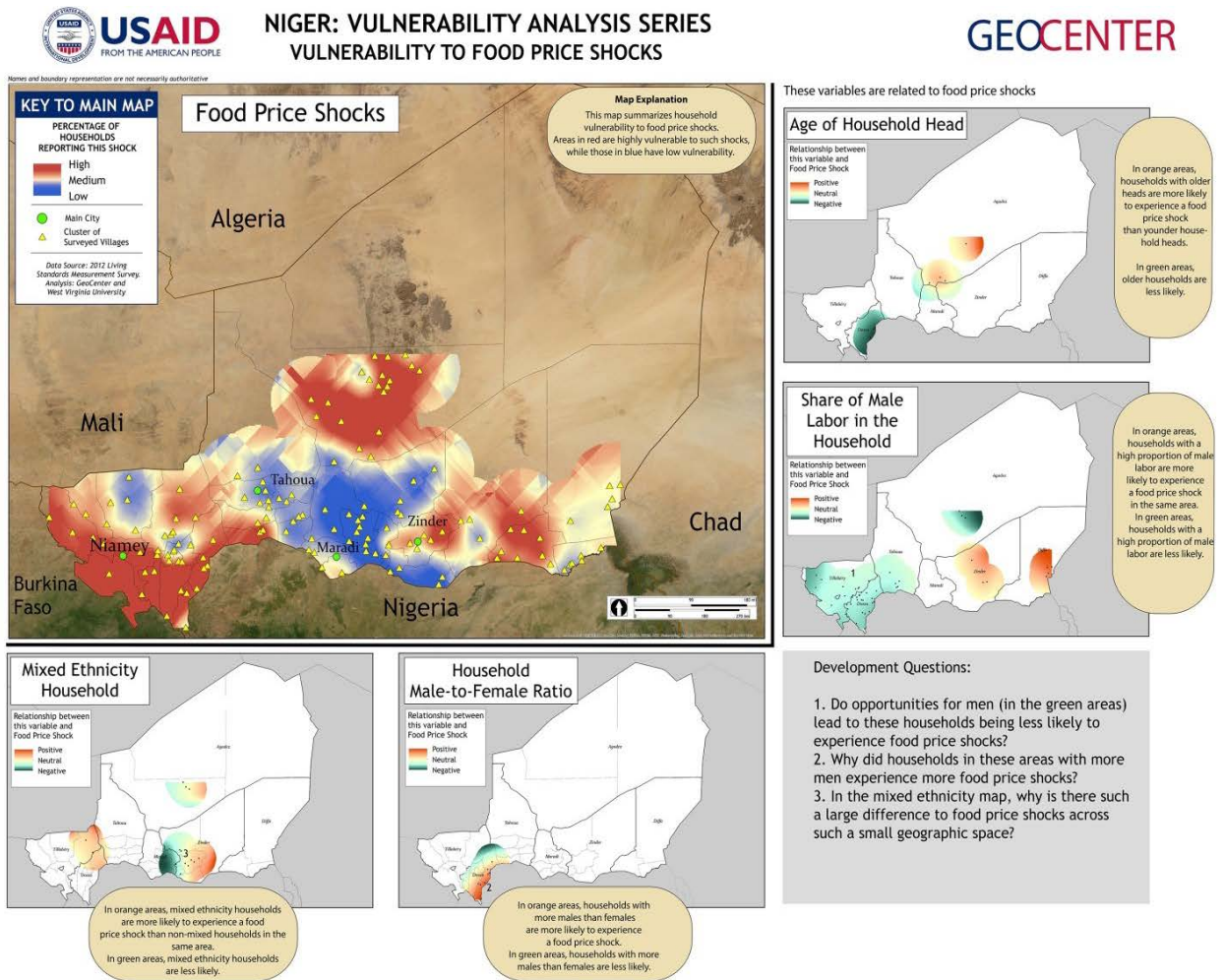
Figure 5: Food Price Shocks

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

746
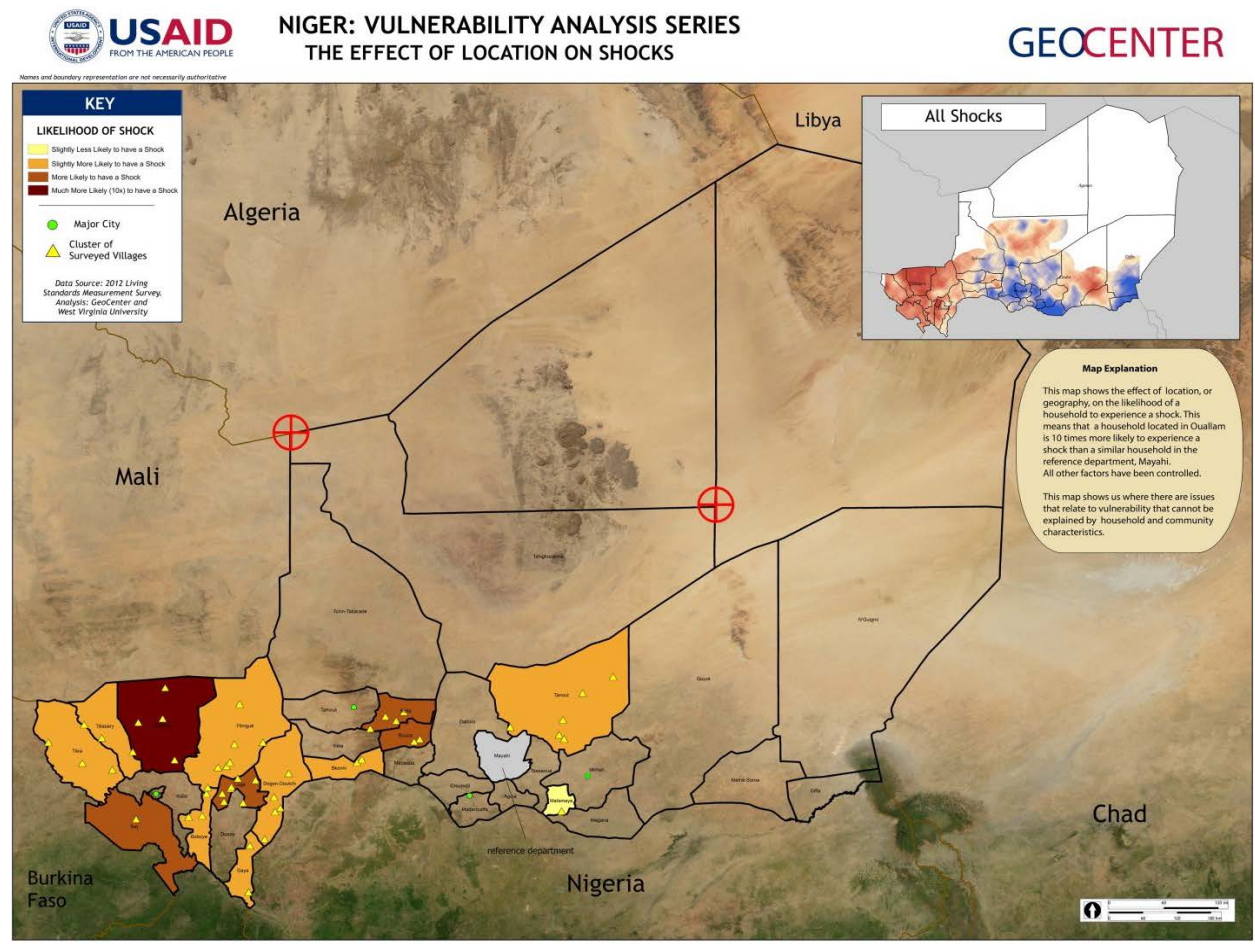
(a)

Geographic fixed-effects	Coef.	Std. Err.	Odds Ratio
Aguie	1.28	0.726	3.597
Bkonni	1.253*	0.489	3.501
Boboye	1.211	0.656	3.357
Bouza	2.038***	0.343	7.675
Dakoro	-0.09	0.376	0.914
Diffa	0.399	0.352	1.490
Dogon-Doutchi	1.708*	0.704	5.518
Dosso	0.5	0.706	1.649
Filingue	1.123	0.611	3.074
Gaya	1.059	0.694	2.883
Goure	1.032	0.968	2.807
Groumdji	0.689	0.37	1.992
Illela	0.431	0.442	1.539
Keita	2.551***	0.493	12.820
Kollo	0.95	0.575	2.586
Loga	2.200**	0.668	9.025
Madaoua	-0.155	0.424	0.856
Madarounfa	0.517	0.412	1.677
Magaria	-0.081	0.343	0.922
Matameye	-1.219*	0.49	0.296
Mayahi	-	-	-
Maine-Soroa	0.946*	0.436	2.575
Mirriah	0.606	0.54	1.833
Ouallam	2.719***	0.636	15.165
Say	1.255	1.013	3.508
Tahoua	0.625	0.454	1.868
Tanout	1.001*	0.39	2.721
Tchighozerine	-0.484	0.934	0.616
Tchin-Tabarade	-0.171	0.528	0.843
Tessaoua	0.147	0.481	1.158
Tillabery	0.945	0.634	2.573
Tera	1.088*	0.532	2.968

(b)

Figure 6. Any Shock Logistic Regression Results with Geographic Fixed-Effects: Map (a) and Table (b)

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

747

5. AFFECTING POLICY

Our analysis demonstrates that human vulnerability is a) explicitly spatial and b) can be explained through correlation to other spatial variables. The use of large datasets and scientifically validated statistical techniques helps legitimatize the outcomes of such research in the minds of policymakers. In our case, the maps we produced were much more palatable for use in the decision making process than other types of visual representations such as charts, tables or graphs. Policymakers needed guidance to interpret the output maps, but once explained, the maps became a powerful visual touchstone for discussion. Higher level decision makers were able to frame and reframe key points around the maps.

In the presentation of results, our maps were only intended to demonstrate to spatial nature of vulnerability, however, in the de-briefing to the principles, the power of the maps became evident. Decision makers raised questions about the process through which we generated the maps and queried us on the specific findings we presented. One of our agency stakeholders wrote to us to explain the impact of the analysis and mapping on decision making in their particular office (or "Bureau" in USAID lingo):

The Niger mapping project brought leadership attention to the Sahel…DoD believes the tools we [USAID] possess are important to address underlying security challenges in the region before they become "hot zones" that require a military response (pers. comm. 06/2014).

In addition to this impact, the head of USAID, Rajiv Shah, presented our results in several speeches and recommended that such data-driven exercises are needed in development decision making.

In using both large datasets and spatial analysis to assist with development policy making we learned three key principles. First, the research questions and methods must be relevant. They must actually address a question that decision makers need to answer. Once the question has been posed, then the appropriate data and tools can be selected. All too often, such efforts try to lead policy makers to an outcome by convincing them that a dataset, technique or communication device (map, website, etc.) is useful without first having identified the actual and real need faced by policy makers. For instance, we presented vulnerability analysis as one way to understand motivating factors for people to join violent extremist organizations. Poverty and vulnerability often lead people to support or join such organizations. The problem was originally framed as an international drugs trafficking one, about which there is a dearth of specific data. By framing our question around vulnerability and by showing that we can understand the conditional correlations of that vulnerability, we were able to convince decision makers of the utility of the research. Another indication of the impact of this particular activity is that the agency has asked similar analysis be conducted for six additional countries.

Second, managing expectations is critical. We often had to explain that correlation does not imply causation and that interpolation was a mathematical estimate of a value where none actually existed. In our project, policy makers often took the fact that our dataset was large and open, that the analysis was statistical and that the maps were clear to imply a level of confidence that we often had to careful clarify. Finally, we learned the importance of transparency in explaining exactly how we derived our maps and statistical outputs. It was essential that we detailed each step, even if that was not a priority of our working group, because the project was a demonstration of how open analysis and data can be used to inform agency strategy. We were clear about the limitations of the dataset and the analysis. To promote transparency and clarity of explanation, we developed logical, but simple, storylines to guide policy makers through our

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

748

process of selecting and analyzing data and to explain the printed map results. These storylines removed statistical, geo-statistical and other academic "jargon" and used words such as "related to" in place of "conditional correlation", "related in space" in place of "geographically weighted regression" and pared down complexity into brief explanations, examples of which are shown in the tan inset boxes in Figures 1, 4, 5 and 6 of this manuscript.

6. CONCLUSION

In this report we have summarized our use of a large dataset to address a direct request from policy makers regarding human vulnerability in Niger. We realize that very few practitioners are so lucky as to have a clear question placed in front of them to be addressed. Our method was highly iterative (between we the researchers and the policy makers), which is also unusual. Our use of advanced statistical and geo-statistical techniques was equally unusual for our audience. What we hope we have shown here is that large, open datasets do have significant value for policy and decision makers, when presented in terms they can fully appreciate.

7. REFERENCES AND CITATIONS

Abson, D., Dougill, A., and Stinger, L. 2012. Using Principal Component Analysis for information-rich socio-ecological vulnerability mapping in Southern Africa. *Applied Geography* 35:515-524.

Alwang, J., Jansen, H., Siegel, P., and Pichon, F. 2005. Geographic space, assets, livelihoods and well-being in rural Central America: Empirical evidence from Guatemala, Honduras and Nicaragua. DSGD Discussion Paper No. 26. International Food Policy Research Institute, Washington.

Amaransinghe, U., Samad, M., and Anputhas, M. 2005. Spatial clustering of rural poverty and food insecurity in Sri Lanka. *Food Policy* 30: 493-509.

Bellon, M., Hodson, D., Bergvinson, D., Beck, D., Martinex-Romero, E., and Montoya, Y. 2005. Targeting agricultural research to benefit poor farmers: Relating poverty mapping to maize environments in Mexico. *Food Policy* 30: 476-492.

Benson, T., Chamberlin, J., Rhinehart, I. 2005. An investigation of the spatial determinants of the local prevalence of poverty in rural Malawi. *Food Policy* 30:532-550.

Burke, W. and Jayne, T. 2010. Spatial disadvantages or spatial poverty traps: Household evidence from rural Kenya. ODI Working Paper 327. Overseas Development Institute, London.

Busby, J., Cook, K., Vizy, E., Smith, T. and Bekalo, M. 2014. Identifying hot spots of security vulnerability associated with climate change in Africa. *Climatic Change* 124: 717-731.

Davis, B. 2003. Choosing a Method for Poverty Mapping. FAO: Rome.

Deichmann, U. 1999. Geographic aspects of inequality and poverty. World Bank Research Paper. Accessed at http://www.worldbank.org/poverty/inequal/index.htm.

Dickin, S., Schuster-Wallace, C. and Elliott, S. 2013. Developing a vulnerability mapping methodology: Applying the Water-Associated Disease Index to dengue in Malaysia. *PLOSOne* 8(5):1-11.

Farrow, A., Larrea, C., Hyman, G., Lema, G. 2005. Exploring the spatial variation of food poverty in Ecuador. *Food Policy* 30:510-531.

Fekete, A. 2012. Spatial disaster vulnerability and risk assessments: Challenges in their quality and acceptance. *Natural Hazards* 61:1161-1178.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

749

Grolle, J. 2013. High-resolution mapping of rural poverty and famine vulnerability in the Sahel: a possible approach for the Republic of Niger. *Population and Environment* 35: 68-97.

Jakobsen, K. 2013. Livelihood asset maps: a multidimensional approach to measuring risk-management capacity and adaptation policy targeting - a case study in Bhutan. *Regional Environmental Change* 13: 219-233.

Kam, S., Hossain, M., Lal Bose, M. Villano, L. 2005. Spatial patterns of rural poverty and their relationship with welfare-influencing factors in Bangladesh. *Food Policy* 30:551-567.

Kienberger, S., Blaschke, T., Zaidi, R. 2013. A framework for spatio-temporal scales and concepts from different disciplines: the vulnerability cube. *Natural Hazards* 68:1343-1369.

King, B. and McCusker, B. 2007. Environment and development in the former South African bantustans. *The Geographical Journal* 137(1): 6-12.

Krisjanson, P., Radeny, M., Baltenweck, I., Ogutu, J., Notenbaet, A. 2005. Livelihood mpaaing and poverty correlates at a meso-level in Kenya. *Food Policy* 30: 568-583.

LaRovere, R., Keulen, H., Hiernaux, P., Szonyi, J., and Schipper, R. 2008. Intensification Scenarios in South-Western Niger: Implications for Revisiting Fertilizer Policy. *Food Policy* 33: 156-164.

Malcomb, D., Weaver, E. and Krakowka, R. 2014. Vulnerability modeling for sub-Saharan Africa: An operationalized approach in Malawi. *Applied Geography* 48: 17-30.

Minot, N. and Baulch, B. 2005. Spatial patterns of poverty in Vietnam and their implications for policy. *Food Policy* 30:461-475.

O'Brien, K. and Leichenko, R. 2000. Double Exposure: Assessing the Impacts of Climate Change within the Context of Economic Globalization. *Global Environmental Change* 10: 221-232.

Preston, B., Yuen, E., Westaway, R. 2011. Putting vulnerability to climate change on the map: a review of approaches, benefits, and risks. *Sustainability Science* 6: 177-202.

Ram, K. 2013. Git can facilitate greater reproducibility and increased transparency in science. *Source Code for Biology and Medicine* 8(7), 1-8.

Robinson, T., Emwanu, T., and Rogers, D. 2007. Environmental approaches to poverty mapping: an example from Uganda. *Information Development* 23(2-3): 205-215.

Thayn, J.B., and Simanis, J., 2013. Accounting for spatial autocorrelation in linear regression models using spatial filtering with eigenvectors. *Annals of the Association of American Geographers* 103(1), 47-66.

Turner, et.al. 2003. A Framework for Vulnerability Analysis in Sustainability Science. *Proceeding of the National Academy of Sciences* 100(14): 8074-8079.

USAID. (2014) Development Game Players Handbooks. Internal USAID Publication.

Winters, P., Davis, B., Carletto, G., Covarrubias, K., Quinones, E. J., Zezza, A., Azzarri, C., Stamoulis, K. 2009. Assets, Activities, and Rural Income Generation: Evidence from Multicountry Analysis. *World Development* 37:1435-1452.

Wisner, et. al. (2004). At Risk: Natural Hazards, People's Vulnerability and Disasters. Routledge: New York.

You, L. and Chamberlin, J. 2004. Spatial analysis of sustainable livelihood enterprises of Uganda cotton production. EPTD Discussion Paper No. 121. International Food Policy Research Institute: Washington, DC.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

750

Appendix

Table 1: Descriptive statistics for household, community, and weather variables (projected using sampling weights)

	Mean	Standard Error	Lower bound	Upper bound
Female headed household	8%	0.009	0.07	0.10
Married head of household	93%	0.008	0.91	0.94
Age of head of household	45	0.581	43	46
Literate head of household	26%	0.020	0.22	0.30
Muslim educated head of household	28%	0.021	0.24	0.32
Highest level of education in household	76%	0.060	0.64	0.88
Mobile phone ownership	41%	0.020	0.37	0.45
Household size	6.62	0.128	6.37	6.87
Number of males divided by females in HH	1.23	0.032	1.16	1.29
Dependency Ratio	143	3.105	137	149
Ethnically mixed household	6%	0.011	0.04	0.09
Household male labor age>11 & <60	1.44	0.040	1.36	1.52
Household female labor age>11 & <60	1.69	0.044	1.61	1.78
Share of household members under 15	49%	0.007	0.48	0.51
Household is landless	31%	0.032	0.25	0.38
Logged value of cultivated land owned	5.83	0.303	5.23	6.43
Infrastructure index*	0.10	0.010	0.08	0.12
Durable wealth index*	0.18	0.007	0.17	0.20
Agricultural wealth index*	0.03	0.037	-0.05	0.10
Community service index*	0.19	0.023	0.14	0.23
Community health index*	0.03	0.021	-0.01	0.07
HH Distance in (KMs) to Nearest Major Road	12.62	1.625	9.40	15.84
HH Distance in (KMs) to Nearest Market	59.89	2.780	54.38	65.40
Annual Mean Temperature (°C)	28.20	0.045	28.11	28.29

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

751

Annual Precipitation (mm)	395	6.762	382	409

*All indices are based on factor analysis and final indices were checked for reliability using Cronbach's alpha. N=1,792

Table 2. Logit analysis of shock variables with geographic fixed-effects

	Any	Ag/Livestock	Food Price	Weather	Health	Financial
Female headed household	-0.4943	-0.7961*	-0.0590	-0.5553*	-0.4224	1.5981***
	(0.39)	(0.45)	(0.47)	(0.31)	(0.33)	(0.48)
Married head of household	-0.4383	0.3039	-0.2587	0.3420	-1.0880***	0.5843
	(0.48)	(0.40)	(0.46)	(0.38)	(0.36)	(0.65)
Age of head of household	0.0085*	-0.0142**	0.0043	0.0100*	0.0123	0.0131
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Literate head of household	-0.0234	-0.3255	-0.1996	0.1687	0.6610***	-0.5721
	(0.19)	(0.23)	(0.22)	(0.23)	(0.23)	(0.39)
Muslim educated head of household	0.0314	-0.1621	0.1188	-0.1486	-0.2056	-0.0725
	(0.18)	(0.22)	(0.19)	(0.21)	(0.20)	(0.35)
Highest level of education in household	0.0603	0.0099	0.0365	-0.0376	0.0095	0.0643
	(0.07)	(0.08)	(0.07)	(0.07)	(0.10)	(0.15)
Mobile phone ownership	0.1053	0.2622	0.2993*	0.0145	-0.4388*	0.2967
	(0.16)	(0.19)	(0.17)	(0.18)	(0.24)	(0.26)
Household size	0.0358	0.0509	0.0375	0.0058	0.0266	0.0491
	(0.04)	(0.06)	(0.06)	(0.05)	(0.07)	(0.08)
Number of males divided by females in HH	0.1387*	0.0522	0.1702**	0.1724**	-0.1090	0.0525
	(0.07)	(0.11)	(0.07)	(0.07)	(0.10)	(0.11)
Dependency Ratio	0.0003	0.0022	0.0007	-0.0000	-0.0017	0.0019
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Ethnically mixed household	-0.5658*	-1.5001***	-0.7386*	-0.5430	-0.1397	0.5241
	(0.32)	(0.57)	(0.39)	(0.37)	(0.42)	(0.57)
Household male labor age>11 & <60	-0.0688	0.0007	-0.2013*	-0.0691	0.0700	0.0168
	(0.09)	(0.13)	(0.11)	(0.10)	(0.17)	(0.16)
Household female labor age>11 & <60	0.0204	0.0427	0.0232	0.1502	-0.1163	-0.0973
	(0.09)	(0.15)	(0.12)	(0.10)	(0.13)	(0.18)
Share of household members under 15	0.1614	-1.2622**	-0.0582	0.0956	0.6294	-0.2660
	(0.55)	(0.63)	(0.58)	(0.66)	(0.74)	(1.21)
Logged value of cultivated land owned	0.0273*	0.0028	0.0318*	-0.0181	0.0187	0.0020
	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.03)
Infrastructure index	0.2244	0.0425	-0.8058	1.2482***	-1.4413*	-0.5714
	(0.49)	(0.74)	(0.65)	(0.46)	(0.74)	(0.71)
Durable wealth	-0.6620	-1.2728*	-0.1378	-0.7810	1.6702**	0.2571
	(0.55)	(0.76)	(0.62)	(0.49)	(0.69)	(0.64)
Agricultural wealth index	-0.0979	0.1128**	-0.1379*	-0.1215*	0.1053	-0.4479
	(0.07)	(0.05)	(0.08)	(0.07)	(0.08)	(0.27)
Community service index	-0.6172*	-0.4312	0.4663	-0.0526	0.0048	-0.5368
	(0.36)	(0.49)	(0.55)	(0.63)	(0.50)	(0.87)
Community health services	1.0083	0.8572	0.4172	-1.2117	-1.5670**	1.5818
	(0.67)	(0.55)	(0.71)	(0.87)	(0.75)	(1.07)
HH Distance in (KMs) to Nearest Major Road	0.0205***	0.0072	0.0026	0.0013	0.0026	0.0084
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
HH Distance in (KMs) to Nearest Market	0.0011	-0.0016	0.0033	0.0055	0.0046	0.0006
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Annual Mean Temperature (°C * 10)	0.0052	-0.0162	0.0746	-0.0308	0.0678**	-0.0456
	(0.03)	(0.03)	(0.05)	(0.03)	(0.03)	(0.04)
Annual Precipitation (mm)	-0.0007	-0.0018	0.0014	-0.0026	-0.0005	0.0034
	-0.4943	-0.7961*	-0.0590	-0.5553*	-0.4224	1.5981***
Geographic Fixed-Effects	Department	Regional	Regional	Regional	Regional	Regional

Department fixed-effects included in estimation but not reported. Stars indicate level of significance: ***p<0.01, ** p<0.05, * p<0.10. Standard errors, in parentheses, account for sampling design and were estimated using Stata/SE 13.1's survey package (svy) for complex survey data. Sample size equal to 1,752 observations.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

752

Table 3. Spatial Filter Logistic Regression Results

	Any Est.	Std. Error	Ag/Livestock Est.	Std. Error	Food Price Est.	Std. Error	Weather Est.	Std. Error	Health Est.	Std. Error	Financial Est.	Std. Error
Female headed household	-0.330	0.323	-0.921**	0.418	-0.269	0.368	-0.408	0.334	-0.459	0.473	1.267***	0.437
Married head of household	-0.251	0.344	-0.027	0.395	-0.221	0.362	0.342	0.347	-1.334**	0.441	0.609	0.500
Age of head of household	0.015***	0.005	-0.008	0.005	0.010**	0.005	0.010**	0.004	0.008	0.007	0.006	0.008
Literate head of household	-0.196	0.151	-0.342**	0.191	-0.223	0.165	0.106	0.152	0.423**	0.215	-0.682**	0.316
Muslim educated head of household	0.181	0.139	-0.119	0.158	0.146	0.139	-0.165	0.138	0.002	0.200	0.247	0.252
Highest level of education in household	0.118**	0.058	0.035	0.064	0.052	0.060	0.009	0.055	0.126	0.082	-0.006	0.103
Mobile phone ownership	0.143	0.145	0.162	0.162	0.265*	0.149	0.000	0.141	-0.295	0.215	0.271	0.263
Household size	0.005	0.047	0.023	0.049	0.051	0.045	-0.014	0.042	-0.114*	0.066	0.041	0.076
Number of males divided by females in HH	0.105	0.067	-0.116	0.075	0.125*	0.065	0.124**	0.060	-0.016	0.095	-0.025	0.113
Dependency Ratio	0.001	0.001	0.002	0.001	-0.001	0.001	0.001	0.001	0.000	0.002	0.003**	0.002
Ethnically mixed household	-0.246	0.247	-1.173***	0.450	-0.516	0.341	-0.097	0.275	0.053	0.403	-0.155	0.460
Household male labor age>11 & <60	-0.006	0.092	0.605	0.097	-0.191**	0.090	-0.060	0.083	0.204	0.124	-0.019	0.158
Household female labor age>11 & <60	0.082	0.096	0.027	0.099	-0.051	0.094	0.123	0.087	0.174	0.130	-0.043	0.161
Share of household members under 15	0.022	0.478	-0.523	0.551	0.292	0.499	-0.274	0.471	1.137	0.713	-1.560**	0.787
Household is landless	-0.112	0.215	-0.073	0.249	-0.314	0.218	0.131	0.206	-0.251	0.305	-0.663*	0.358
Logged value of cultivated land owned	-0.009	0.020	0.004	0.023	-0.005	0.021	-0.013	0.019	-0.007	0.029	-0.043	0.032
Infrastructure index	0.096	0.414	0.082	0.472	-1.097**	0.454	1.315****	0.399	-1.363**	0.670	-0.394	0.791
Durable wealth	-0.545	0.427	-0.787	0.507	-0.093	0.447	-0.585	0.430	0.599	0.638	-0.349	0.811
Agricultural wealth index	-0.133**	0.052	0.035	0.053	-0.071	0.059	-0.085	0.058	0.096	0.069	-0.339*	0.183
Community service index	-0.054	0.228	-0.787***	0.298	0.457	0.288	-0.211	0.284	0.295	0.368	-0.498	0.482
Community health services	-0.321	0.383	0.334	0.506	0.629	0.425	-0.811*	0.422	-1.140*	0.660	1.160	0.769
HH Distance in (KMs) to Nearest Major Road	0.008	0.004	0.004	0.004	0.012***	0.004	0.002	0.004	0.011*	0.006	-0.003	0.007
HH Distance in (KMs) to Nearest Market	0.003	0.002	-0.004	0.002	-0.002	0.003	0.002	0.002	0.000	0.003	0.009**	0.004
Annual Mean Temperature (°C * 10)	0.030****	0.008	0.035***	0.011	0.037***	0.012	0.013	0.009	-0.008	0.012	-0.033**	0.014
Annual Precipitation (mm)	-0.001**	0.001	-0.006****	0.001	0.002*	0.001	-0.001	0.001	0.000	0.001	0.005**	0.002
Eigenvalues Retained (in order)	1, 11, 12		10, 11, 5, 8, 2		3, 5, 2, 1, 8, 12, 9, 4		10, 11, 6		8, 10, 2, 7		12, 3, 6, 7, 11, 1, 10	

Spatial filter variables included in estimation but not reported. Stars indicate level of significance: ****p<0.001, ***p<0.01, ** p<0.05, * p<0.10. Sample size equal to 1,751 observations.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

753

LEGAL ISSUES ON DATA PRIVACY AND SECURITY IN CYBERSPACE WITH SPECIAL REFERENCE TO INDIA

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Abstract: Data and information synonyms, the dominant approach to solving this problem is to view personal information as a commodity that interested parties should contract for in the course of negotiating a cyberspace transaction therefore, data or personal information considered as a modern form of money or property, cyberspace is new frontier for gathering personal information. Internet has become hub of personal information market. Personal data is used for different purposes in cyberspace. Most people are not aware, who has collected their personal data, who used that data, for what purpose, and who still holds a copy of it. Absolute privacy is a paradigm in cyberspace. In India data standard compliances are questionable. Companies or other institutions are not following due diligences for data security. To face these new challenges many countries have enacted laws for data privacy and security in cyberspace. In India, there is no special legislation dealing with data privacy and security in cyberspace. Even though privacy is recognized in Indian Constitution has fundamental right under Art. 21. Information Technology Act, 2000 and rules under it are not sufficient. This paper focuses on comparative study with EU, US and India.

1. INTRODUCTION

Privacy is internationally recognized as a human right (Ian J. Lloyd, 2004). Information privacy is an individual's claim to control the terms under which personal information identifiable to the individual is acquired, disclosed, and used (Jerry Kang, 1998). Privacy is personal information which is not public or open, privacy is a state of being alone and not watched by another. It is covering a sophisticated collection of interests, ranging from intimacy, sexual choice, personal identity, moral and physical well-being, reputation, formation of human relationships, health and environmental protection, collection, access to personal information is an individual identity as a human being, including personal data (David Wright, Paul De Hert, 2012).

The Secrecy Paradigm (Daniel J. Solove, 2004)*,* is a traditional way of understanding privacy, according to which privacy is invaded by uncovering one's hidden world, by surveillance, and by the disclosure of concealed information. The harm such invasions cause consists of inhibition, self-censorship, embarrassment, and damage to one's reputation. The law is heavily influenced by this paradigm. As a result, if the information is not secret, then courts often conclude that the information cannot be private. However, this conception of privacy is not responsive to life in the modern Information Age, where most personal information exists in the record systems of hundreds of entities. Life today is fueled by information, and it is virtually impossible to live as an Information Age ghost, leaving no trail or residue.

1.1. Personal Data

Information relating to individuals, called 'personal data', is collected and used in many aspects of everyday life. An individual gives personal data when he/she, for example, registers for a

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

754

library card, signs up for gym membership, opens a bank account, etc. Personal data can be collected directly from the individual or from existing data base. These data may subsequently be used for other purposes and/or shared with other parties. Personal data can be any data that identifies an individual, such as a name, a telephone number, or a photo.

The term personal data is defined as follows in Article 2(a) of the general directive: personal data shall mean any information relating to an identified or identifiable natural person (data subject); an identifiable person is one who can be identified, directly or indirectly, in particular by reference to an identification number or to one more factors specific to his physical, physiological, mental, economic, cultural or social identity (Peter Carey. 2004). In India the Information Technology Rules 2011framed under Section 2 (1) (i) of the Information Technology Act, 2000 recognized the personal data which covers photograph of a person, name, age, email, mobile number, pan card number so on which identify a person (Prashant Mali, 2012).

1.2. Sensitive Personal Data

Racial or ethnic origin, political opinions, religious beliefs or other beliefs of a similar nature, Trade union membership, Physical or mental health or condition, Sexual life, the commission or alleged commission of any offence, any proceedings, the disposal of such proceedings or the sentence of any court in such proceedings (Peter Carey, 2004).

In India IT Rules protect sensitive personal data which covers password of a person, financial information, debit card, credit card, physical, psychological, mental conditions, sexual orientation, medical records, bio-metric information, finger print, and retina scan. An exception to this sensitive data is information available under the Right to Information Act, 2005 not covered (Prashant Mali, 2012).

Data is a modern form of money or property (Paul M. Schwartz, 2013), which may be scattered, unimportant, small bits of data has become a potent, large set of data that can be misused by companies or by antisocial elements (Rodney D. Ryder, 2007). It cannot be transferred without consent of the owner/author, for which, one who wants the data has to follow the procedure like transfer procedure of traditional property data protection (Serge Gutwirth, Yves Poullet & Paul De Hert, 2010). But data protection is also more specific than privacy since it simply and only applies when "personal data" are "processed". By default, and contrary to privacy, data protection rules are not prohibitive, but they organize and control the way personal data is processed.
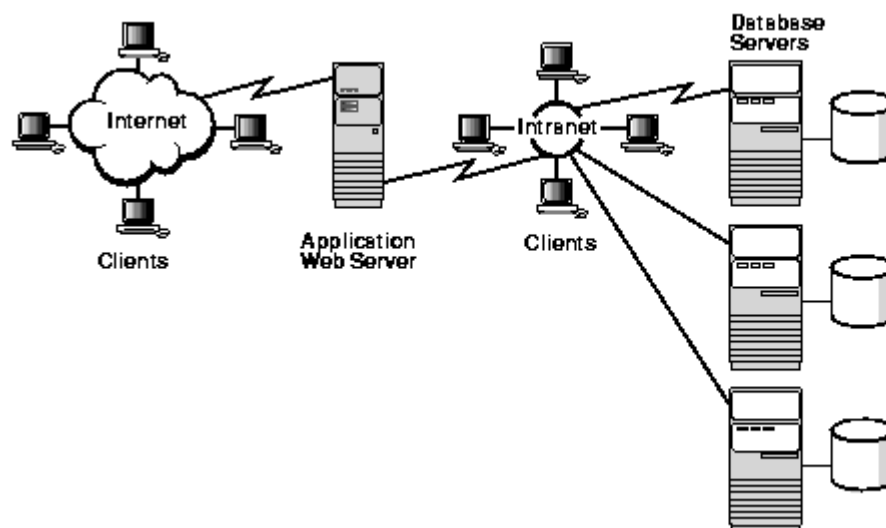

Figure - 1. Scope of Data Security Need

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

755

1.3. Cyberspace

Cyberspace does not have a standard, objective definition. Cyberspace is "the notional environment in which communication over computer networks occurs." The word "Cyberspace" is credited to William Gibson, who used it in his book, Neuromancer, written in 1984. The word became popular in the 1990s when the uses of the internet, networking, and digital communication were all growing dramatically and the term "cyberspace" was able to represent the many new ideas and phenomena that were emerging. Cyberspace is a concept that associated with a mature electronic culture. Such culture not only allows one to process and interact with information in electronic form (Katsh, M. Ethan, 1995). Cyberspace is a globally networked, computer-sustained, computer accessed, and computer-generated, multi-dimensional, artificial, or "virtual" reality. In this world, on which every computer screen is a window, actual, geographic distance is irrelevant. This information is derived in part from the operation of the natural, physical world, but is derived primarily from the immense traffic of symbolic information, images, sounds, and people, that constitute human enterprise in science, art, business, and culture (John Perry Barlow, 1994).

Cyberspace is the new frontier for gathering personal information, and its power has only begun to be exploited (Daniel J. Solove, 2004). The Internet is rapidly becoming the hub of the personal information market, for it has made the peddling and purchasing of data much easier. Currently, there are two basic ways that websites collect personal information. First, many websites directly solicit data from their users. Numerous websites require users to register and log in, and registration often involves answering a questionnaire. Online merchants amass data from their business transactions with consumers. Secondly, Government organizations, particularly those engaged in fighting crime and terrorism, having a particular need for personal information, personal data of others, it may help to find out who a person is, whether he poses a risk to society and with what people he is in contact.

Personal data have been used for many different purposes in cyberspace. An unfortunate problem, however, is that most people are not aware of who has collected their personal data, who has used that data, for what purposes, and who still holds a copy of the data (Hideyasu Sasaki, 2007). In fact, the advances in the Internet and information technologies, although allowing personal data to be efficiently collected and processed, have at the same time turned cyberspace into a hotbed for data abuse, for example, e-mail spamming, and credit card fraud etc. To face these new challenges, many countries have enacted laws to regulate abuse of personal data in cyberspace, for example, the Australian Privacy Act (Australian Government, 1988), the British Data Protection Act (British Government, 1998), the Personal Information Protection and Electronic Document Act of Canada (Canada Government, 2000), the German Federal Data Protection Act (German Government, 2001), and so forth. Moreover, the European Parliament and Council passed the European Union's Directive 95/46/EC, on the protection of individuals with regard to the processing of personal data and on the free movement of such data, in 1995 (European Union, 1995).

Regarding the privacy there are mainly three areas of privacy one is economic or cybercrimes where the wrong doer will be prosecuted and punished accordingly, second is military security which is waging war, destruction of infrastructure etc. therefore cyber security become a fifth domain for national security in India. Finally content of data is important for what is good and bad. There are different kind of securities one is technical security second is legal security and insurance security.

2. GENERAL SECURITY STANDARD COMPLIANCES - AROUND THE GLOBE

There are different models for regulation of data security, mainly there are EU and US standard for data protection compliances. EU compliance which talks about very comprehensive,

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

756

stringent nature of regulation and opposite side US regulation which talks about HIPAA and financial aspects GINA regulations, those are imposing rights and liabilities to government and private companies. National privacy frame work for India, NASCAM and DSCI are working for regulation of national security frame work which is regulating government and private companies which confers some kind of assurance of data security to citizens (Vinayak Gadse, 2012).

3. EUROPEAN UNION MODEL

In European Union Directive 95/46/EC (the data protection Directive) was developed to harmonize national provisions in this field. As a result, the personal data of all citizens will have equivalent protection across the Union. The fifteen Member States of the EU were required to bring their national legislation in line with the provisions of the Directive by 24th October 1998. According to the directive in case rights have been violated, is to contact the person who appears to be the source of the violation in order to find out who the Data Controller is. If don't get a satisfactory result from this, could contact national data protection authority. According to the Directive, each Member State must provide one or more public authorities to ensure the proper application of the data protection law. This authority, often referred to as the supervisory authority, is competent to hear complaints lodged by any person or business. The supervisory authority must investigate the claim and may temporarily ban the processing. If the supervisory authority finds that the data protection law has been violated, then the supervisory authority could, among other things, order the erasure or destruction of the data and/or ban further processing. To contact the supervisory authority, should (preferably in writing) describe the problem and submit enough information so that the problem is well described. In some member states, the supervisory authority has standardized forms that can fill out to make a complaint. If this is available, then should use these forms because this will speed up the handling of case and will receive an answer more quickly. In some member states complaints may be submitted by e-mail. In others this is not yet possible.

3.1. PCI Payment Card Industry

The PCI DSS SAQ is a validation tool for merchants and service providers that are not required to undergo an on-site data security assessment per the PCI DSS Security Assessment Procedures. The purpose of the SAQ is to assist organizations in self-evaluating compliance with the PCI DSS.

There are multiple versions of the PCI DSS SAQ to meet various business scenarios. A chart to help you determine which SAQ best applies to you and how to complete the SAQ is linked below. Each SAQ includes a series of yes-or-no questions about security posture and practices. The SAQ allows for flexibility based on the complexity of a particular merchant's or service provider's business situation, as shown in the table below, this determines validation type. The SAQ validation type is not correlated with a merchant's classification or risk level.
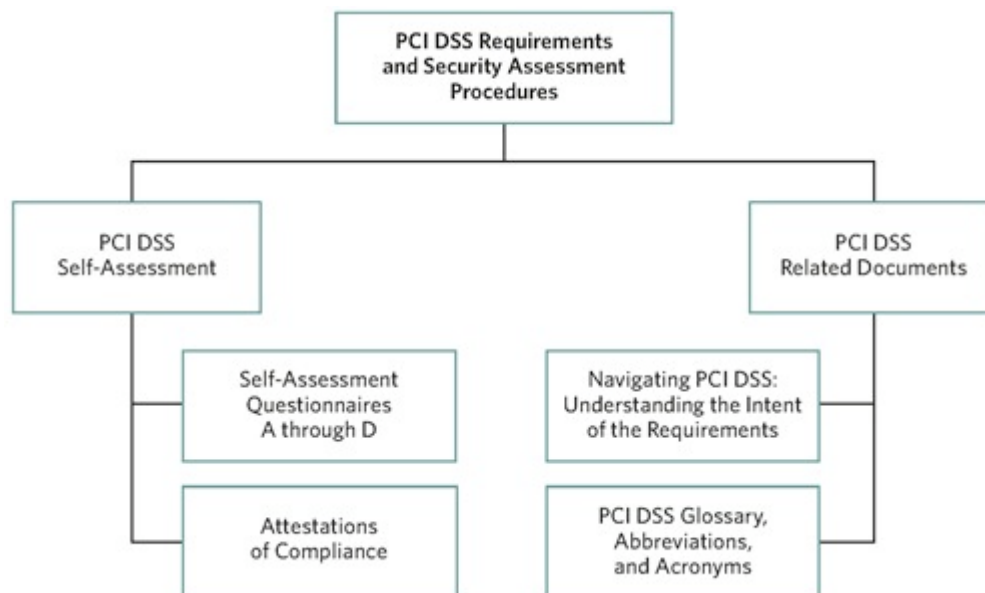
Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

757

Figure - 2. PCI Security process

3.2. The Family Educational Rights and Privacy Act, 1974 (FERPA)

The Family Educational Rights and Privacy Act 1974 (FERPA) is a Federal law that protects the privacy of student education records. These rights transfer to the student when he or she reaches the age of 18 or attends a school beyond the high school level. Students to whom the rights have transferred are "eligible students."

Schools may disclose, without consent, "directory" information such as a student's name, address, telephone number, date and place of birth, honors and awards, and dates of attendance. However, schools must tell parents and eligible students about directory information and allow parents and eligible students a reasonable amount of time to request that the school not disclose directory information about them. Schools must notify parents and eligible students annually of their rights under FERPA. With several exceptions, schools must have a student's consent prior to the disclosure of education records after that student is 18 years old.

3.3. The Sarbanes-Oxley Act of 2002

It directed the Commission to establish rules prohibiting auditors from providing certain non-audit services to audit clients and requiring management and auditor reporting on the effectiveness of public companies internal controls. It increased penalties for violations of securities laws and required certification of financial results by key corporate officers. Through these and other provisions, the Act called for improvement in the system of checks and balances that govern the production of financial information provided to investors.

3.4. The Health Insurance Portability and Accountability Act of 1996 (HIPAA)

The Health Insurance Portability and Accountability Act of 1996 (HIPAA) is most significant federal health care reform in a generation, the Act creates the first national standards for the availability and portability of group and individual health insurance coverage, relies on the states as well as the federal government to enforce those standards, begins the development of federal policy for the electronic transfer of medical information.

3.5. Availability and Portability

HIPAA sets new standards for regulation of health insurance coverage. It assigns responsibility for regulating and enforcing these standards to both the federal government and the states. The

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

758

companies have liabilities to follow the standards which protecting client's data. HIPAA covered entities health plans, health care clearing houses, and health care providers who transmit financial and administrative transactions electronically are required to comply with the national standards and regulations. Under HIPAA, the Secretary is required to impose a civil monetary penalty on any person failing to comply with the national standards and regulations. The minimum civil penalty (fine) for a violation is $100 per violation and up to $25,000 for all violations of an identical requirement or prohibition during a calendar year.

HIPAA also establishes criminal penalties for any person who knowingly and in violation of the Administrative Simplification provisions of HIPAA uses a unique health identifier, or obtains or discloses individually identifiable health information. Enhanced criminal penalties may be imposed if the offense is committed under false pretenses, with intent to sell the information or reap other personal gain. The penalties include a fine of not more than $50,000 and/or imprisonment of not more than one year; if the offense is under false pretenses, a fine of not more than $100,000 and/or imprisonment of not more than five years; and if the offense is with intent to sell, transfer, or use individually identifiable health information for commercial advantage, personal gain, or malicious harm, a fine of not more than $250,000 and/or imprisonment of not more than 10 years.

3.6. The Genetic Information Nondiscrimination Act of 2008 (GINA)

GINA generally will prohibit discrimination in health coverage and employment on the basis of genetic information. GINA, together with already existing nondiscrimination provisions of the Health Insurance Portability and Accountability Act, generally prohibits health insurers or health plan administrators from requesting or requiring genetic information of an individual or the individual's family members, or using it for decisions regarding coverage, rates, or pre-existing conditions. The law also prohibits most employers from using genetic information for hiring or promotion decisions, and for any decisions regarding terms of employment. The law will be enforced by various Federal agencies. Remedies for violations include corrective action and monetary penalties. Under Title II of GINA, individuals may also have the right to pursue private litigation.

4. PRESENT POSITION IN INDIA

In India, the Constitutional guarantee of the right to privacy is valid only against the state and no constitutional remedy for violation of privacy lies against any individual under Article 21 read with Article 19 (1) (a). while examining the width, scope and content of the expression personal liberty in these articles interpreted by the Indian Supreme Court in Kharak Singh V. State of U.P (1 SCR 332: AIR 1963 SC 1295) held that the term "Personal Liberty" is used in the article as a compendious term to include with itself all the varieties of rights which go to make up the personal liberties of man other than those dealt with under Article 19 (1).

India has issued rules under the IT Act, 2000 for protection of data and privacy. The Interception Rules, 2009 (under section 69). The Monitoring and Collecting Traffic Data Rules,2009 (under section 69B). The Information Technology (Due Diligence observed by Intermediaries Guidelines) Rules, 2011, the Information Technology (Reasonable security practices and procedures and sensitive personal information) Rules, 2011, the Draft Reasonable Security Practices Rules, 2011 (under section 43A) etc., regulate the cyber space, security for data and privacy to collect, store, process and communicate information. It is paradoxically these very capacities of technology which make us vulnerable to intrusions of our privacy.

Section 43-A of Information Technology Act, 2000 states that a body corporate which is company, firm, and sole proprietor includes sole proprietor that advocates, doctors, charted accountants so on. If they are dealing and handling any sensitive personal data, which it owns, controls, and operates the data .They must follow reasonable security practices which are provided under the Act. If they do not follow the reasonable practices they are liable up to 3

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

759

years of punishment and a fine to an extent of Indian Rupees 5 crores. An effected party can claim damages by approaching IT Secretary of State if damages are below 5 crores, for above 5 crores party can approach civil court.

There is an exception that government organizations are not covered, where most of data is dealing and handling which is owns, control, operates the data by the government and its organs but it is not covered and they are not have an obligation to follow reasonable security practices (Prashant Mali, 2012). The data protection is needed at government and its organs and at the same time privacy of individual; the state is not at all ready to respond to privacy of people. India is still not having legislation for privacy, state can simply intercept into individual privacy without any objection or procedure established by law. Here state mechanism like police and other investigation agencies intercepting data even in petty cases. Moreover, the state has kept individual data in the hands of foreign companies like America, UK, Israel etc. Therefore, Indians having serious threat to their data and privacy from three ways one is from Netizens, second State and its agencies, third from foreign states against Companies, Indian Citizens (A. Michael Froomkin, 2013).

5. FOREIGN STATES

The US Government and other Governments are keeping surveillance on Indian Government and Citizens. In the year 1967, by virtue of the U.S. Supreme Court orders in Katz Vs United States that the Government of USA had passed the law of the Wiretap Act, 1968 that regulate domestic surveillance, and subsequently passed law of Foreign Intelligence Surveillance Act, 1978 (FISA) which gave to U.S. Government the power to conduct, without judicial sanction, surveillance for foreign intelligence information. Then following the 9/11 of September incidents in USA World Trade Centre attacks, Congress enacted the Patriot Act, 2001. Section 215 of the Act, dramatically expanded the scope of FISA to allow secrete warrants to conduct surveillance in respect any tangible thing that was relevant to a national security investigation and also the FISA law is providing powers to Government to take the data from any private company of USA.

India is one of the prominent targets of US intelligence gathering. As shown by the Boundless Informant heat map publishing by the Guardian, it occupies the fifth place among countries under surveillance, with 6.3 billion pieces of data, and ahead of China and Russia. The reason this penetration so simple, not only do Google, Yahoo! And Microsoft (Hotmail) has a large number of Indian users, even government agencies and officials routinely use these web-based services for their communications. The FISA is allowing US Government, access to data from private and public companies (Prabir Purkayastha and Rishab Bailey. 2013). The same ignorance or callousness is being displayed with regard to data relating to the unique identification number (UDI) Authority has selected three US companies one for supporting and two for creating the data repository without taking into consideration the fact that these US companies are duty bound to furnish their data if asked for by the US government. Therefore, Indians are having great threat from US and countries like UK, Israel, China, Russia, and Pakistan etc., as they are always intercepting into e-mails, servers.

6. GOVERNMENT AND OTHER INSTITUTIONS

The existing government always tries to watch opposite party leader's movements, and their strategies and also officials, as a part of Political surveillance. The Indian state is main whistle blower and it is justifying its acts. Privacy rights of individuals against the government and individual's protection against unreasonable government institutions on privacy, such as searches of the home or interceptions of communications (Rodney D. Ryder. 2007). Typically, the government has sounded evasive, trotting out the all-too-familiar argument that law-abiding citizens have "nothing to fear" and that a bit investigation into privacy is a small price to pay for security and all this is meant to protect people from terrorists, or terrorism.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

760

The new Section 69 of I.T. Act, dealing with "Power to issue directions for interception or monitoring or decryption of any information through any computer resource" is much more elaborate than the one it replaced. In October 2009, the Central Government notified rules under Section 69 which lay down procedures and safeguards for interception, monitoring and decryption of information (the "Interception Rules 2009"), and under Section 69B to "monitor and collect traffic data or information generated, transmitted, received or stored in any computer resource" (the "Monitoring and Collecting Traffic Data Rules 2009") which are similar, although with important distinctions. But these rules are not safe to citizens and it is not a complete procedure like EU law. There is much gap, difficulty to understand what kind of data is allowed and what kind of crime allowed to intercept and what is the procedure to intercept.

Wiretapping, or, tapping for short, focuses on contents of communication, as the information communicated between persons may be very useful in criminal investigations (Sylvia Mercado Kierkegaara. 2007). Most legal systems explicitly mention privacy of letters, and privacy of phone calls, as there are different types of privacy. Since tapping violates basic human right, it is generally not allowed, but there are exceptions in western countries, such exceptions are strictly controlled and often concern suspicions of crime or terrorism or both. The police are often exceeding the authority in most of the countries, tap needs to be authorized by court, permission to tape is only provided under strict conditions. The tapping is not allowed for minor offences i.e. the cases must involve an offence punishable with, for instance at least four years of imprisonment. Further, there is a reasonable exception that the punishable, the suspect will participate in the conversation. Not only suspects, phones can be tapped, but also for instance, relatives, phone, when the communication involves people with professional rights of non-disclosure, such as lawyers and doctors monitoring the conversation is not allowed tapping is only allowed for public networks, private networks are beyond scrutiny. The aim is to use data for investigation detection and prosecution of serious crime considering that lot of communication takes place.

7. INDIVIDUALS

Net users are threat to data and privacy, internet centers, cyber cafés are places to commit offences, the users can create their email address and facebook address with fake information therefore their identity and bring their liability is impossible. The Indian law has creating inadequate measures to control and regulate those places (Henderson, Harry. 2006). The law begins by describing legitimate, permissible uses for, providing information directly to the individual named in the report, and a variety of "legitimate business needs" such as a person using a credit card or applying for credit, insurance, or employment. The law also prohibits "information brokers" from disclosing credit information without it falling under one of the legitimate purposes. Credit bureaus and agencies are required to notify one another when a consumer disputes information in a report. The credit agency must have an effective procedure for reviewing and correcting information.

8. REMEDIES UNDER INDIAN LAW

India have legal regime for regulating cyberspace consequently various kinds of provisions have been incorporated for protection of data security, stealing, download, extract, diminish a data will punish according to sections 66 and 43 of Act which providing 3 years of punishment and 5 lakhs rupees fine or both. There is critique on Indian cyber law that it's not so strong, punishment is not too much, it's not effective, only couple of convictions for the last 19 years, but the fact remains the law still provides an enabling legal frame work that should commit any of the cybercrime a case can be registered and appropriate relevant incriminating electronic evidence brought, appropriate convictions can also be done. But clearly cybercrime continuous to be an extreme important area, government of India needs to work much further so as to make

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

761

this legislation far more in sync with the requirements of changing times and social media (Pavan Duggal, 2013).

9. CONCLUSIONS

There is a need to follow technological security, legal security and insurance security measures for India and these security measures shall follow public and private organizations where the data is owns, controls, and operates the data.

No general right relating to privacy and personal data protection has been developed so far. In India there is an immediate need to pass legislation for operation of right to privacy.

State shall make rules to bring all the government organization, institutions and organs into due diligence under the Information Technology Act, 2000 and follow security policy measures with same as private companies.

Even though it is often quoted in India as an Act containing provisions pertaining to data protection, none of the provisions seem to offer an adequate protection. The concept of "personal data" is not even defined. **The Credit Information Companies (Regulation) Act, 2005 co**ntains certain provisions ensuring data protection but it is limited in its scope.

However it does not contain rules ensuring a comprehensive right to information. Moreover, no specific authority has been established to ensure the respect of these provisions under this Act. Nevertheless, Rules and Regulations that could be adopted under Article 20 (f) of this Act could provide for an adequate protection in the field of credit information.

The State shall develop its own network system and shall not rely heavily on the private networks, especially in government transactions. Data shall not be stored with networking system instead of that it shall be saved with other devises which is not connected to internet. Important discussion and data shall be communicated through **protected domestic network.**

It is necessary and essential that a new law dealing with data privacy and protection shall be developed in India, by making a comparative study of the existing laws in other countries and taking into consideration the special requirements of India.

State shall notify the HIPAA kind of standard compliances for India which are set by independent Institution. NGO's and Non-Profitable Organizations shall start propaganda about privacy and data security importance, difficulties and compliances.

10. REFERENCES

David Wright, Paul De Hert. (2012). *Privacy Impact Assessment*. Vol-6, New York: Springer Dordrecht Heidelberg, p.39

Daniel J. Solove. (2004). *The digital person, technology and privacy in the information age*. London: New York University Press, p. 9, 46.

Hideyasu Sasaki. (2007). *Intellectual property protection for multimedia information technology*. New Yark: Information Science Reference (an imprint of IGI Global), p.162.

Ian J. Lloyd. (2004). *Information Technology Law*, 4th Edition, New York: Oxford University Press, p.47.

Jerry Kang. (1998). *Information Privacy in Cyberspace Transactions*, Stanford: Stanford Law Review.

John Perry Barlow. (1994) The Economy of Ideas: A Framework for Rethinking Patents and Copyrights in the Digital Age," *Wired,* March, p. 85.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

762

Katsh, M. Ethan. (1995). Law in a Digital World, New York: Oxford University Press, Inc. pp. 28 - 29.

Michael Froomkin. A. (2013). *the Death of Privacy?,* Jstor.org., 09-01-2013.

Prabir Purkayastha, Rishab Bailey. (2013). India: Front line, date July 12, 2013

Sylvia Mercado Kierkegaara. (2007). *Cyber law security and Privacy.* Ankara: Barosu Bar Association press, pp.39-56.

Henderson, Harry. (2006). *Privacy in the information age.* Facts On File, Inc, p. 53.

Pavan Duggal. (2013). Delivered lecture on Understanding Indian IT Act 2000 with 2008 and 2011 amendments, October,27 of 2013, Available at You Tube dt.30-01-2015.

Paul M. Schwartz. (2013). *Property, Privacy, and Personal Data.* Jstor.org. 9-01-2013

Peter Carey. (2004). *Data Protection A practical Guide to UK and EU Law*, 2nd Edition, New York: Oxford University Press, p.86.

Prashant Mali. (2012) Delivered lecture on Legal aspects of IT Security and IT Act 2000 compliance, November,1 of 2012 at Mumbai. India., Available at You Tube dt.22-01-2015.

Serge Gutwirth, Yves Poullet & Paul De Hert. (2010). *Data Protection in a Profiled World.* New York: Springer Dordrecht Heidelberg, p.28.

Rodney D. Ryder. (2007). *Guide to Cyber Laws* (*Information Technology Act, 2000, E-Commerce, Data Protection & The Internet*), 3rd Edition, Nagpur: Wadhwa and Company, pp.477-506.

Vinayak Godse. (2012) Delivered Key Note Address-II on Data protection and data security council of India, October,17 of 2012 at Kolkata. India., Available at You Tube dt. 29-01-2015.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

763

ICT4D IN SRI LANKA - CHALLENGES, OPPORTUNITIES AND SOLUTIONS

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Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

764

ICT4D FOR BRIDGING THE 'DIGITAL DIVIDE' (A STUDY BASED ON FIVE ICT4D INITIATIVES IN SRI LANKA)

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Abstract: Information and Communication Technology is being considered as a key factor for accelerating and achieving economic and social development of a country. There are number of ICT4D initiatives in the developing courtiers, which have being implemented with the aim of bridging the 'digital divide'. ICT4D nevertheless is transforming into new age which requires new technologies and new approaches to innovation. By critically examining the five selected ICT4D case, this study analyzes the changing patterns and different stages of ICT4D approaches of Sri Lanka.

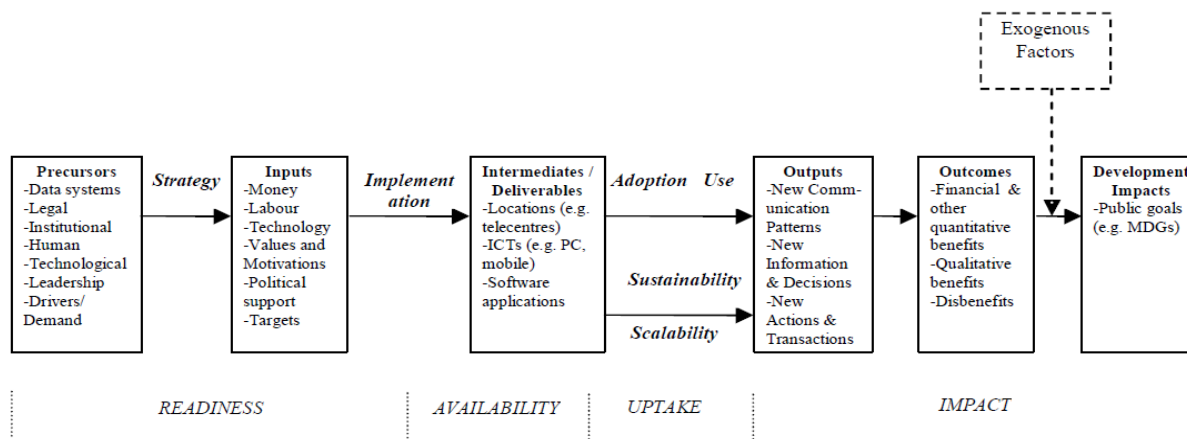**Keywords**: 'digital divide', ICT4D, Sri Lanka

1. INTRODUCTION

'Use of information and communication technologies for international development is moving to its next phase' (*Heeks, 2008:26*). Sri Lanka is also reaching a crucial stage ICT4D. There are number of ICT4D initiatives which have being implemented by both government and other organizations, focusing the digital inequalities situation in the country. This study critically examines five selected ICT4D projects among them. When analyzing these projects, ICT4D value chain introduced by Richard Heeks, will be used as the key theoretical framework.

2. 'RE-ENGINEERING GOVERNMENT' PROJECT

'Re-engineering Government' is the one of major e-government initiatives, which has being designed to bring fundamental reform of government with the objective of improving citizen service delivery. As being mentioned by its vision statement, this program aims to provide citizen services in an efficient manner by improving the way government works, by re-engineering and technologically empowering government business processes (*ICTA, 2011*). The project intend to improve the way government works, by three steps as, government to government (G2G), government-to-citizen (G2C) and government-to-business (G2B)(*Rainford, 2006*). The project basically, provides citizen services such as; e-Pension, e-Foreign Employment, e-Local Government and e-District Secretariat (e-DS), e-Money Order, e-Motoring, e-National ID Card, e-Parliament, e-Population Registry and e-training programs(*ICTA,2011*)

This approach can be examined with the basic components of Heeks's ICT4D value chain. Heeks emphasizes the importance having both horizontal and vertical coherence of ICT policy for achieving the development. He identifies ''e-readiness'' as a key requirement for achieving the horizontal coherence. (*Heeks et al. 2010:2*) According to him money, labour, technology, values and motivation, political supports are the key inputs in e-readiness (Figure - 01).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

765

Figure 01- ICT4D Value Chain

Source: *Heeks et al. 2010:2*

According to some analysis Sri Lanka has effectively improved its global e-government readiness (*UNDESA 2008, Mia and Dutta 2009*). It is clear fact that government has been able to bring some policies and recommendation for achieving the e –governance. Heeks describes legal, institutional and leadership aspect are important precursors (figure 1). According to the 'e -Government Policy Approved by Cabinet', main administrative bodies of the government should be prepared for delivering e-services. Some analysis nevertheless criticize e-government approach for lack of e-readiness (*Davidrajuh, 2004 and Karunasena, 2010*). According to them government has not been able to develop sufficient basic infrastructure which is mentioned above as the first step for e-readiness.

According to Heeks ICT should roll out to the poor in the 'Availability' stage, and in the 'Uptake' stage ICT should be applied for making it useful (*Heeks, 2008:33*). Government has been able to deliver some e – services. As an example now 65% central government ministries and 78% departments provide static information through their websites (*ICTA, 2008a*). But analysts show the fact that these initiatives, are still at the initial stage of development and as a consequence, citizens have not yet had the opportunity of enjoying the full benefits of e-services (*Karunasena and Deng, 2010:293*). Further, the take-up of e-government services in Sri Lanka is very low. Only 22.3% citizens are aware of available e-government services (*ICTA 2008b*).

According to Heeks, economic and social development goals should be achieved in the impact stage(*Heeks,2008:33*). As being mentioned by the program concept note, main goal of the program is the sustainable improvements in the Government of Sri Lanka's efficiency, transparency, effectiveness, and quality of services (*ICTA, 2011*). However, above facts suggest that these goals are still far from achieving.

3. 'NANASALA' (KNOWLEDGE CENTERS) PROJECT

Nanasala is the one of the key components of the 'e-Sri Lanka' initiative which aimed primarily at the use of ICTs for rural sector development. This program was launched in 2004 with a long term plan to connect every village in Sri Lanka to the Internet (*ICTA, 2011*). A key objective of the program was to establish multi-service community information centers, which provide access to the Internet, telephones and other information services along with training to the public in rural communities. At the beginning of the project it was aimed to establish 1000 centers by the end of 2008, throughout the country. However according to the current data of the Nanasala official web site, there are only 603 centers being establish so far (*ICTA, 2011*).

When analyzing with the Heeks ICT4D value chain this project seems achieved most of requirements in the 'Readiness' and 'Availability' stages. When planning this project,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

766

government has well identified the need of bridging the gap of "digital divide" that separates the urban areas from the rural communities in Sri Lanka. Therefore, one of main goals of the project was to facilitate access to ICT amongst the most vulnerable groups in Sri Lanka, and ensure that the benefits of ICT development flow to these groups. (*ICTA, 2008a*)

Heeks describes 'Availability' as the second stage of the ICT4D chain. According to him availability means supply. In this stage, implementation of an ICT4D initiative turns the inputs into a set of tangible ICT deliverables such as telecenters, PC, mobile and Software applications (*Heeks et al. 2010:2*-3). As we observed, Nanasala project aimed such a set of tangible ICT deliverables. By acting as multi-service community information centers, Nenasala aimed to fulfill most of IT need of the rural communities. According to Heeks both Scalability and sustainability are expected in the uptake stage (*Heeks et al. 2010:2*). When designing the Nanasala project guaranteeing the long-term sustainability was identified as an important component. Project evaluation reports nevertheless revels that the sustainability is not being ensured as expected. As an example a survey revealed that, at least 50% of the centers do not have a clear understanding of long term sustainability (*ICTA, 2008a*). Nanasala project has also being criticized for poor monitoring and evaluation process which is a key requirement for ensuring the long term sustainability (*ICTA, 2008c*).

When analyzing this project with the 'Impact' stage it is clear that most of expected outcomes are still not being achieved. The main objectives of a Nenasala was to assist communities in: poverty reduction, social and economic development and peace building (*ICTA, 2011*). It was expected that beneficiaries can obtain more social and economic opportunities via this project. As an example, it was anticipated that beneficiaries could find job opportunities via the internet at Nenasala. However, a survey revealed that only 23% job seekers were able to find jobs via the internet at community model Nenasalas. (Table 01)

Table 01 Jobs Found Via the Internet at Nenasalas

Particulars		Community Model		Business Model		Total	
		No.	%	No.	%	No.	%
Have any users of the Nenasala found jobs through internet searches at the Nenasala?	Yes	10	*23.3*	4	*36.3*	14	*25.9*
	No	33	*76.7*	7	*63.7*	40	*74.1*
Total		43	*100.0*	11	*100.0*	54	*100.0*

Source - *ICTA,2008c:17*

As being mentioned earlier, peace building was another goal of Nenasala project. As we observed this was a good objective as an initiative for achieving the ethnic harmony of the country. Because, ICT can help bridge communications gaps between the main stakeholders in the peace process and enable public participation in the process from the grassroots upwards (Hattotuwa, 2004:1). But unfortunately there are no clear evidences to show that Nanasala project has contributed for the peace building of the country.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015
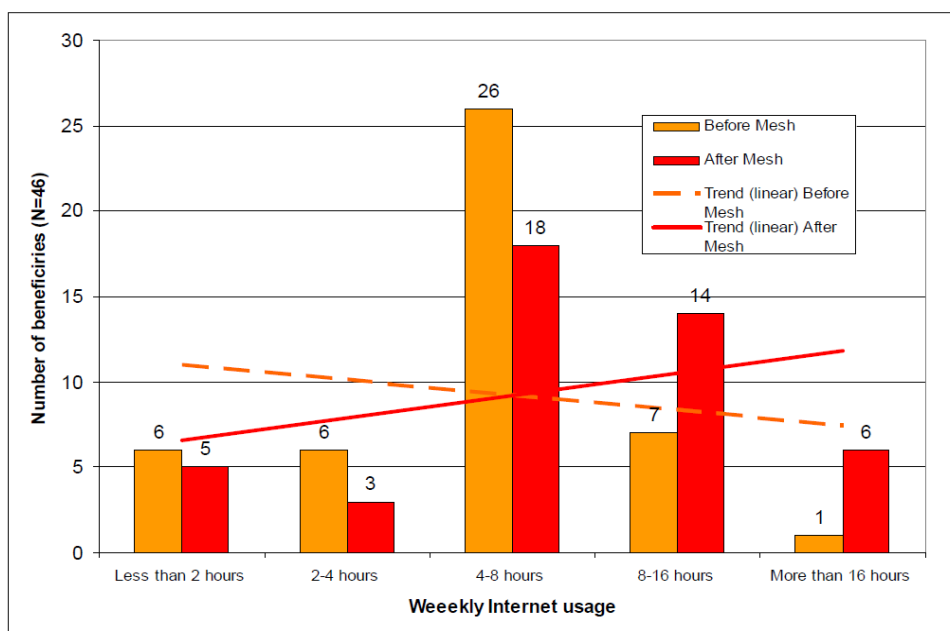
767

4. E-VILLAGE PROJECT IN MAHAVILACHCHIYA

'Mahavilachchiya e-village' is the First Model e-Village of Sri Lanka. This was created in 2006, through a partnership between ICTA, a local NGO called Horizon Lanka Foundation (HLF) and Asia Pacific Development Information Program (APDIP) of the UNDP. The project is based on 'Mesh Networking', which enabled beneficiaries to obtain Internet and LAN facilities to their home. The concept behind the e-Village project was to bring about a positive change in the community of Mahavilachchiya, by introducing people to the advantages of ICT usage in seeking developmental solutions. (*HLF, 2010*).

As we observed, this project is a 'per poor effort'. According to Heeks, 'Per-poor' innovation occurs within and by poor communities' (*Heeks, 2008:30*). The 'e-village' project of Mahavilachchiya was also an initiative that took birth within the village itself, with the assistance of the private donors during its initial stages. (*Wattegama and Wanninayake.2007:2*). HLF was established in 1998, by a young English teacher, from the rural village of Mahavilachchiya. At the beginning the organization started as an after-school club, providing children further education in English and computers. Step by step, they expanded their services and Horizon Lanka Academy was established with a computer lab. In 2001, the organization was able to launch their website. By 2004 the Horizon Lanka got internet access using RLL technology, as the first Sri Lankan rural village to get such a facility even before telephone coverage came to the village (*HLF, 2010*). HLF initiated this particular project in 2006, after securing a grant from UNDP.

When analyzing this project with Heeks's model, it is clear that it has been able to achieve the most elements of first two steps, 'Readiness' and 'Availability'. The project had policies to make ICT4D availability possible. The vision of HLF is to 'make Mahavilachchiya the ICT hub of Sri Lanka'. The concept behind this e-Village project also was to 'bring about a positive change in the community of Mahavilachchiya, by introducing people to the advantages of ICT usage in seeking developmental solutions' (*HLF, 2010*). When initiating this project HLF has well examined nature and patterns of the 'digital divide' in Sri Lanka. Further, Wanninayaka who was the founder of HLF has criticized the 'technocentricity' of some ICT approaches in Sri Lanka.[1] And in the availability stage the project has been able to roll out ICT to the poor communities in the area. A research has shown the duration of PC usage by the beneficiaries had increased as a result of the mesh networks (figure 2)

Figure 2: Duration of PC usage by beneficiaries of the project before and after the installation of mesh network (average and per week basis)

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[1] "We have seen over the years that millions of rupees are spent on telecenter initiatives at public schools and other places and most of the times the computers just idle in the rooms without being touched…" (*Wanninayaka,2004 in Proenza and Reshan,2004:19*)

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

768

Source: Wattegama,C and Wanninayake, 2007:6

AS Heeks states, in the 'Uptake stage' ICT should be implemented to make it useful and the greatest development impact should be achieve in the 'Impact stage' (*Heeks, 2008:33*). According to (*Wattegama and Wanninayake, 2007:15-16*), this project has made a significant impact in the education of the beneficiaries, but has been unable to achieve the 'bringing quick economically important outcomes' which was a one of the main goals of the project. Their research has shown that the internet connection at home could do little or nothing to improve income of beneficiaries. Therefore they emphasize the fact that sustainability of this project is also at great risk. Long-term survival for this project relies on the financial stability, so that the project is not dependent on the funds of a few individual donors. To become financially sustainable, plans need to be in place to generate income (*Bhagat, 2008*). But, if the project fails to bring any economic outcome this goal will not be achievable.

5. KOTHMALE COMMUNITY RADIO INTERNET PROJECT

The internet project at Kothmale was initiated in 1998 as a pilot project of UNESCO in partnership with a number of Sri Lankan and international agencies (*Slater et al, 2002*). It is formally part of SLBC, and is run by a combination of permanent SLBC employees, part time paid workers and volunteers. It was originally started to rebuild a rural community in central Sri Lanka following displacement of populations due to the Mahaweli dam project (*KCMC, 2008*)

According to Heeks, addressing the issues of 'digital divided' is a one of main elements in the 'Readiness' stage. (*Heeks, 2008:33*). One of main expectations of this project was, also addressing the discourse of digital divided. Kothmale has poor information resources and problems of information diffusion because of geographical dispersed population and few domestic telephones (*Slater et al, 2002*). Radio is the most popular media in the area. Even though, there is high awareness and some understanding about the internet among communities in the area, they are only few opportunities available for them to have the internet access. Project aimed to bridge all these gaps. Therefore some identify this as a 'marriage of internet with local community radio' (*Pringle and David, 2002*). According to some analysts, Kothmale Community Radio is one of the most discussed and commended initiatives in Sri Lankan, because this is a unique combination of ICTs, community participation and strong multi-party partnerships. (*Gunasekera, J. 2008.*)

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

769

As we observed, now project is in the 'Uptake' stage by implementing and applying ICT to make it useful. Under this project, three computer access points have already been established at different community centers in the local area. However, none have yet developed into full-service cybercafés (*Slater et al, 2002*). It will take time to reach the 'Impact' stage with the fulfillment of economic and social goals.

6. SARVODAYA'S TELECENTER PROJECT

Sarvodaya's Telecenter Project was being implemented by the Sarvodaya Shramadana movement largest and oldest rural development NGO in Sri Lanka. This project had started with a 1 pilot telecentre in 1997 as the pioneering ICT for community development initiative, since had evolved into multiple project elements, including 31 telecentres and 177 Village Information Centers (VIC) by 2004 (*Sarvodaya, 2005 in Liyanage, 2006 :9*).

When examining the 'Readiness' stage of the project, it is a clear fat that Sarvodaya had policies for ICT4D. As being mentioned by its vision statement their aim is to have combination of ICT with nature, culture, spirituality and development. The slogan of the project is 'e-empowerment of poor' (*FUSION, 2008*). Therefore we can assume that the project aimed to bridge the digital divide too. Then with the infrastructure, they have found some infrastructure facilities for making ICT availability possible. As an example Sarvodaya was able to obtain funds from UNESCO to enhance the ability of telecenters. (*Kapadia, 2005:19*)

The project seems, have been able to roll out ICTs to the poor to help them become users. A large number of students and schools levers uses the internet facilities provided by the centers. In some VICs and telecenters, people can access information on new agricultural practices and techniques. This is an ideal opportunity for the farmer who lives in rural areas. A research has shown the fact that 89% of beneficiaries were satisfied with the service provided by the project (*Kapadia, 2005:21*). Some researchers have shown the fact that unlike most of NGO initiatives in Sri Lanka, the Sarvodaya telecenter model is sustainable and rapidly replicable. According Kapadia (*2005:24*) this project is sustainable due to two main reasons. Firstly, the telecenter is income-generating. He point out the fact that, even though the telecenters charge very low rates for courses and services they can cover their operating costs. Secondly, the growth of this project is not dependent on the availability of large capital investment. Because, VICs can be developed even at virtually zero cost, with the help of motivated youth volunteers in the villages. These evidences suggest that this project archived most of necessary elements in the 'Availability' and 'Uptake' stages too.

According to Heeks, there are major three components in the Impact stage as; outputs, outcomes, and development impacts. Outcomes refer to financial & other quantitative and qualitative impacts and development impacts refer to public goals such as MDGs (*Heeks et al. 2010:2*). This project has been able to bring some indirect economics benefits for the poor communities. A survey has shown that, about 56% beneficiaries have achieved indirect economics benefits. Most important point is, the project has been able to bring some social impacts too. VICs and telecenters provide considerable information on public health and nutrition. Further these centers have been able to expand the knowledge of villagers by giving knowledge regarding the environmental issues and hazard like tsunami, and disseminate information on the value of local plants and animals (Kapadia, 2005:23)

7. CONCLUSION

According to Heeks, ''there is no sharp dividing line that lets us say, ICT4D1.0 stopped here; ICT4D 2.0 began here'' (*Heeks, 2008:32*).This statement is well applicable with the Sri Lankan context. The study finds that, it is very difficult to draw demarcation line between ICT4D 1.0 and ICTD 2.0 stages in Sri Lanka. When analyzing above mentioned projects with the deferent stages of the level of ICT4D activity, it is a clear fact that they have been able to fulfill majority

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

770

of elements in the both 'Readiness' and 'Availability' stages. However, most projects have been unable to go beyond the 'Uptake' stage. Lack of sustainability has been a common weakness for most of projects. 'Sarvodaya' project nevertheless brings an ideal model for ensuring the sustainability. The study further reveled that above initiatives are still far from achieving the 'Impact' stage. Necessary adjustments should be made in no time, for achieving the maximum results of the ICT4D2.0.

REFERENCES

Bhagat, A. (2008). Life after Connectivity: the Impact of the Community Mesh Network in Mahavilachchiya, Sri Lanka's E-village, The Journal of Community Informatics, Vol. 4 No. 1 Special Issue: Wireless Networking for Communities, Citizens and the Public Interest. http://www.ci-journal.net/index.php/ciej/article/view/425/391 accessed on 28.01.2011

Davidrajuh, R. (2004). 'Planning e-government start-up: a case study on e-Sri Lanka', Electronic Government, Vol. 1, No. 1, pp.92–106.

Gamage, P. (2009). A Critical Examination of the '1000 Telecentre Programme of the e-Sri Lanka Initiative' and its Impact on Reducing Digital Inequalities.

Gunasekera, J. (2008). Enhancing The Livelihoods Of The Rural Poor Through ICT: A Knowledge Map. Sri Lanka Country Study. Working Paper. NO. 12. Dev's working papers series.

Hattotuwa, S. (2004). Untying the Gordian Knot: ICT for Conflict Transformation and Peacebuilding. Info-Share, Sri Lanka.

Heeks, R. (2008). ICT4D 2.0: The Next Phase of Applying ICT for International Development, Computer, vol. 41, no 06,pp 26-33

Heeks, R. and Duncombe, R. (2005). Information & Communication Technologies (ICTs), Poverty Reduction and Micro, Small & Medium-scale Enterprises (MSMEs) . A framework for understanding ICT applications for MSMEs in developing countries . Institute for Development Policy and Management (IDPM).UK

Heeks, R., Gao P & Ospina, A. (2010). E –Development Briefing No. 14, Centre for Development Informatics, University of Manchester

Horizon Lanka Foundation (HLF). (2010). Web site of the HLF http://horizonlanka.wordpress.com/ accessed on 30.1.2011

ICTA, (2008a). Government ICT usage survey. Information Communication Technology Agency of Sri Lanka, Colombo, Sri Lanka.

ICTA, (2008b). Government organizations visitors survey. ICT Agency of Sri Lanka, Colombo, Sri Lanka.

ICTA, (2008c). Nenasala Interim Survey.

ICTA, (2011). Web site of the ICT Agency of Sri Lanka. http://www.icta.lk/

Kapadia, K. (2005). Developing Information Technology, Informing Technology for Development: A study of ICT and rural development in Sri Lanka. Report for Tier Group, U.C. Berkeley and Sarvodaya Shramadana Movement of Sri Lanka.

Karunasena, K and Deng, H. (2010). Exploring the Public Value of e-Government: An Empirical Study from Sri Lanka, 23rd Bled eConference eTrust: Implications for the Individual, Enterprises and Society June 20 - 23, 2010; Bled, Slovenia

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

771

Liyanage, H. (2006). Sri Lanka :NGO & Community Participation in Setting up the Nanasala for targeting the poor and vulnerable and improving government accountability in Sri Lanka, Sarvodaya Shramadana Sangamaya Inc.

Mia, I & Dutta, S. (2009). The global information technology report 2008-2009: Mobility in a networked world. World Economic Forum, Palgrave, Mcmillan Publisher, ISBN 13: 978-1-4039-9932-0, New York, 2009.

Pringle, I and David, M. (2002). The Electronic Journal on Information Systems in Developing Countries.

Proenza, F and Reshan, (2004). E -Sri Lanka's Telecenter Development Program :Strategic Choices and Challenges of A High Impact – High Risk Investment, Working Paper, 6 http://www.e-forall.org/pdf/VGKChoicesChallenges_6Sep2004.pdf accessed on 26.01.2011

Punchihewa, D and Wimalaratne, P. (2010). Towards an ICT Enabled Farming Community. School of Computing, University of Colombo, Sri Lanka

Rainford, S. (2006). E-Sri Lanka: An Integrated Approach to e-Government. ICT Agency of Sri Lanka.

Sarvodaya ICT4D Movment – FUSION, (2008). http://www.fusion.lk/ accessed on 30.01.2011

Slater, D .Tacchi, J and Lewis, P. (2002). Ethnographic monitoring and evaluation of community multimedia centres: A study of Kothmale community radio internet project, Sri Lanka.

UNDESA. (2008). UN e-government survey 2008: From e-government to connected governance. Department of Economic and Social Affairs, United Nations, New York.

Wattegama, C and Wanninayake, N. (2007). Connected villages as a means of empowering the rural poor: A case study from Sri Lanka, UNDP Regional Centre, Colombo, Sri Lanka

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

772

BRIDGING THE DIGITAL DIVIDE IN SRI LANKAN TEA ESTATE AREAS

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Abstract: Sri Lanka is characterised by rapid economic growth combined with fast technological advancements. However, these advancements do not reach out to the entire society. The purpose of this paper is to examine the manifestations of the internal digital divide in the Sri Lankan tea estate context. With their particular history and socio-economic structures, tea estate areas face serious challenges in bringing their whole population into the 21st century where digital literacy plays a crucial role in facilitating a full participation in the society. This study analyses the digital divide with a specific perspective on gender issues and people with disabilities. We discuss the role of education, social-economic structures, cultures and languages in the manifestations of the digital divide. We also examine the telecentre projects and their role in the effort of bridging the digital divide as they provide access to the information and communication technology (ICT) and the Internet as well as they provide training in digital literacies. We comment on the potential of open data movement underlining the crucial role of education and training in the process of citizen empowerment.

Keywords: Digital infrastructure, Digital divide, Digital literacies, Education for all, Tea estate areas, Sri Lanka

1. INTRODUCTION

In Sri Lanka, a vast majority of the total population, 78% of approximately 20 million people, live in rural and estate areas (Central Bank of Sri Lanka, 2013). The technological development is fast but most of the infrastructure improvements as well as research efforts are focused on the capital and other urban areas (TRCSL, 2013). While the external digital divide related to other countries decreases, the internal digital divide between urban and rural areas increases (Pringle & David, 2002). This brings serious challenges for the society in relation to providing full societal services and facilitating active citizenship to the entire population. From a cultural perspective this affects participation in the global digital culture where the case of Sri Lanka may provide useful insights for other rural areas in the world, and vice versa.

The term "digital divide" is defined as "The gulf between those who have ready access to computers and the Internet, and those who do not" ("Digital divide," 2015). The divide can be based on race, gender, educational attainment, and income. Closely related to digital divide is the notion of "digital literacies" which refers to the knowledge, skills, attitudes and behaviours in the use of a broad range of digital devices. As the technologies develop and the use of them takes new forms, also the notion of digital literacies is widening. Within digital literacies we can distinguish among others computer literacy, network literacy, information literacy and social media literacy (Burn & Durran, 2007; Gillen & Barton, 2010). Thus, bridging the digital divide is not just about providing people with access to technology but it is also about facilitating people with ownership of skills and competences and the knowledge that are attached to the use of the digital technologies.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

773

The paper is structured as follows. First, the research problem, questions and methods are formulated. Then, a background is provided to contextualise the study before results are discussed. Finally, conclusions are presented followed by further work and references.

2. PROBLEM AND RESEARCH QUESTION

The problem addressed in this paper is the internal digital divide in Sri Lankan society, which needs to be better understood from the perspectives of the people in tea estate areas. Only through understanding the structures and mechanisms of the existing digital divide, it is possible to take action and build new structures and facilitate new services, which will help to bridge the divide.

Our research questions are: What are the manifestations of the digital divide in the Sri Lankan tea estate areas? How can these manifestations be addressed?

3. METHODS

The literature review was conducted iteratively following the six steps described by Machi & McEvoy(2008) as a guide. This included selecting a topic, searching and surveying the literature to develop the arguments, and writing the review. The authors also contributed with their previous knowledge of the field. Ethics were considered from the outset by having a native Sri Lankan as the main author, which also enhances the validity of the study based upon a life-long experience of the context. The reliability of the study relies on the authors' ability to correctly review previous research, related to the research questions, which to a certain extent depends on a long experience of the   field (Hansson, Mozelius, Gaiani, & Meegammana, 2010; Mozelius & Megammaana, 2011b).

Strength of the study is the combination of both emic and etic perspectives.

- The insights and experiences of one of the co-authors, who is part of the context studied, bring dimensions to the analysis that helps us understand the mechanism of digital divide.

- The etic - outside - perspective may shed light to phenomena that seem too obvious to an insider to take into consideration.

In this study, the different perspectives of the authors have facilitated fruitful conversations that have deepened our analysis.

4. SRI LANKA

Sri Lanka is a South Asian country, ranked 92 (of 187 countries) on the Human Development Index (HDI) and shows a continued development in the last few decades (UNDP, 2013). Between 1980 and 2012, Sri Lanka's HDI value increased from 0.557 to 0.715, an increase of 28% or average annual increase of about 0.8%. Although Sri Lanka has shifted to the category of high human development, this development has not spread evenly among the population. The Inequality-adjusted HDI due to inequalities in population is 0.607 and the overall loss is 15.1. Loss due to inequality in life expectancy at birth is 9.4%, loss due to inequality in education is 14.6% and loss due to inequality in income is 20.8%. Table 1 below is based on the UNDP Sri Lankan report (UNDP, 2013).

HDI value	HDI rank	Life expectancy	Expected years of schooling	Mean years of schooling	GNI per capita (US$)
0.715	92	75.1	12.7	9.3	5,170
Source: (UNDP, 2013)					

Table 1. UNDP HDI Data

In rural Sri Lanka, 70% of women are involved in subsistence agriculture and production but often lack capital, labour, education and access to information and communication technology

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

774

(Aluwihare-Samaranayake, De Silva, & Coomaraswamy, 2003). As consequence, they are weak in economic empowerment. Also in Sri Lankan culture, women are mainly responsible for caring of children and family activities and hence they have limited access to education after their formal school education. The education level of the women is directly affecting the living standards of the family (FAO, 2013; Wanasundera, 2006). Hence if they can access educational resources, it may be one solution to defeat poverty.

After the civil war, Sri Lanka is in a state where a careful attention of equal development and cooperation between different nations is required. Especially, the northern, central and eastern provinces should have equal opportunities (European Commission, 2011) compared with the more developed western province. Although the literacy level is in a high-level category, the primary and secondary education system is criticised for not being aimed at skill development and employability (Wijetunge, 2006). Further, Wijetunge (2000) highlights the importance of life-long learning in Sri Lanka and recommends enhanced opportunities. Lifelong learning is important for the on-going, voluntary, and self-motivated pursuit of knowledge for either personal or professional reasons and also enhances social inclusion, active citizenship and personal development, but also competitiveness and employability.

Based on the data presented above, there are several challenges in bridging the internal digital divide: 1) An unequal spread of development within the population, 2) Low educational level among women and disabled in rural Sri Lanka, 3) Maintaining knowledge up-to-date through life-long learning.

5. TEA ESTATE AREAS

There is no universal definition for estate areas and different institutions use slightly different criteria. We apply the Sri Lankan census department definition of estate areas: *"Estate sector consists of all plantations which are 20 acres or more in extent and with ten or more resident labourers"* (Census of Population and Housing 2011, 2011). According to the year 2012 census, there are about 900,000 people living in the tea estate areas of Sri Lanka. Majority of these, 84%, live in the following six districts: Nuwara Eliya, Badulla, Rathnapura, Kegalle, Kandy and Matale. From these six districts, Nuwara Eliya has got the highest number of people i.e. 377,171, equivalent of 53%. Table 2 shows the distribution of tea estate population in the six main districts with tea estates (Department of Census and Statistics Sri Lanka, 2012b).

District	Population	Estate Sector %	Estate population
Country total	20359439	4,4	895815
Nuwara Eliya	711644	53,0	377171
Badulla	815405	18,0	153898
Rathnapura	1088007	9,2	100096
Kegalle	840648	6,8	57164
Kandy	1375382	6,2	44121
Matale	484531	3,9	18896
Source: (Department of Census and Statistics Sri Lanka, 2012b)			

Table 2. Tea estate population

5.1. History

The Sri Lankan tea estates have their origin in the coffee plantations that were started by the Dutch. Coffee grew well in the upland regions around Kandy and coffee trading was a profitable business that later was taken over by the British colonisers. At that time, in the 1830s, plantation agents recruited workers (at that time a.k.a. coolies) from the South Indian regions in Tamil Nadu. The migrating Tamils had to walk a long way through the jungle from Sri Lanka's north-western coasts to estate areas in the central highlands. Many of these migrants died of diseases

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

775

and overstrain during the travel to the estate area(Yogasundram, 2008). In 1841 the unwritten "contracts" between planters and workers were made legally binding which made it impossible for recruited workers to leave the estates even if they were badly treated (ibid.). These immigrants have in Sri Lanka later been called *"Indian Tamils"* or *"Plantation Tamils"* (Hussein, 2009) and both by Sri Lankan Tamils and colonisers they have been considered culturally distinct from Sri Lankan Tamils (Wickramasinghe, 2006) .

Gradually the entire economy was transformed as the successful coffee plantations were overshadowing the cultivation of sugar cane and coconuts (ibid.). An abrupt ending of the coffee cultivation commenced in 1869 when the coffee blight (*hemiileia vastratrix*) was identified in some coffee estates. This was a devastating leaf disease that in just a few years spread to almost every coffee plantation on the island and ruined the coffee industry. The by far most successful substitute for coffee was to grow tea (Yogasundram, 2008). For the coffee cultivation, the need for labour was focused to the picking season between mid-August and November, but tea plants are harvested all year round. A new wave of Indian Tamils migrated to Sri Lanka in the end of the 19th century and in the census of 1911 the number of Indian workers in Sri Lanka was reported to be about 500,000 persons, which at the time, represented 12% of the country's total population (Wickramasinghe, 2006).

5.2. Demography

The tea estate population lives in a very special environment and is considered one of the most vulnerable groups in the Sri Lankan society (Samaraweera, 2009). The 2012 report published by United Nations Development Programme Sri Lanka further explains this situation:

"The estate sector is a unique feature of the Sri Lankan economy. It consists of Tamil descendants of workers brought mostly from southern India during the mid- 19th Century to work on tea and coffee estates. Trapped in generational, long-term poverty, due to historical circumstances and a variety of other factors relating to geography, language and access to services, they have poor health and education outcomes relative to the rest of the country" (UNDP, 2012, p. 15).

Table 3 shows poverty indicators in Sri Lanka in 2006/07 and 2012. It shows that the estate sector records the highest poverty rate in 2006/07 but rate has reduced by six times. Also, the estate sector has got the lowest household expenditure and it is about 50% when compare with the urban sector. It is spends the lowest amount for education, but both communication and communication expenditure has increased approximately by 100%.

Sector	Poverty head count %)		Mean household income per month, Rs.		Household Expenditure Share, %			
					Communication		Education	
	(2006/07)	(2012)	2006/07	2012	2006/07	2012	2006/07	2012
Urban	6.7	2.4	41928	68,336	2.8	4.1	4	6.8
Rural	15.7	7.5	24039	42184	2.3	3.2	3.1	5.2
Estate	32.0	6.2	19292	31395	1.7	3.5	1.6	3.1
Source: (Department of Census and Statistics, 2013, p. 30,38)								

Table 3: Poverty and expenditure by sector 2006/07 and 2012

Also this report demonstrates that the large estate populations (Nuwara Eliya, Badulla and Ratnapura), live in the poorest, most deprived parts of the country. This special situation of estate sector population has been summarised by Aheeyar (2006, p. 5):

"Estate workers and families were provided with housing, health care and other basic necessaries by the estate management within the estate premises in order to keep them intact. Further they rarely leave the estates and do not get ample opportunities to mix with outside

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

776

world and interact with neighbouring communities. The outsiders were also not allowed to enter the estates without the permission of the estate management. In addition to above mentioned geographical isolation of estates, socio-cultural differences of Indian origin Tamils from rest of the people of the country, problems with citizenship rights until recent time, and ethnic conflict related security consider actions influenced them to live in isolated condition".

Electricity and telecommunication facilities are necessary for using ICT. Table 4 shows how all these facilities are scarce in tea estates. Especially, telephone penetration in urban areas is three times higher than in tea estate areas. PC penetration is about 10 times that of tea estate areas. The table shows clearly the gap between urban and rural/estate areas when it comes to electricity and telecommunication facilities, which are the basic infrastructure required for ICT use.

Sector	Electricity	Land lines and mobile	No telephone	Tv	PC
Urban	95	41.7	15.2	86.9	23.6
Rural	84	29.3	23.3	79.3	11.2
Estate	76	13.8	38.9	70.5	2.2
Source: (Department of Census and Statistics Sri lanla, 2010)					

Table 4: Electricity and telecommunication facilities (%) 2009/10

A comparison of literacy rates and computer literacy rates by sector shows that estate sector records the lowest rate (Table 5). When it comes to computer literacy, it shows a clear difference between the urban, rural and estate areas. Urban areas show a computer literacy rate of 36.8% when the estate area shows the rate of 8.8%. The urban sector literacy rate is 11% higher than estate sector literacy rate (considering estate sector rate as the base). However, urban sector computer literacy is 318% greater than the estate sector. Although the gap is smaller, when compared with the rural sector it also shows a similar pattern of disfavour for the estate areas. Computer literacy is an essential requirement, and this pattern indicates the existence of digital divide between sectors in Sri Lanka.

Sector	Literacy			Computer literacy rate		
	No	Rate (%)	Difference based on estate sector	No	Rate (%)	Difference based on estate sector
Urban	3059241	97,7	13,5%	1150667	36,8	318%
Rural	12466443	95,7	11,2%	2872734	22,1	151%
Estate	616583	86,1	Base (100%)	62766	8,8	Base (100%)
Source: (Department of Census and Statistics Sri Lanka, 2012a)						

Table 5: Population aged 10 years and over by literacy and computer literacy rates by sectors

5.3. Languages

In Sri Lanka, the three most important languages are Sinhala, Tamil and English. Majority of Indian Tamil population lives in tea estates and as shown in the table 6, the ability of this group to speak English is comparatively low. Since English is important for computer literacy and lingua franca of global education, this minority group has got an inherent disadvantage.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

777

Percentage of population aged 10 years and over in major ethnic groups by district and ability to speak Sinhala, Tamil and English Languages							
Percentage of Sinhalese Population Ability to Speak		Percentage of Tamil Population Ability to Speak		Percentage of Indian Tamil Population Ability to Speak		Percentage of Sri Lankan Moor Population Ability to Speak	
Tamil	English	Sinhala	English	Sinhala	English	Sinhala	English
4	13,2	64,6	24,1	50,8	8,7	60,9	20,6
Source: (Department of Census and Statistics Sri Lanka, 2001)							

Table 6. Language distribution

A comparison of language skills by sectors shows in the table 7. As the table shows English speaking ability is about 10% in urban sector and rural sector rate is about two times (21.9%) and urban sector rate is about 4 times (41.4%). Ability to read and write in English also shows a similar pattern. Urban sector read write ability in English is about 3 times higher than estate sector value. Language skills related figures shows language skills as a barrier for bridging the digital divide in estate sector and ICT initiatives should carefully addressed this issue.

Sector	Population	Ability to speak %			Ability to read and write %		
		Sinhala	Tamil	English	Sinhala	Tamil	English
		%	%	%	%	%	%
Urban	3130283	85.2	41.4	44.1	77.1	39.1	49.4
Rural	13021416	88.6	21.9	19.7	83.2	20.6	27.1
Estate	716126	64.8	92.1	10.1	27.3	76.8	17.0
Source: (Department of Census and Statistics Sri Lanka, 2012a)							

Table 7: Population aged 10 years and over, by ability to speak, ability to read and write main languages, ethnic group, sex and sector

5.4. People with impairments

Available census data show that the rate of disabilities among the population is not evenly spread in Sri Lanka (Department of Census and Statistics Sri Lanka, 2001). In all 18 districts, the number of disabled is 162.9 out of 10000 people (both men and women). It ranges from 122.8 in the capital city of Colombo, to 242.4 in Hambanthota. The Hambanthota district has low employment, which explains why many from this area joined the army and were injured in battle. The corresponding ratios in tea estate areas are: Badulia, 163.5; Ratnapura, 169.9; Nuwara Eliya, 149.5. While inclusion requires accessibility, the need is not greater in tea estate areas than in other districts. Men have a significantly higher disability rate than women in all areas, which can be explained by the recent civil war. This fact should be considered regarding the need for accessibility in general but also in ICT applications.

5.5. Women in the tea estates

Historically, the major body of the labour force at the tea plantations has consisted of women who are the tea pickers and also work with the various parts of the tea processing in the factories. Their work is described as undervalued and underestimated by Ilyas (2014) in his recent account on Estate Tamils in Sri Lanka.

Women work both as breadwinners and caretakers in their households. Despite their important contributions to the household, they are subject to the patriarchal family system that deprives them of any economic independence. Women are also deprived of education. Only half of the

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

778

female population on the estates (53%) complete their primary education, 24% continue to the secondary school and only 4 % complete their O-levels (Ilyas, 2014, p. 189).

Although Sri Lankan women have played unusually favourable role in society and political field when compared to other countries of the SAARC region, the plantation women have been neglected and marginalized by development programmes (Ilyas, 2014). They are locked as tea states workers and mainly employed as unskilled labourers. Samarasinghe (1993) explains their situation with a title "Puppet on a string". According to Samarasinghe, 95% of Indian Tamil women had employment in 1993, while the total female labour force of Sri Lanka was 26%. Tea plucking is still the lowest paid profession (Central bank of Sri Lanka, 2013) but as the women work longer hours than average female workers, they earn more (Ilyas, 2014; Samarasinghe, 1993)

Generally, tea plantation workers have very low educational level and the women in tea estates have the lowest status. The illiteracy rate among tea plantation women is 74.4% compared with 16% among the women in the country as a whole (Samarasinghe, 1993). In conclusion, women in tea estate areas are marginalised through their social, economic and educational status. The digital divide is particularly wide for tea estate women as their possibilities to education are the poorest in the whole Sri Lankan society.

5.6. Telecentres in tea estate areas

A nationwide project has established 700 community driven telecentres in Sri Lankan rural and semi-rural areas with the aim of providing ICT services to the population (Nenasala Official Web Site, 2015). These telecentres are equipped in different ways but normally with 2-4 computers and a printer. Many telecentres, but not all, have Internet access (Gamage & Halpin, 2007; Mozelius & Megammaana, 2011a).

Telecentres are seen as one of the most important initiatives to bridge the digital divide in developing countries but their impact on the local community differs due to a wide range of factors. In a traditional definition, a telecentre is a place that offers public access to computers, printers and often Internet facilities. A more modern and broader definition might be that telecentres should be public places where people can get a wide variety of communication and information services, with the aim to benefit the surrounding communities and support eGovernance in rural areas (Gaiani, Meegammana, Mozelius, & Hansson, 2009).

Dasanayaka (2003) emphasises the importance of providing poor people with proper information so that they can participate in selecting technology for themselves. This can guarantee a greater benefit for them in the long run. Hence information is the first challenge for poor people when designing their own ICT environment. Currently, a number of ICT based initiatives launched by the Information and Communication Technology Agency of Sri Lanka (ICTA) have later been gathered under the common umbrella of **eSri Lanka**. The shared vision that should be realized through a coordinated six programme strategy, is a vision which: *"… encompasses ICT Policy, Leadership, and Institutional Development Programme, The Information Infrastructure, Re-engineering Government, ICT Human Resource Development, ICT Investment and Private Sector Development"* (eSri Lanka, 2011).

Main objectives are that eSri Lanka should contribute to *"develop the economy of Sri Lanka, reduce poverty and improve the quality of life"* (ibid.). Telecentres and e-government initiatives in rural areas should by design be targeted to bridge the internal digital divide (Gaiani, Hansson, Meegammana, & Mozelius, 2009; Gamage & Halpin, 2007; Weerakkody, Dwivedi, & Kurunananda, 2009). However, findings show that designated objectives for e-services in rural areas are not always successfully implemented (Karunasena & Deng, 2010) and there are groups that might need special support to be fully included. Three target groups to whom ICT can open up possibilities for inclusion are women (Gaiani, Megammaana, Mozelius, & Hansson, 2009), farmers (Rozan et al., 2006) and people with disabilities (Mozelius & Megammaana, 2011a).

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

779

6. DISCUSSIONS

When examining the digital divide in Sri Lanka, we find that it is not only a socio-economic, historical and cultural phenomenon, but also a geographical one (Gamage & Halpin, 2007). The western and southern parts of the island have access to ICT facilities to a larger extent than the eastern and northern parts of the island. Access to Internet and ICT facilities is in general rare in the former civil war zones. To support inclusion, and trying to bridge the internal digital divide and to strengthen the civil society, could play a valuable part in the Sri Lankan peace process. Tea estate areas are another neglected part of the country, where the digital infrastructure is far less developed than in urban areas. The focus of our study has been in the Sri Lankan tea estate areas with their specific history, culture, geography and linguistic as well as socio-economic settings. The population has been deprived of the basic rights of the citizens as they have lived under the rule and dependency of the tea estate owner in isolation. As the population in the tea estate areas exclusively serve as work force for the estate, their possibilities to education have been and still are limited.

The open data movement ("8 Principles of Open Government Data," 2007) cherishes the idea of improving transparency and empowering the citizen. Currently, many development projects are based on the principle of open access to information and they possess high expectations on the empowerment effect. However, we still know very little of the actual, long term impact of open data approach. In the case of Sri Lankan tea estate areas, we may consider open source as one possible solution for low cost access to ICT. However, this requires training and support, which need to be planned and reserved resources for. Open access to public data may provide tea estate workers with tools for transforming their present situation, but as Gurstein (2011) rightly points out, we may create a new kind of divide, that of data, instead, if these open data initiatives do not facilitate adequate education. Data as such cannot guarantee empowerment. The key is to be able to analyse, interpret and evaluate data and apply it to your needs. These are specific skills that require focused training. As the data needs interpretation it also requires education; according to Duhem: "without theory it is impossible to regulate a single instrument or to interpret a single reading" (Curd & Cover, 1998, p. 259). However, while education plays an important role, the notion of openness is also complex regarding education itself. Open Education Resources (OER) can be of four different types: I) access of learning material at no cost; II) formal validation of learning; III) remixing of resources; and IV) redistribution of resources (Tuomi, 2013). Further, these types can be more or less restricted with licencing e.g. Creative Commons as well as validation with badges or peer-based certification (ibid). To avoid the possible hype of ICT, it is important to consider good practices of ICT4D implementation practices, by including local users, local institutions and local ownership (Heeks, 2010).

The original purpose of the Nenasala telecentres was to provide access to the information and communication technology and the Internet as well as to offer training courses in computer use. Today, we can see that as the technology becomes cheaper and thus accessible to a wider part of the population, the purpose of the telecentres is shifting from an access point into a multipurpose training centre. We can also see growing emergence of private actors providing access to computers and the Internet thus diminishing the importance of the telecentres as access points. Telecentres can still play a central role in providing a space and a place for a community and individuals to build their competences required of an active citizen in the 21st century. The aspirations of eSri Lanka show the needs of a current society and the possibilities of communal services to meet those needs. In the tea estate areas, the telecentres may provide an important access point and training facility to the marginalised population. When planning for such training initiatives, it is crucial to consider the specific requirements of the tea estate population concerning language, gender, and special needs.

Examples from other developing regions show that telecentres can provide an innovative, stimulating, and creative hub for young entrepreneurs to meet others, get training in how to run a business, exchange ideas, experiences, and build their networks. "Buni space" in Dar es Salaam,

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

780

Tanzania is a vibrant working space with access to the Internet and computers providing training, mentoring, and support for young people who will start their own businesses. The number of members has increased drastically over the three years that the space has been there, now exceeding 1600. Volunteers conduct a lot of the work and the goal is to have a sustainable structure that will guarantee autonomy even when the initial sponsors will leave the project.

Another interesting example of community driven ICT space is the Plan Ceibal project in Montevideo, Uruguay. Here the digital inclusion is not just about access to the technology but the goal is to create an educational community where teachers, students, families, and community agents come together forming a pedagogical alliance in order to develop ICT use in schools. Interestingly, women – mothers of school children – have become to play an important role demonstrating participation and ownership in the technological environment. This has been made possible by providing women an exclusive space and opportunity to get familiar with the information and communication technology and train the use of it in a secure and comfortable one-gendered environment. Women do the training with their peers without the dominance of men.

Concerning the Sri Lankan internal digital divide between urban and tea estate areas, both men and women are underprivileged. Even though the tea estate areas have less disabled, the rural location and low-income level creates a hard situation for disabled in the tea estates. As the main income is based on picking tea leaves, physical disabilities can be especially troublesome. ICT may provide solutions for these challenges but the special requirements for accessibility need to be considered.

7. CONCLUSIONS

The manifestations of the digital divide in the Sri Lankan tea estate areas may be summarized as follows. Identified types of challenges in tea estate areas are lack of education, lack of access to ICT lack of computer literacy, and the language barrier. These four challenges may intersect, e.g. education concerns language, computer literacy and access to ICT.

Groups of people at high risk for the internal digital divide are both women and impaired in the estate population with a low (or not updated) educational level. In addition, accessibility to ICT needs to be considered for impaired people. Although the number of disabled in tea estates seems not to be higher than in Sri Lanka generally, the need is greater as the career opportunities are less than in the urban areas. Further, special attention should be paid on the situation of women regarding both education and access to ICT.

Based upon the results it may be concluded that English language is required for utilisation of computers and software in general. If we wish to provide other language groups with equal opportunities to education and civil services, it is utterly important to develop these services in vernacular languages. Telecentres could play a major role in this and consequently in the transformation of the Sri Lankan society in the 21st century. Telecentres should be developed further for providing various civic services, i.e. e-governance, e-health, e-learning and e-agriculture in close dialogue with the tea estate population. The open source movement have potential in bringing interesting solutions for providing these services. It must be the needs and requirements of the tea estate population that guide the development efforts and the choices for ICT solutions.

As a next step in our research, we find it important to conduct empirical studies in the tea estates and gather in-depth data for examination of conditions for community involvement in local development. It is also of great relevance to investigate how ICTs might support this development for better lives for the tea estate population.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

781

REFERENCES

8 Principles of Open Government Data. (2007). Retrieved February 25, 2015, from https://public.resource.org/8_principles.html

Aheeyar, M. M. M. (2006). *Preliminary Investigation on the Issues Related to Poverty and Marginalization of Estate Sector Communities in Badulla and Nuwara Eliya Districts*.

Aluwihare-Samaranayake, D. S., De Silva, C. S., & Coomaraswamy, U. (2003). Distance Learning Resources for Rural Women and girls in Sri Lanka–A Case Study (pp. 12–13).

Burn, A., & Durran, J. (2007). Media education: Literacy, learning and contemporary culture.

Census of Population and Housing 2011. (2011). Census of Population and Housing 2011. Retrieved from http://www.statistics.gov.lk/pophousat/cph2011/index.php?fileName=ConceptsandDefinitions&gp=StudyMaterials&tpl=2

Central Bank of Sri Lanka. (2013). *Economic and social statistics of sri lanka 2013* (pp. 112–114). Colombo: Central Bank of Sri Lanka, Statistics Dept. Retrieved from http://www.cbsl.gov.lk/pics_n_docs/10_pub/_docs/statistics/other/econ_&_ss_2013_e.pdf

Curd, M., & Cover, J. A. (1998). *Philosophy of Science: The Central Issues*. W.W. Norton. Retrieved from http://books.google.lk/books?id=8vttRAAACAAJ

Dasanayaka, S. (2003). Technology, poverty and the role of new technologies in eradication of poverty: The case of Sri lanka. *South Asia*, *10*, 11.

Department of Census and Statistics. (2013). *Household Income and Expenditure Survey 2012/13*.

Department of Census and Statistics Sri Lanka. (2001). Percentage of population aged 10 years and over in major ethnic groups by district and ability to speak, Sinhala, Tamil and English languages. *CENSUS OF POPULATION AND HOUSING 2001*. Retrieved February 18, 2015, from http://www.statistics.gov.lk/PopHouSat/PDF/Population/p9p11Speaking.pdf

Department of Census and Statistics Sri Lanka. (2012a). *Census of Population and Housing 2011*. Retrieved from http://www.statistics.gov.lk/PopHouSat/CPH2011/index.php?fileName=FinalPopulation&gp=Activities&tpl=3

Department of Census and Statistics Sri Lanka. (2012b). Department of Census and Statistics - Final Reports. *Department of Census and Statistics - Final Reports*. Retrieved February 22, 2015, from http://www.statistics.gov.lk/PopHouSat/CPH2011/index.php?fileName=Activities/TentativelistofPublications

Department of Census and Statistics Sri lanla. (2010). *Household Income and Expenditure Survey*. Colombo: Department of Census and Statistics Sri lanka.

Digital divide. (2015). Retrieved February 18, 2015, from http://www.oxforddictionaries.com/definition/english/digital-divide

eSri Lanka. (2011). eSri Lanka (2011). "Smart People, Smart Island", http://www.icta.lk/en/e-sri-lanka.html (retrieved 18/6/2013).

European Commission. (2011). *Horizon 2020 - The Framework Programme for Research and Innovation - Impact Assessment Report*. Retrieved from

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

782

http://ec.europa.eu/research/horizon2020/pdf/proposals/horizon_2020_impact_assessmen t_annexes.pdf

FAO. (2013). SD Dimensions : People : Asia's women in agriculture, environment and rural production : SRI LANKA. Retrieved June 27, 2014, from http://www.fao.org/sd/wpdirect/wpre0112.htm

Gaiani, S., Hansson, H., Meegammana, N., & Mozelius, P. (2009). "Critical Issues for e-Learning Telecenters in Sri Lanka and India", ICDE World Conference on Open Learning and Distance Education, Maastricht, Netherlands. In *23rd ICDE World Conference on Open Learning and Distance Education including the 2009 EADTU Annual Conference*. Masstrichet.

Gaiani, S., Meegammana, N., Mozelius, P., & Hansson, H. (2009). Knowledge through Cables: is it for Everyone? In *eIndia 2009 Conference*. Hyderabad, India.

Gaiani, S., Megammaana, N., Mozelius, P., & Hansson, H. (2009). Knowledge through Cables: is it for Everyone? - A South Asian Case Study. In *eIndia Conference*.

Gamage, P., & Halpin, E. F. (2007). E-Sri Lanka: bridging the digital divide. *The Electronic Library*, *25*(6), 693–710. doi:10.1108/02640470710837128

Gillen, J., & Barton, D. (2010). *Digital Literacies. A research briefing by the technology enhanced learning phase of the teaching and learning research programme. Technology Enhanced Learning Programme* (Vol. Research B).

Gurstein, M. B. (2011). Open data: Empowering the empowered or effective data use for everyone? | Gurstein | First Monday. *First Monday*, *16*(2).

Hansson, H., Mozelius, P., Gaiani, S., & Meegammana, N. (2010). Women empowerment in rural areas through the usage of telecentres - a Sri Lankan case study. In *eIndia 2010, Hyderabad, India* (pp. 5–10). doi:10.1109/ICTER.2010.5643279

Heeks, R. (2010). Do information and communication technologies (ICTs) contribute to development? *Journal of International Development*, *22*, 625–640. doi:10.1002/jid.1716

Hussein, A. (2009). Zeylanica, a Study of the People and the Languages of Sri Lanka. doi:978-955-0028-04-7

Ilyas, A. H. (2014). Estate Tamils of Sri Lanka – a socio economic review. *International Journal of Sociology and Anthropology*, *6*(6).

Karunasena, K., & Deng, H. (2010). "Exploring the public value of e-government: An empirical study from Sri Lanka",. In *Proceedings of Bled eConference eTrust: Implications for the Individuals. Enterprises and Society, Bled.*

Machi, Lawrence A., & McEvoy, Brenda T. (2008). The Literature Review: Six Steps to Success: Corwin Press.

Mozelius, P., & Megammaana, N. (2011a). Cross-ethnic Collaboration at a Sri Lankan Telecentre - Barriers for Effective E-learning in Rural Regions. In *eWorld Forum*. New Delhi India.

Mozelius, P., & Megammaana, N. (2011b). Differently-Abled Persons with ICT Ability - Inclusion and Empowerment in Sri Lankan Rural Areas via Telecentres, 14th Cambridge International Conference on Open, Distance and e-Learning, 2011, Cambridge, England.

Nenasala Official Web Site. (2015). Nenasala. Retrieved September 15, 2014, from http://www.nenasala.lk/

Pringle, I., & David, M. (2002). Rural community ICT applications: The Kothmale model. *The Electronic Journal of Information Systems in Developing Countries*.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

783

Rozan, A., Zaidi, M., Mikami, Y., Bakar, A., Zaki, A., & Vikas, O. (2006). Multilingual ICT education in cyberspace, Information for Development (i4d) Magazine, 4(6), 19-20.

Samarasinghe, V. (1993). Puppets on a string: women's wage work and empowerment among female tea plantation workers of Sri Lanka. *The Journal of Developing Areas*, *27*(3), 329–340.

Samaraweera, G. (2009). The Relationship between Poverty and Population Characteristics in the Estate Sector of Sri Lanka. *Sri Lanka Journal of Humanities and Social Sciences; Vol 1, No 1 (2009).*

TRCSL. (2013). Statistical Overview. Retrieved from http://www.trc.gov.lk/information/statistics.html

Tuomi, I. (2013). Open Educational Resources and the Transformation of Education. *European Journal of Education*, *48*, 58–78. doi:10.1111/ejed.12019

UNDP. (2012). *Sri Lanka Human Development Report 2012 - Bridging Regional Disparities for Human Development.*

UNDP. (2013). *Human Development Report 2013 : Rise of the south Sri Lanka*. Retrieved from http://hdrstats.undp.org/images/explanations/lka.pdf

Wanasundera, L. (2006). *Rural women in Sri Lanka ' s post-conflict rural economy.*

Weerakkody, V., Dwivedi, Y. K., & Kurunananda, A. (2009). Implementing e-government in Sri Lanka: Lessons from the UK. *Information Technology for Development.*

Wickramasinghe, N. (2006). "Sri Lanka in the Modern Age - A History of Contested Identities", Vijitha Yapa Publications, Colombo, Sri Lanka ISBN: 955-8095-05-6.

Wijetunge, P. (2000). Refereed article The role of public libraries in the expansion of literacy and lifelong learning in Sri Lanka, *101*(1155), 104–111.

Wijetunge, P. (2006). Introduction of the modern school library concept to Sri Lanka through the National Institute of Library and Information Sciences (NILIS).

Yogasundram, N. (2008). "A Comprehensive History of Sri Lanka, from Prehistory to Tsunami",. In *Second revised edition.*

Proceedings of the 13ᵗʰ International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

784

ORIGIN-DESTINATION MATRIX ESTIMATION FOR SRI LANKA USING MOBILE NETWORK BIG DATA

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Abstract: In this paper we discuss the potential of mobile network big data (MNBD) for providing insights for transportation planning that can supplement traditional methodologies. Adapting recently developed techniques for analyzing Big Data, we demonstrate their applicability to the Sri Lankan context. The paper assess the efficacy of two different methodologies for providing insights related to transportation planning from MNBD, and we validate the results using data from traditional transportation forecasting methods. We discuss the resultant limitations and the issues of attempting to leverage such data and propose various methods to address the constraints.

Keywords: Big Data, Call Detail Records, Transport Forecasting, Origin-Destination Matrices

1. INTRODUCTION

Understanding patterns of human mobility is a requisite precursor not just for developing an effective transportation policy, but also for strategic planning and management of the extant transportation system. Traditional transport forecasting techniques depend on surveys. Cost and scale implications for these surveys mean that compromises have to be made in term of the level of spatial and temporal granularity of the data. Developed economies on the other hand, fueled by the increased 'datafication' from the greater use of sensors can avail of a host of additional as well as high-frequency data to feed into the transportation planning systems. These benefits have not uniformly flowed to developing economies, which still depend heavily on traditional survey instruments to fulfill many of their data requirements.

On the other hand developing nations (like developed economies) do exhibit signs of ubiquitous telecommunication access, primarily through mobile phones. Sri Lanka for example has a mobile penetration of over 90% and coverage of nearly 100% of the landmass (Telecom Regulatory Commission of Sri Lanka, 2014). Due to the nature of mobile phone technology, which requires mobile phones to connect with strategically placed base-stations, the mobility of mobile phones can be considered a proxy for human travel patterns.

As a result Mobile Network Big Data (MNBD) affords the possibility of obtaining spatially fine and high frequency data on human mobility, especially in urban areas, which have a higher density of base stations (and therefore greater spatial granularity in the data).

Recent research (Calabrese, Di Lorenzo, Liu, & Ratti, 2011; Wang, Hunter, Bayen, Schechtner, & González, 2012; Jiang, Fiore, Yang, Ferreira, Frazzoli, & González, 2013) utilizing MNBD for understanding and forecasting urban mobility has introduced methods of varying complexity and dealing with different aspects of mobility. Often each application of the method has been to a single country (or region) using only one operator's data. Whilst these methods have shown applicability of MNBD for providing transportation related insights in those specific countries,

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

785

what is less clear is the generalizability of the proposed methods to other regions and/ or the performance/ effectiveness of each of the different methods to the same underlying data.

The aim of this paper is two-fold. Firstly it attempts to adapt the methods developed using datasets from other countries for the case of Sri Lanka (specifically the Western Province). Secondly it aims to test the efficacy of different methods to derive data (currently obtained only through infrequent surveys) relevant for transportation planning, management and policy. To our knowledge there is no prior work that has done so, and also compared the resultant insights with those from traditional survey instruments.

2. THE FOUR STEP MODEL

The traditional transport forecasting approach used in Sri Lanka is predominantly based on the well known four step model, which consists of trip generation, trip distribution, mode choice, and route assignment, in that specific order.

Trip generation involves identifying the volumes of trips in and out of each traffic analysis zone. These volumes are derived based on household-level travel surveys, which also incorporate numerous socio-economic elements and land usage forecasts. The resulting trips are identified by the associated purpose such as work or leisure. Once trips have been identified they are distributed among pairs of traffic analysis zones and adjusted for population in a process known as trip distribution. The result output of this stage is usually a set of Origin Destination (O-D) matrices, which represent the trip distribution. Each data point in an O-D matrix represents the volume of trips from a source zone (Origin) to a destination zone (Destination) during the relevant time period. Gravity models, which distribute trips based on the population of the zones, distance between the zones, etc., are a common technique used at this stage. In the third stage, the different modes of travel such as private automobile, bus, train, etc. are predicted and assigned for the trips identified in the previous stages. Discrete choice modeling with the different transport modes as choices is a typical approach used at this stage. The fourth and final stage of the classical transport forecasting approach is route assignment. This involves assigning the identified trips to the road network based on origin and destination. This is commonly known as the route choice or route assignment. The task is complicated by the inter-dependency between the transport demand at a given time and the travel time between the origin and destination by a given route.[1]

3. STATE OF THE ART

Depending on their sophistication, mobile networks capture a range of spatio-temporal data that can be valuable for transportation planning. Of these, the most common, and one that is universally captured by all mobile operators is passive positioning data in the form of Call Detail Records (CDRs). CDRs are generated automatically by the network and captured in the operator's logs for billing, and network management purposes (from keeping track of the handset in relation to its network elements, to understanding network load).

Each CDR corresponds to a particular subscriber of the operator's network and is created every time a subscriber originates or receives a call. In the case of an in-network call (i.e. both parties on the call were subscribers in the same mobile network), two records are generated, one for each party.

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[1] For a more thorough treatment of the four-step model refer to McNally (2008)

Call Direction	Calling Party Number	Called Party Number	Cell ID	Call Time	Call Duration
1	A24BC1571X	B321SG141X	3134	13-04-2013 17:42:14	00:03:35

Table 1: Structure of a pseudonymized Call Detail Record (CDR)

Table 1 is a stylized representation of the elements of a pseudonymized CDR.[2] *Call Direction* defines whether the record is for an incoming or an outgoing call. *Calling Party Number* and *Called Party Number* are each pseudonymized references to a subscriber. The *Cell ID* field provides the reference to the cell (i.e. antenna) to which the relevant mobile phone connected for the recorded activity. Depending on the directionality of the *Call Direction* variable, the Cell ID field corresponds to either the caller or callee. Each cell is associated with a corresponding Base Transceiver Station (BTS), which in turn has a latitude and longitude associated with it. A BTS may (and often does) host more than one antenna. The *Call Time* field provides the time at which the recorded activity was initiated.

The spatio-temporal data derived from CDRs can be used to directly estimate trip distribution between zones. This is in contrast to the four-step model where trip distribution is the second step. However data derived in this manner from MNBD can require numerous adjustments, including correcting for selection bias, and scaling to the actual population.

The key element in analyzing trip generation and distribution based on MNDB is the identification of movement trajectories or trips of individuals. Utilizing CDR data from the Boston metropolitan region, Calabrese et al. (2011) suggest an approach for identifying individual trips using a number of temporal and spatial constraints to minimize the impact of localization errors. Their approach collapses event locations from the CDRs for an individual into a contiguous series of virtual locations. Each virtual location represents a contiguous series of events, where the event locations are not more than 1km apart, and the time between the events is less than 10 minutes. The centroid of all antenna locations associated with that particular virtual location, represents the position of the virtual location. The daily trajectory of an individual is thus represented by a chronological order of *virtual locations* and each non-identical consecutive pair of virtual locations corresponds to a trip. The trips are aggregated based the virtual origins and destinations at different temporal windows to derive O-D matrices. Jiang et al. (2013) discuss a similar technique, which identifies stay locations based on a roaming distance of 300m which is the maximum distance between any two antenna locations and a minimum separation of 10 minutes between the first and last records. This method uses a grid clustering approach to further aggregate the stay locations to stay regions for more coarse-grained analysis of travel motifs, and preferential return and exploration characteristics of individual mobility.

With both methods, there is an inherent uncertainty whether the derived location represents the two ends of a trip (i.e. origin or destination) or is actually an intermediate location during a trip. The approaches suggested by Calabrese et al. (2011) and Jiang et al. (2013) focus on aligning the origins and destinations of the trips derived from the analysis to the actual trip endpoints. Wang et al. (2012) discuss a different approach that focuses on maximizing the captured mobility information, and placing less importance on whether the captured locations represents end-points or intermediate points, of a particular trip. In this approach any two consecutive non-identical locations in the daily location sequence of an individual, which occur within 1 hour of each other are considered the origin. Due to more relaxed spatial and temporal constraints this approach captures more mobility information from the CDRs as compared to the two earlier

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[2] The actual CDRs contain the phone numbers of the subscribers. When obtained for research purposes such as this, the phone numbers are often replaced with a random identifier (or pseudonym) to maintain anonymity. The authors do not maintain any mappings the identifiers and the phone numbers they represent.

approaches. However this also means that the derived results are more sensitive to noise in terms of localization errors that may lead to over-estimation of very short distance trips.

Bayir, Demirbas & Eagle (2009) propose an alternate approach, which initially generates multiple mobility paths per person for each day. The paths are generated by incorporating both transient locations and trip end points, each of which are derived by methods similar to those articulated by Jiang et al. (2013) and Calabrese et al. (2011) respectively. Frequent mobility paths or trips are then identified for individuals through the application of a frequent-sequence mining algorithm, with suitable support and confidence parameters. The systematic O-D matrices generated in this manner can be considered estimations of the regular mobility or commuting patterns of the considered population.

Lokanathan, de Silva, Kreindler, Miyauchi, & Dhananjaya (2014) carried out a preliminary analyses of MNBD from Sri Lanka to understand human mobility. Their work articulated aggregate daily mobility patterns and spatio-temporal population density changes. However they did not explore fine-grained mobility patterns of the kind being conducted here.

4. THE DATASET

The study utilizes a month of historical and pseudonymized CDR data for nearly 10 million Subscriber Identity Modules (SIMs) obtained from multiple operators in Sri Lanka.[3] Collectively this dataset contains over 1.4 billion CDRs, with a volume of almost 120 Gb.

5. METHODOLOGY

Both the O-D matrix estimation techniques discussed below follow two general stages. The first involves breaking down the movement of individuals into distinct sequences of trips. In the second step the resulting trips are aggregated across defined origin and destination locations. The O-D matrices estimated in this paper employ Voronoi cells defined for the mobile network base stations as the origin and destination locations.

5.1 Stay Based O-D Matrix Estimation

With some modifications, the stay-based approach utilizes techniques developed by Calabrese et al. (2011) and Jiang et al. (2013) that as a starting point, identifies stays. A stay for an individual is defined as a consisting of geographical location associated with a specific time period during which the individual was stationary.[4] In terms of the CDRs for an individual, a **stay** is identified by a continuous series of records such that,

    (1) Two contiguous records in the series are less than a distance D apart, where $D = 1$km.
    (2) Two contiguous records are separated by a time interval $T_{Interval}$ such that
         10 minutes $\leq T_{Interval} \leq$ 1 hour

The maximum diameter (D) of a stay controls the spatial resolution at which stays are identified. Higher values for D result in lower spatial resolution with a larger upper bound for the area applicable for a stay. A 1km maximum diameter was chosen as an appropriate trade-off between the level of spatial resolution and the reduction of noise due to localization errors particularly in areas with very high tower density, similar to Calabrese et al (2011).

The CDR dataset demonstrated a relatively low level of individual activity level with 95% of the individuals having on average no more than 25 records per day. Given the relative sparsity of records and the intermittent nature of mobile phone activity for individuals, consecutive records

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[3] The agreements with the operators do not allow us to mention the name of the operators, nor the precise number of SIMs whose data was analyzed.

[4] The term stay is based on "stay point" and "stay region" by Jiang et al. (2013). However our definition of a stay utilizing mobile data is more closely related to the definition provided by Calabrese et al. (2011)

for an individual may be separated by a significant time interval, which may hide actual motion. Neither Calabrese et al. (2011), nor Jiang et al. (2013) consider an upper bound for time interval We have introduced an additional temporal constraint of the time interval being less than 1 hour to mitigate the effect of hidden motion on the duration of the stays identified.

A stay is represented as a 4-tuple, *<user-identifier, location, start-time, end-time>*. The location field corresponds to the location of the medoid BTS of the set of BTS-es contributing to the **stay**.

The daily sequence of stays identified for an individual is used to generate the corresponding set of trips. Each pair of consecutive stays are considered the origin and destination of a trip and the last recorded time of the origin stay and the first recorded time of the destination stay are extracted as the relevant times. Therefore if **n** stays have been identified for an individual on a given day, this would represent a total of **n-1** trips for that day.

A trip is a represented as 5-tuple, *<identifier, origin, destination, final-origin-time, first-destination-time>*

Origin-Destination matrices are constructed by aggregating the identified trips at the base station locations. In estimating O-D flows for different periods of a day, trips can be partitioned based on either the final recorded time at the origin or the first recorded time at the destination. We chose the latter since it provides the first evidence of the trip having occurred. Since the first time recorded at the destination is an upper bound for the time at which the individual arrived at the destination, this approach can be expected to shift trip distribution forward in comparison to the actual movement.

5.2 Transient O-D Matrix Estimation

The transient based approach proposed by Wang et al (2012), has been applied to datasets from different countries (Bahoken & Raimond, 2013; Iqbal, Choudhury, Wang & González, 2014). We apply the same technique here to data from Sri Lanka, with small modifications.

In this approach a trip is identified from the CDRs by a consecutive pair of records such that,

    (1) The records indicate a displacement, i.e. the BTS-es utilized for each record is different
    (2) The records are separated by a time interval $T_{Interval}$ where,
           10 minutes $\leq T_{Interval} \leq$ 1 hour

Unlike Wang et al. (2012), we also impose a temporal constraint of a minimum time (10 minutes) to the time interval between records. This change reduces the number of false displacements due to stationary individuals connecting to multiple neighboring towers during short time intervals, which may otherwise get captured as trips. The upper-bound limit of 1 hour on the time interval is used to manage the number of trips captured during a day for an individual, as well as the degree to which the trips identified through records may correspond to actual trips by the individual.

A trip is a represented as 5-tuple similar to the previous approach, *<identifier, origin, destination, origin-time, destination-time>*

The trips are aggregated at the BTS level to estimate O-D flows. The time recorded at the destination was used when partitioning the flows into time intervals within a day.

6. RESULTS

The two approaches outlined earlier were used estimate two sets of O-D matrices for the Western Province of Sri Lanka. Initially the O-D matrices were estimated at the lowest possible location resolution, which was at the BTS-level. The resulting O-D matrices were found to be sensitive to the false displacement effect where stationary individuals appear to be in motion due to connecting to different base stations in the vicinity. We generated a set of new origin and destination locations by generating 1km x 1km grid positioned to maximize distances between base stations in neighboring cells. The final O-D matrices were derived by aggregating BTS-level O-D matrices to the regions specified by the afore-mentioned grid.
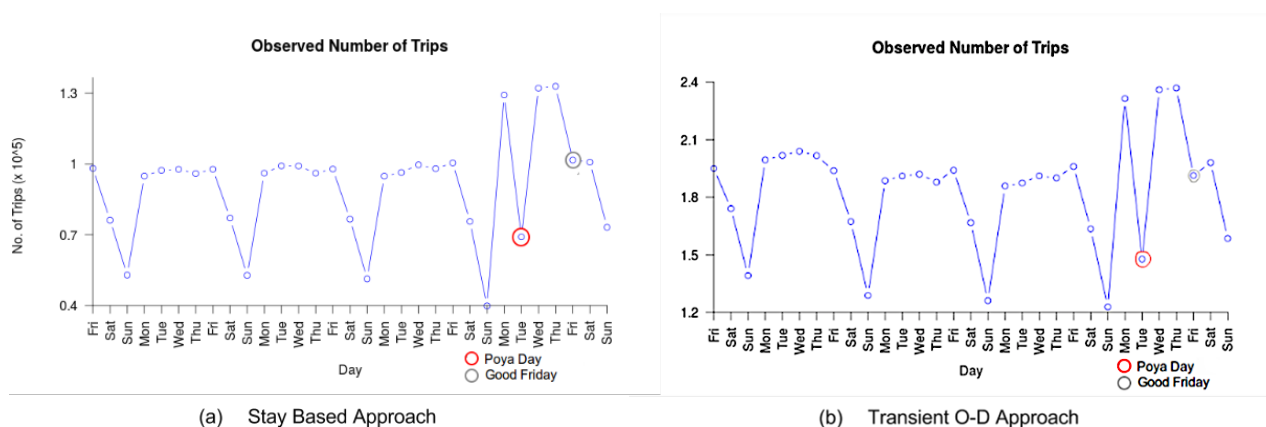

Figure 1. Daily total number of trips observed over a month

6.1. Stay Based O-D Matrix Estimation

Due to the strong spatio-temporal constraints applied in this approach we observe that stays are detected for only about 50% of the individuals having a CDR on a given day. Similarly trips are detected for only about 20% of the individuals having a CDR on a given day. We can conclude that stays and trips are more likely to be detected for individuals with high levels of activity (i.e. high number of CDRs) per day. What is less clear is high activity users are representative of the population and further research will be required.

6.2. Transient O-D Matrix Estimation

Unlike the stay-based approach, the transient approach utilizes more relaxed spatio-temporal constraints. This results in much better trip detection, with 45% of all individuals with a atleast one CDR on a given day, generating trips. Further more the average daily number of trips observed via this method is approximately 20 times greater than those generated using the stay based approach. However, the transient O-D matrices are more sensitive to false displacement in comparison to the stay-based approach due to the lack of a spatial constraint defining a locality. While the stay-based approach tends to capture travel between significant 'end' locations, the transient O-D matrices also capture the intermediate locations during travel, which possibly makes it more appropriate for traffic analysis.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

790

6.3. Validation

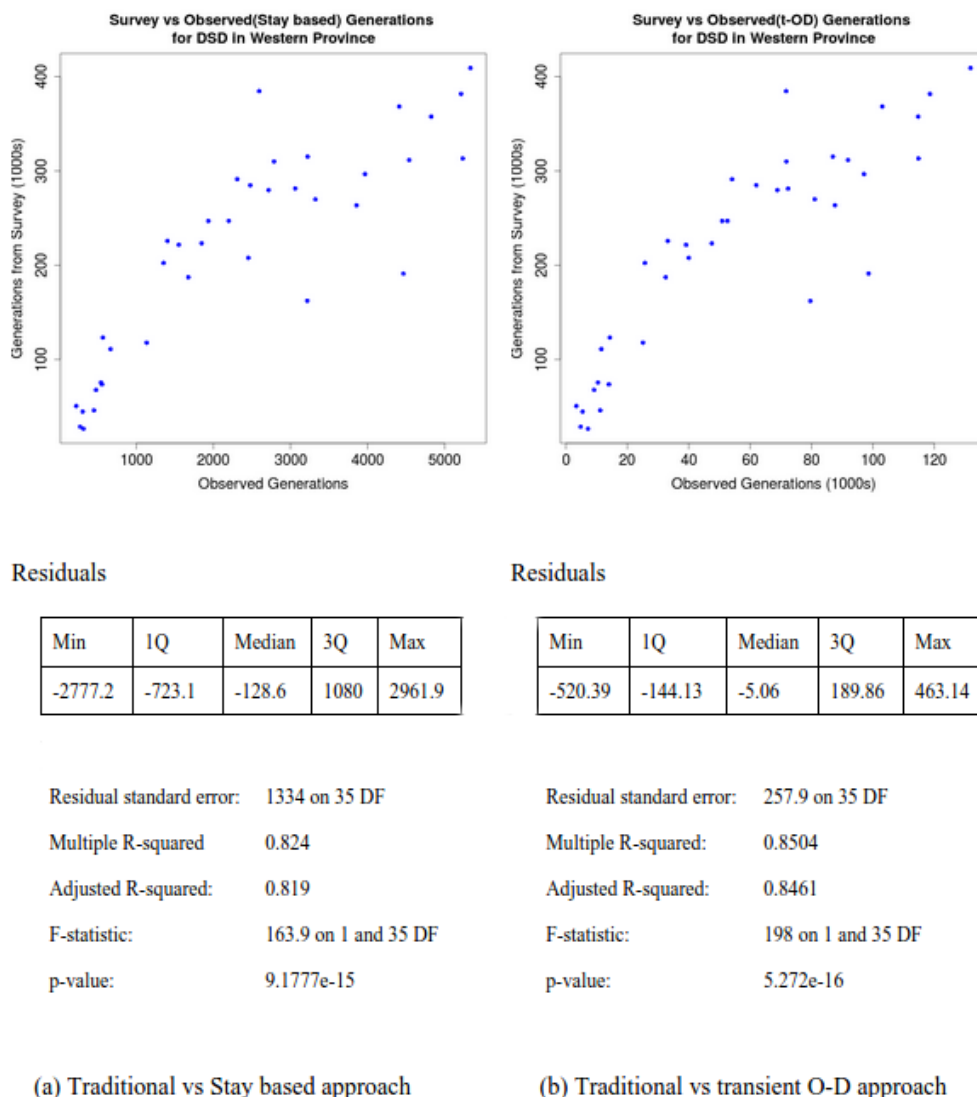(a) Traditional vs Stay based approach   (b) Traditional vs transient O-D approach

Figure 3. Relationship between trip generations based on traditional and MNBD approaches

We aggregated the derived O-D matrices to the Divisional Secretariat Division (DSD) level, which is a third-level administrative unit in Sri Lanka. We compared our results for the Western Province (consisting of 40 DSDs) from each approach with DSD-level trip estimates generated from transportation surveys. A weighted least square linear regression was run in each case where the weight equaled $\frac{1}{MNBD\ estimate}$. The results of these comparisons for each approach are shown in Figure 3. The higher r-squared value for the results from the transient trip approach, suggest that this approach is marginally better than the stay based approach. However it is also noisier as compared to the stay based approach.

7. DISCUSSION

The results suggest that MNBD do capture underlying patterns of human mobility quite well. The transient trip approach is marginally better than the stay based approach when comparing the results to data from transportation surveys. Furthermore, the advantage of the former approach is that it is less biased towards users with high mobile activity. But this also means that it is more susceptible to noise in the form of localization errors. However the stay based

approach does align more closely with actual origins and destinations of travel, which suggests that it is better for identifying congregations rather than for modeling mobility.

Irrespective of the approach, the results do highlight several issues and limitations that will need to be accounted for.

7.1. Accounting for Sampling Bias

Mobile network datasets are free of the human biases and errors inherent in observational data such as those obtained from surveys. However when utilizing CDR data, it is biased towards more frequent users of mobile phones. As the number of interactions an individual has with the mobile phone over the course of a day increases, it becomes possible to more closely map that individual's mobility, and the reverse is true as the number of interactions decrease. Therefore the issue of whether the aggregated mobility represented by the O-D matrices estimated with the CDR dataset, is truly representative of the entire observed population or just the more frequent users needs to be addressed for the results to become useful. Depending on the degree of bias identified it may be possible to correct O-D flows to be more representative or remove a fraction of the CDR data corresponding to activity levels that don't correlate with the majority of the observed population (Wang, Calabrese, Di Lorenzo, & Ratti, 2010)

7.2. Non-Uniform Tower Density

The BTS density strongly correlates with population density in a region. Therefore urban areas have a disproportionately larger faction of BTS-es than rural areas, when compared by landmass. For example Colombo District (a part of Western province) is the most urbanized region in Sri Lanka and has a significantly larger concentration of BTS-es than any other district in the country. As a result the spatial resolution that can be extracted from CDR data varies from region to region, with higher resolutions available in denser urban regions, and much lower resolutions in less dense rural regions. This means that an individual from a rural region with mobility similar to another in urban region will seem to be less mobile. Grid based approaches with fixed spatial resolution have been suggested as potential way to mitigate this issue (Williams, Thomas, Dunbar, Eagle & Dobra, 2014). The area of interest is split in to rectangles with identical dimensions based on the level of analysis being performed, for example 5 km square cells for district level flow of people or a more high resolution 2 km square cells for road network traffic analysis. Base stations that are situated within a cell are assigned to the center of the cell and cells that don't contain a base station are ignored in the analysis. One of the limitations of such an approach is that the quantization of space results in artifacts for events that are close to the borders of the cells. An individual calling from within a particular cell may in fact be connecting to a base station in a neighboring cell. Such artifacts can be accounted for by performing the analysis based on all possible grids at the same resolution by shifting the grid on the area of interest based on a suitable shifting distance and considering the average value of the measures being used. This approach can also mitigate the impact of a single location being served by multiple base stations at different times by assigning an average location to neighboring towers based on the considered spatial resolution.

7.3. Mapping Socio-Economic Data to Mobility

The O-D matrix estimation techniques discussed in this paper use the BTS as the origin and destination locations. Traditionally O-D matrices use traffic analysis zones that are created based on census data allowing a number of census based socioeconomic parameters to be associated with the O-D matrices. This ease of association simplifies the next steps in analysis required for transportation planning, including understanding travel motives, travel mode, and route choice. In the case of CDR based O-D matrices, the association of the census based parameters requires that the origin and destination locations used be mapped to traditional traffic analysis zones or that the census data be mapped to the more granular origins and destinations derived from MNBD.

Proceedings of the 13th International Conference on Social Implications of Computers in Developing Countries, Negombo, Sri Lanka, May 2015

792

7.4. Travel Mode

In estimating O-D matrices we have ignored the mode of travel as well the complications associated with vehicular traffic. A single vehicle may carry multiple individuals, each of whom may use a mobile phone during travel. The number of passengers, travel speed, choice of route and the physical dimensions vary depending on the type of vehicle. Therefore adjustments are needed to incorporate these elements so as to convert the O-D matrices that represent just human mobility to once that represent vehicular traffic (Wang et al., 2012).

7.5. Access to Data

Replicability of such research, and improvements (even incremental) will continue to remain a challenge so long as access to MNBD remains limited. However MNBD are inherently private data sets and it is not possible to make them fall under the purview of Open Data policies. Further more there can be competitive implications for the operators sharing such data. For example base station maps have business sensitivity. If it is known which operator's data has been utilized, the analyses can reveal localized penetration numbers of the number. Ways to open up such private-data sources (in a manner that addresses potential privacy and competition concerns) will remain important if we are to be able to hone and improve the analyses. For the moment atleast, consumers of such research have no option but to take the analysis and the results on faith.

8. CONCLUSION

The key advantages of MNBD analysis of human mobility are the higher spatial resolution and the ability to generate frequent forecasts at low cost. In contrast traditional transport forecasts are costly, infrequent and have lower spatial resolution. Traditional survey based techniques do however deliver forecasts that are a comparatively richer source of information in some aspects due to integration with socioeconomic and demographic information. Practically, the way forward will not be to replace these surveys with insights from MNBD, but rather to supplement them. One way this can happen is to calibrate the MNBD based forecasts with insights from the traditional survey instruments at a particular point in time. Then the MNBD data is used to reverse engineer the richer results possible from surveys, for the intermediate times between surveys. The approach retains the strengths of both the traditional and MNBD based forecasting methods by providing frequent forecasts at greater spatial resolution, but which have also been adjusted using the survey data to mitigate many of the issues outlined earlier. Furthermore it may also then be possible for the surveys to be spread further apart in time, resulting in cost reductions.

9. REFERENCES

Bahoken, F., & Raimond, A. M. O. (2013). Designing Origin-Destination Flow Matrices from Individual Mobile Phone Paths: The effect of spatiotemporal filtering on flow measurement. In *ICC 2013-International Cartographic Conference*.

Bayir, M. A., Demirbas, M., & Eagle, N. (2010). Mobility profiler: A framework for discovering mobility profiles of cell phone users. *Pervasive and Mobile Computing*, *6*(4), 435–454. doi:10.1016/j.pmcj.2010.01.003

Calabrese, F., Di Lorenzo, G, Liu, L., Ratti, C. (2011). Estimating Origin-Destination flows using opportunistically collected mobile phone location data from one million users in Boston Metropolitan Area.

Jiang, S., Fiore, G. A., Yang, Y., Ferreira, J., Frazzoli, E., & González, M. C. (2013). A Review of Urban Computing for Mobile Phone Traces: Current Methods, Challenges and Opportunities. In *Proceedings of 2nd ACM SIGKDD International Workshop on Urban Computing*. Chicago, IL.

Iqbal, M. S., Choudhury, C. F., Wang, P., & González, M. C. (2014). Development of origin-destination matrices using mobile phone call data. *Transportation Research Part C: Emerging Technologies*, *40*, 63–74. doi:10.1016/j.trc.2014.01.002

McNally, M. G. (2008). The four step model. In Hensher & Button (Eds.). *Handbook of Transport Modelling.* Pergamon, 2nd Edition.

Telecom Regulatory Commission of Sri Lanka. (2014). Statistical Overview of Telecom Sector. Retrieved September 26th, 2014. Available at http://www.trc.gov.lk/old_site/information/statistics.html.

Wang, H., Calabrese, F., Di Lorenzo, G., & Ratti, C. (2010). Transportation mode inference from anonymized and aggregated mobile phone call detail records. In *13th International IEEE Conference on Intelligent Transportation Systems* (pp. 318–323). IEEE. doi:10.1109/ITSC.2010.5625188

Wang, P., Hunter, T., Bayen, A. M., Schechtner, K., & González, M. C. (2012). Understanding road usage patterns in urban areas. *Scientific Reports*, *2*, 1001. doi:10.1038/srep01001

Williams, N. E., Thomas, T. A., Dunbar, M., Eagle, N., & Dobra, A. (2014). Measures of Human Mobility Using Mobile Phone Records Enhanced with GIS Data, 33. Retrieved from http://arxiv.org/abs/1408.5420