Proceedings of the 10th International Conference on Social Implications of Computers in Developing Countries

Assessing the Contribution of ICT to Development Goals

Dubai School of Government
International Federation for Information Processing

26-28 May 2009, Dubai, United Arab Emirates

Elaine Byrne  
Edited by  
Brian Nicholson  
Fadi Salem
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Preface

It is widely recognized that information and communication technologies have the potential to contribute to meeting development goals such as health care, poverty reduction and education. ICT has been a key element of various economic development and public sector reform agendas around the globe, and it is often argued that countries harnessing the potential of ICTs can expect accelerating economic growth, improving human welfare and the fostering of good governance practices. The role of development goals in policy making is an important area of academic study and practical application.

The Dubai School of Government (DSG) and the International Federation for Information Processing (IFIP) organised the 10th International Conference of the IFIP 9.4 working group on Social Implications of Computers in Developing Countries in Dubai, United Arab Emirates between 26-28 May 2009, under the theme of “Assessing the Contribution of Information and Communication Technologies to Development Goals.” In addition, the conference hosted a doctoral colloquium, offering Ph.D. students from the ICT for Development (ICT4D) community a unique opportunity to present and discuss their research with specialists, scholars and peers in an international setting.

In response to the Call for Papers, 80 papers were submitted, from which 20 full papers and 17 works-in-progress and practitioner reports were accepted. All 80 papers submitted underwent a double-blind peer review process. Based on the feedback from two reviewers and the programme organizing committee, these papers were revised by the author(s); the accepted papers are printed here. The papers describe, critique and develop arguments, drawing conclusions from a multitude of development projects on the role of ICTs in achieving development goals and addressing challenges to sustainability in developing nations.

The proceedings include practitioner reports and case studies, as well as conceptual and theoretical papers. A ll focus clearly on the overall conference theme of “Assessing the Contribution of ICT to Development Goals” and align with the general focus of IFIP 9.4 working group. The papers cover a wide geographical area, and are based on research from institutions in Albania, Australia, Brazil, Canada, Egypt, Ethiopia, Finland, Germany, India, Ireland, Jordan, The Netherlands, New Zealand, Nigeria, Norway, South Africa, Sweden, United Arab Emirates and United Kingdom.

Papers reproduced in this printed copy of the proceedings were presented in the conference. An electronic version of the proceedings is available on the IFIP 9.4 website (http://is2.lse.ac.uk/ifipwg94/) and on the main conference website (http://ifip.dsg.ae), in addition to the papers presented in the doctoral colloquium organized in parallel with the conference. In all cases, copyright remains with the respective authors.
As with the organisation of any conference, much of the work takes place behind the scenes. These published papers are the result of the dedication of the organising committee, the programme committee, the reviewers, and last, but not least, the authors of the papers. We hope that you find the papers informative as well as enjoyable.

Finally, the editors would like to thank The Emirates Foundation for its generous grant that made possible the production of this publication.

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Discourses on Innovation and Development in Information Systems in Developing Countries’ Research

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INTRODUCTION

There is a fairly large literature on Information Systems in Developing Countries (ISDC) research. Being nurtured within the field of Information Systems, ISDC research tends to focus on the development and implementation of information technology applications and the organizational changes associated with them. Nevertheless ISDC research has extended the IS research domain to consider the broader socio-economic context of the organizations hosting new technologies. I will refer to this object of study of ISDC research as ‘IS innovation’ to convey the notion of novelty of experiences of IS implementation and the associated changes within the hosting organization and beyond it. The rationale for using the term innovation is that, even if the technologies implemented in an IS project are already common elsewhere and widespread, the local experience of technology implementation and socio-organizational change constitutes an innovation for the organization concerned and may well constitute innovation for its socio-economic context. Seeing IS implementation as innovation sensitizes the researcher to consider the effort of technology and organizational change and the value of such change in relation to an organization’s context. As I argue in this chapter, this is particularly important in ISDC research.

ISDC research is premised on the potential of ICT to contribute to the improvement of socio-economic conditions in developing countries (Sahay 2001; Walsham et al. 2007). It aspires to the realization of perceptions of desirable world orders, such as Sen’s theory of capabilities (Madon 2004) or the United Nations’ Millennium Goal (Gilhooly 2005) vision of eradicating poverty. It is also guided by conceptual models of transformations happening in the contemporary world that necessitate ICT infrastructures, such as Castells’ ideas of society and economy as networks (Braa et al. 2004). But beyond these very general premises and aspirations, every ISDC study makes also assumptions about the way IS innovation happens in the context of developing countries and about the notion and process of ‘development’ towards which IS innovation is intended to contribute.

The existence of alternative assumptions and theoretical perspectives regarding IS innovation are a feature of the epistemological state of IS research in general, and has been extensively discussed in the IS literature (Hirschheim and Klein 1989; Orlikowski and Baroudi 1991; Robey and Boudreau 1999). To some, this state of diversity of research questions, theoretical foundations and research method is a weakness that needs to be corrected with more strict ‘disciplinary’ mechanisms (Banville and Landry 1992; Benbasat and Weber 1996; Benbasat and Zmud 2003). But others have argued that that plurality in IS research stems from the nature of IS innovation as a social endeavour, and reflects deeper epistemological perspectives within the social sciences. Rather than seeking to eliminate alternative perspectives, IS research can strengthen its contributions by making explicit their underlying conceptual and theoretical differences (Hirschheim and Klein 1989; Robey 1996). I take this latter view and, in this chapter I seek to explore the different underlying perspectives regarding IS innovation within the broader socio-economic context of developing countries.

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1 For a review, see Avgerou, C. "Information systems in developing countries: a critical research review," *Journal of Information Technology* (23:3) 2008, pp 133-146.
Development is a contested notion too, and it has been subject to a long theoretical debate. Moreover, development policy and action are entangled with the conflicting interests and power relations in the contemporary global and national politics. The international agencies’ policies for economic growth and institutional reform are widely contested in developing countries. Most ISDC studies avoid engaging with controversies on ‘development’ and tend not to discuss what constitutes development. However, some ISDC authors addressed the question of development more explicitly. For example, Thompson (2004) drew from Escobar’s Foucauldian critiques of the discourse on development and voiced suspicion about the development policies IS innovation interventions are intended to support (Thompson 2004). Some authors have taken a critical stance to the currently prevailing development ideas that drive the discourse on digital divide and justifies IS innovation in terms of creating a country’s competitiveness capabilities in a global free market (Wade 2004a; Warschauer 2003). Others pointed out the ongoing controversies about the validity of this theoretical position and suspicions on the motives of the agencies that promote them (Avgerou 2003b; Ciborra 2005; Heeks and Kenny 2002; Westrup and Al-Jaghoub forthcoming).

The combination of assumptions regarding the nature of IS innovation effort and development as the aim for IS innovation gives rise to different discourses in ISDC research. I use the term ‘discourses’ to refer to research approaches stemming from these assumptions on the fundamental nature and consequences of IS innovation. Approach is too vague a term, while ‘discourse’ indicates more specifically the research language of concepts, theories, and methods, through which researchers form the object of a research study and construct arguments about it.

My main literature sources for this chapter are the specialist journals on ISDC, namely Information Technology for Development, Information Technologies and International Development, and the Electronic Journal of Information Systems in Developing Countries; and the proceedings of the series of conferences on ICT in developing countries organized by the IFIP WG9.4, published in books and journal special issues (Avgerou and Walsham 2000; Bhatnagar and Bjørn-Andersen 1990; Bhatnagar and Odedra 1992; Krishna and Madon 2002; Krishna and Madon 2003; Odedra-Straub 1996; Roche and Blaine 1996; Sahay and Avgerou 2002). In addition, I reviewed articles on developing countries published in the general IS journals, some of them in special issues on ISDC research 2.

In the next section I present two perspectives regarding the nature of the IS innovation process: as transfer and diffusion and as socially embedded action; I draw relevant examples from the literature on IS implementation and IS and culture to demonstrate them. In the following section I distinguish between two perspectives on the nature of development transformation towards which ICT is understood to contribute: progressive transformation and disruptive transformation. I draw examples from various research themes and, more specifically, from the literature on telecentres. I then discuss the four discourses formed by combining the perspectives on the nature of IS innovation process and on the nature of development transformation process, and demonstrate them with examples from the literature on software industries in developing countries. Finally, in the conclusions, I argue for the need to develop theoretical capabilities for studying IS innovation in relation to socio-economic contexts and to increase awareness and use of socio-economic development theory.

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IS INNOVATION IN DEVELOPING COUNTRIES

ISDC research has been shaped with acute awareness of the relentless ICT and organizational innovation taking place in advanced economies of the world - primarily North America and Europe - and of the increasing socio-economic interconnectedness of all countries and regions in the condition named globalization. With such awareness, an assumption permeating most ISDC research is that developing countries are in disadvantage in relation to the IS innovation experiences in the context of the origin of new technologies and related new organizational models. This sense of disadvantage is manifested in various ways. To begin with, emphasis has been given to the limited technology and skills available in developing countries or regions. This culminated in the notion of ‘digital divide’ signifying a new form of inequality and source of socio-economic disadvantage. Some research focused on the significance of this problem and sought to monitor progress in reducing it (Kenny 2000; Mbarika et al. 2003; Wresch 1998). Most ISDC research, though, tends to focus on the experiences and consequences of IS innovation, rather than the limitations of technical resources that inhibit it. Such research too tends to be grounded on the assumption that technological and institutional trends are set elsewhere and conveys a sense of urgency to engage with these trends. Difficulties met in following trends and standards of ICT-enabled globalization and in practicing IS innovation effectively feature frequently in research questions and findings of ISDC research, see for example (Heeks 2002).

Thus, invariably, research on how IS innovation happens in developing countries and with what consequences acknowledges and addresses distinctions of context. The context where a new technology artefact and business model first took shape (usually in an advanced economy) may be different from the context where this combined artefact and model are implemented as part of IS innovation practice in a developing country. Moreover, the socio-organizational settings of IS innovation within sectors, countries, or regions may differ substantially from each other – for example e-government is practiced differently and with different results in countries with different public administration sectors.

General IS research has rarely addressed explicitly questions of the socio-economic context if IS innovation and is weak in relevant theoretical guidance. Nevertheless two different orientations towards addressing issues of context are implied in the universalistic and situated research traditions of general IS research and influenced ISDC research (Avgerou 2002; Avgerou and Madon 2004). Universalistic perspectives elaborate on the value of ICT and information and on the processes of IS innovation through which such value can be realized in terms of general techno-economic reasoning, independently from the particular circumstances of the social actors involved. For example they look for ‘best practice’, or for the most suitable new organizational form for the information age (Fulk and DeSanctis 1999; Scott Morton 1991). They often acknowledge contextual contingencies, but assume an overriding rationality that determines universal goals of IS innovation and the logic of action towards their satisfaction (Porter and Millar 1984). In contrast, situated perspectives consider IS innovation as enacted by social actors and tend to place emphasis on meaning making and practice within the power dynamics of the immediate setting of the innovating organization (Orlikowski et al. 1996; Suchman 1994). These perspectives are discernible in two different ways of addressing issues of context in ISDC research, either in terms of transfer and diffusion processes or in terms of socially embedded processes.
TRANSFER AND DIFFUSION

The transfer and diffusion perspective examines IS innovation as the diffusion of IS knowledge transferred from advanced economies and adapted to the conditions of developing countries. This perspective assumes that the material/cognitive entities that comprise IS technologies and associated practices of organizing are adequately independent from the social circumstances that give rise to them to be transferable, more or less intact, into any other society. Consequently, subject to suitable adaptation, these entities can make a desirable impact. Such research, therefore, traces the particular factors that capture the differences of the recipient country and organization that are likely to affect the innovation process - such as economic conditions, technology competences, people’s attitudes to IT, institutionalised work place habits. Consequently it designs modifications of the technologies and interventions in the recipient institutions to make them hospitable to the intended innovation.

In studies of IS development and implementation, authors following the transfer and diffusion approach assume and endeavour to show the relevance of general IS research knowledge and good practice models (methods, analytical approaches, or theories) in particular developing countries or regions and to work out adaptations appropriate for them. They often shape their research in the conceptual terms of the theories of technology diffusion and technology acceptance (Davis 1989; Rogers 1995). For example Rose and Straub (1998) and Al-Gahtani (2003) use Davis’ technology acceptance model to study IT use in the Arab world, and identify empirically the particular factors of the social and organizational context of the Arab countries that affect their take up of ICT (Al-Gahtani 2003; Rose and Straub 1998).

Many studies have sought to transfer and adapt systems development methodologies to accommodate analyses of the socio-organizational conditions of developing countries (Bell and Wood-Harper 1990; Korpela 1996; Korpela et al. 2000; Mursu et al. 2003). Similar method adaptation efforts have addressed the implementation of ERP technologies and IS-driven organizational change (He 2004; Jarvenpaa and Leidner 1998). Such studies enrich IS implementation knowledge and professional practice by working out modifications appropriate to accommodate various local circumstances. They avoid an a-contextual ‘best practice’ view and adopt a notion of ‘appropriate’, context-specific practice (Avgerou and Land 1992; Bada 2002). They challenge the feasibility of ‘transferring’ generic technical know-how into developing countries organizations with the expectation of the same organizational practices and outcomes as in their context of origin (Avgerou 1996). Yet, they retain the general assumptions on the validity of purpose of the attempted innovation as well as the validity of the underlying objectives and rationality of the transferred methods in their new context of practice.

SOCIAL EMBEDDEDNESS

The social embeddedness perspective takes the view that IS innovation in developing countries is about constructing new techno-organizational structures within a given local social context. It focuses attention on the embeddedness of IS innovation in the social context of various organizational settings of developing countries. The socially embedded innovation research approach finds the assumption of the transfer and diffusion perspective about the nature of information systems oversimplifying and misleading. It has developed more elaborate ontologies of IS innovation as socially constructed entities, and therefore contingent in their perceived significance and their interplay with human actors and their social
institutions. The focal point of the research is the process of innovation *in situ*, thus tracing the cognitive, emotional, and political capacities that individuals nurtured in their local social institutions bring to bear on unfolding innovation attempts. Through this approach the socially embedded innovation discourse sheds light on what, regarding an attempted innovation, is locally meaningful, desirable, or controversial, and therefore how innovation emerges (or is retarded) from the local social dynamics. With attention to local concerns, situated meanings of ICT, and courses of reasonable action that often differ from the taken-for-granted rationality of IS innovation, ISDC studies reveal a much more complex picture of the IS innovation effort than the general IS field has constructed, see for example (Miscione 2007).

Studies of IS implementation that follow the social embeddedness approach see the purpose of innovation as arising from local problematizations and its course as being determined by the way local actors make sense of it and accommodate it in their lives (Avgerou 2002). To that end, this perspective found theoretical grounding in contemporary social theory, such as Actor Network Theory, structuration theory, organizational institutionalism. These provided insights and vocabularies to address conceptual relationships such as technology/society, agency/structure, technical reasoning/institutional dynamics. The main objective of contextualist ISDC studies has been the development of theoretical capacity for addressing questions concerning the way specific categories of technologies and social actors clusters are formed, shape each other, and construct particular socio-economic effects.

In comparison to situated studies in the general IS field, ISDC studies following the social embeddedness approach broaden research perspective beyond the particular circumstances of work within an organization - see for example (Ciborra and Associates. 2000; Orlikowski 1996; Orlikowski 2000). Early efforts to account for IS innovation in relation to its context built on Pettigrew’s contextualist theory, which views particular instances of organizational interventions as processes unfolding through time in relation to layers of context: typically, the organizational setting and its national environment (Pettigrew 1985; Walsham 1993). Madon, for example, followed Pettigrew’s contextualist analysis to study the introduction of computers for the management of a rural development programme in India’s local administration districts. Her analysis encompassed work norms within the district bureaucracies as well as cultural aspects of the Indian rural setting within which the rural development initiative and its administration was embedded (Madon 1993). While Pettigrew’s contextualist approach continues to be followed in ISDC studies (Braa et al. 2007a), several other theoretical approaches have been introduced to explore IS innovation in the developing countries’ context, including neo-institutionalist and social constructionist analyses (Avgerou 2001; Avgerou 2003a; Miscione 2007; Silva 2007).

An example of research that takes such a socially embedded view of IS innovation is the series of publications on an extensive action research programme aiming to contribute to the development and implementation of healthcare information systems (HISP) in African, Asian, and Latin American countries (Braa et al. 2007a; Braa et al. 2004). Authors analysing the HISP efforts have used a variety of complementary socio-theoretical approaches – structuration, ANT, Castells networks of action model, complexity theory. They have not attempted to capture the healthcare context of developing countries in a best practice general model. Instead, they have aimed to develop a conceptual analytical capacity to guide context-specific sense making and practice in countries with different health care systems and practices. This has led them to consider a range of issues, including standards that are sensitive to the local context (Braa et al. 2007a), and multiple country collaboration across
north (technologically and economically advanced) and south (developing) regions (Braa et al. 2007b).

Another example of the social embeddedness perspective is a study of a 10-year effort to implement a data infrastructure for land administration in Guatemala by Silva (2007). His study traces the unfolding of power dynamics within the institutional context of the country and focuses on the historically formed lack of inter-institutional cooperation in the country that created conditions unfavourable to sharing data.

TRANSFER AND DIFFUSION AND SOCIAL EMBEDDEDNESS PERSPECTIVES IN RESEARCH ON IS AND CULTURE

In ISDC studies of culture the transfer and diffusion approach frames the relationship of IS and culture in terms of transferring ICT applications into a non-western national culture, which is usually seen as posing obstacles to innovation and as being a source of resistance (Struab et al. 2001). Hofstede’s model of national culture variables and cultural difference (Hofstede 1984) is often used to analyse conflicts between values embedded into and behaviours required by ICT and the national culture of developing countries (Leidner and Kayworth 2006).

Such studies have been criticised as oversimplifying cultural difference, see for example (Myers and Tan 2002); they ‘sweep the subtleties of cultural difference under the universal carpet’ as Walsham put it in his extensive discussion of examples of ISDC studies of IS innovation and culture (Walsham 2001). In contrast, research taking the socially embedded and transformative perspective has led many authors to highlight distinct features of historically formed collective behaviour that require attention when designing appropriate ICT systems, or when organizing the innovation process, such as attitude to hierarchy, arranging action in time, sense of space and geography (Rohitratana 2000; Sahay 1998; Zakaria et al. 2003). It has also drawn attention to cross-cultural interactions. In effect, such studies avoid the juxtaposition of IS innovation - assumed to be inscribed with western culture - with DC culture - assumed to be bent to accommodate it (Walsham 2002).

Particularly promising is the research that suggests a concept of culture which is dynamic and emergent, ‘constantly being maintained and changing’, an ongoing accomplishment (Westrup et al. 2003). Such research transcends the ICT/culture fit or conflict. Neither ICT nor culture are taken to be uni-dimensional determinants of values and behaviours. ICT, seen as a hybrid network of artefacts, people, and institutions, is subject to negotiation and local IS innovation shaping. Cultural influence on IS innovation, seen as a historically formed disposition for a particular behaviour, may stem from the innovating organization, its national or regional environment, or the social class of individual actors. And rather than IS innovation fitting in or conflicting with the culture of its social context, of particular interest is the mutual re-constitution of IS innovation and the cultures that influence it.

THE QUESTION OF DEVELOPMENT IN ISDC RESEARCH

The main motivation for ISDC research is the belief that ICT has, potentially, the capacity to contribute towards the improvement of many different aspects of life, from alleviating poverty to strengthening the democratic polity. But not all IS research in developing countries engage explicitly with questions of ‘development’ as action to transform the socio-economic conditions that have been historically formed in the so-called ‘developing countries’. In this chapter I am interested in the research that concerns developing countries and is conscious of
development as a purposeful and contested endeavour. Therefore, I examine that part of the literature that goes beyond a declaration of an assumption that ICT may serve good causes – e.g. the elimination of poverty – and at least implicitly takes a position regarding the socio-economic transformation process through which ICT will deliver its potential benefit.

Such transformative ISDC research often focuses on specific developmental aims, such as enhancement of livelihoods in rural areas (Duncombe and Heeks 2002), or improved government services (Krishna and Walsham 2005), and seeks to understand the effort it takes for IS innovation to take place successfully and deliver expected benefits. More often than not, though, ISDC research, confronted with the complex and highly political challenges of development endeavours, takes a critical stance to the role of ICT and development. I distinguish two perspectives of ICT-enabled development. The **progressive** perspective considers ICT as enabling transformations in multiple domains of human activities, but they can be accommodated within the existing international and local social order. The **disruptive** perspective is premised on the highly political and controversial nature of development, both as a concept and as an area of policy for international and local action, and reveal conflicts of interest and struggles of power as a necessary part of IS innovation in developing countries.

### PROGRESSIVE TRANSFORMATION

The progressive transformation perspective in ISDC research reflects a much more widespread understanding of ICT as an instrument for economic and social gains that has been promoted since the mid 1990s by major international development agencies, including the World Bank (World Bank 1999), the United Nations Development Programme (United Nations Development Programme 2001), the World Economic Forum (Dutta and Mia 2009). UNDP’s 2001 Human Development Report (United Nations Development Programme 2001, p. 29) is a good example of the association international organizations make between ICT and development, not least because this series of UNDP reports takes a broad view of development as a socio-economic condition that goes beyond a narrow consideration of economic growth. The 2001 UNDP report seeks to present a clear association between technology and desirable development effects, giving special attention to ICT – particularly the Internet. Indicatively, it quotes a World Bank study (Wang et al. 1999) that showed ‘technical progress accounted for 40-50% of mortality reductions between 1960 and 1990 – making technology a more important source of gains than higher incomes or higher education levels among women’ (United Nations Development Programme 2001, p. 29). It asserts that, ‘(c)ross-country studies suggest that technological change accounts for a large portion of differences in growth rates’ (ibid.).

Central in this perspective is the view is that ‘investment in ICT and effective use do matter for the economic development of a country’ (Mann 2004), p. 67. It is acknowledged that other changes matter too, particularly because ICT needs to be accompanied by organizational restructuring to deliver productivity gains (Dedrick et al. 2003; Draca et al. 2007). Moreover, development requires effective government, and e-government is considered to be an important tool for achieving efficiency, transparency and responsiveness. International development agencies have emphasized also the potential of ICT to improve the performance of state institutions, the delivery of health and education services, as well as democratic participation (United Nations Development Programme 2001).

Some ISDC research has sought to corroborate this thesis on the economic significance of ICT for development (Mbarika et al. 2007; Ngwenyama et al. 2006), addressing concerns of sceptics who doubt the appropriateness of ICT for poor countries and point out their pressing
necessity to provide for the basic life needs of a large part of their population, alleviate extreme poverty, and fight endemic diseases and illiteracy. But on the whole ISDC research in the progressive transformation perspective tends to accept without testing the assumption that ICT potentially contributes to economic growth and to investigate the features of the ICT-based economy in particular countries or regions (Molla 2000) or the way ICT contributes to the competitiveness of organizations or regions (Goonatilake et al. 2000; Jarvenpaa and Leidner 1998; La Rovere 1996; La Rovere and Pereira 2000; Munkvold and Tundui 2005). Some research from the progressive transformation perspective elaborated on the conditions under which ICT mediated business models and practices, which are considered necessary for participating in the global economy are diffused or the conditions under which IT-enabled niche industries are fostered (Davis et al. 2002).

The progressive transformation perspective is discernible also in research studying IS innovation in non-commercial organizations, such as in the development of national health data infrastructures (Braa et al. 2007a). The fundamental assumption is that IS innovation in the institutions responsible for the provision of social services can empower them to improve their services and work conditions (Puri 2007).

DISRUPTIVE TRANSFORMATION

The disruptive transformation perspective considers development, including ICT-enabled development, as a contested endeavour or as involving action that affects differently different populations, and thus laden with conflict. Research taking this perspective often expresses doubts about the effectiveness and even the intentions of international or national policies regarding ICT and development. At the international level, analysis manifests suspicion of the developmental intentions of the so-called Washington Consensus as well as the effectiveness of the policies for development that comply with the institutions that comprise it – World Bank, IMF, WTO. At the local level they see the established social order as harbouring inequalities of wealth and power - for example in relation to castes, gender, or ethnic origin – and the ICT-enabled interventions as affecting differently categories of citizens.. This approach tends to draw from heterodox economic ideas and critics of globalization (Wade 2004b) and often applies critical theoretical analyses (Kanungo 2003). The researcher is not a neutral observer of the way IS innovation contributes to socio-economic transformations; s/he takes the side of a particular category of people (e.g. the poor, women, children of the world or of a particular developing region) who are weak and vulnerable in the socio-economic regimes of their milieu, and who are in risk to lose out (or at least not benefit) from IS innovation initiatives. Research from the disruptive transformation perspective reveals hidden intentions and power dynamics which maintain or worsen current unevenness of wealth and opportunities for fulfilled lives among countries and categories of people.

A good example of the disruptive transformation perspective is Ciborra’s study of the computerization of driving licenses in Jordan (2005). In his analysis, Ciborra identifies an international socio-political significance of e-government interventions. Although the declared objectives of e-government projects, such as the computerization of the issuing of driving licenses, are improvements of efficiency of citizen services, Ciborra’s study shows that such an innovation stumbles upon the complex network of state government controlling mechanisms. Indeed Ciborra, drawing from Heidegger’s treatise on technology, points out the ordering character of information technology. The order sought in this case study, he argues, does not concern only the Jordanian government, but the world order at large. He traces the origin of the rationale of e-government in developing countries in the Washington Consensus
and the security interests of the US government (Ciborra 2005), thus critically revealing a disruptive logic of IS innovation.

PROGRESSIVE VS DISRUPTIVE TRANSFORMATION: PERSPECTIVES IN RESEARCH ON TELECENTRES

The difference between these two perspectives is manifested in the research on telecentres, most of which acknowledges and discusses developmental aims. The rationale for the creation of telecentres is that countries or regions which do not have access to internet-based services are ‘excluded’ not only from global economic opportunities but also from modern society’s information channels for education, health, and democratic participation. Poverty in many developing country areas, particularly the rural regions, prohibits the diffusion of ICT and telecommunication connectivity to any extent comparable to that of advanced economies. A solution appeared to be the development of community information services, often called telecentres, equipped with computers, internet connection, as well as fax machines. Many initiatives to introduce telecentres in poor rural communities in developing countries have been taken by international NGOs, such as the Canadian IDRC’s Acacia3 programme in Africa, or by country governments. Although their services vary, most of them run software applications of local interest, such as providing information on health, agricultural product prices, educational material or the issuing of government certificates.

Early research in the 1990s presented promising initiatives, highlighting the perceived potential of local empowerment through information and communication. Authors that heralded the developmental opportunities of telecentres gave examples of possibilities of overcoming extreme poverty or bureaucratic obstacles, of participating in public sector decisions and actions, and of overcoming corruption (Beilur 2007). Later, research indicated a more nuanced picture of some impressive cases of economic gain and social empowerment, widespread failure and closure, and increasing frustration among key actors such as the entrepreneurs who owned the telecentres, users/customers, and donors (Beilur 2007; Madon et al. 2007). Of interest to the discussion in this chapter is the researchers’ assumptions about the way telecentres are expected to contribute their developmental promise.

Much of the research on telecentres assumes that they are introduced in the existing socio-economic structures and practices of disadvantaged communities and can have a positive impact on lessening the gap between them and the advanced industrialised societies. A common expectation in the telecentres initiatives by many NGOs and governments, even in very poor communities, has been that, after investing some seed money, telecentres would form viable enterprises, able to cover the costs of their operations and to sustain a profitable business for local entrepreneurs (Harris et al. 2003). Consequently, research on telecentres attempts to fit and adapt the economic rationality of profitable business, even though, as research shows, there is not much potential for profit making from telecentre ‘customers’ who live in extreme poverty and most of whom have little appreciation of the benefits they may gain from using ICT services (Madon et al. 2007).

Some research who attempted to explain why so often telecentres prove unsustainable raised fundamental questions of effective mechanisms for development, such as public/private

3 For information about IDRC’s telecentre initiative, see http://www.idrc.ca/acacia/index.html. Other initiatives for the creation of community telecentres by international development organizations include ITU’s (http://www.itu.int/ITU-D/index.html; UNESCO’s (http://www.unesco.org/websovlriip/#funding) and the World Bank’s (http://worldbank.org/html/fpd/telecoms/subtelecom/selected_projects.htm).
partnership mechanism of governance for development (Madon 2005). Kanungo’s (2003) analysis of the sustainability of an initiative that uses IT to create ‘knowledge centers’ in Indian villages places emphasis on the value of these centers ‘in terms of a better informed and liberated society’. His Habermasian approach focuses on the disruptive mechanisms enabled by IT that may form a basis for empowerment for the rural poor.

FOUR DISCOURSES ON IS INNOVATION AND DEVELOPMENT

The combination of the two perspectives regarding the nature of the IS innovation process and the nature of the development transformation process give rise to distinctive discourses about ICT and development, see Figure 1. I don’t mean that ISDC publications can be classified unambiguously on the four squares of a matrix. Indeed, some of the examples I draw from the ISDC literature could be positioned elsewhere on the plane of the matrix if a discussant chose to focus on some line of argument of a research article other than the one I chose to bring to the readers’ attention. But my aim is not to classify existing research in rigid categories. It is to show the streams of argumentation about ICT and development that result from taking – most often in an unacknowledged way – these particular views about IS innovation and about development.

I find it easier to distinguish between the transfer and diffusion from the social embeddedness perspective of IS innovation and more difficult to do so for authors’ perspectives regarding development. This is because ISDC research rarely adequately defines and discusses development perspectives and rarely draws from socio-economic development theory in its analysis. Moreover, quite frequently authors mix progressive transformation and disruptive transformation perspectives. For example, they may adopt the progressive transformation view of ICT and development at the global context by grounding their analysis on publications of indicator tables and policies of international agencies that follow neo-classical economic reasoning, and they may include a disruptive transformation view in their arguments that challenge existing power orders in domestic efforts of harnessing ICT (Brown and Brown 2009). Differences of perspective on the development process at different levels of context may indicate either complementarities or inconsistencies in the argumentation of an author. A point I wish to make in this chapter is that ISDC research can improve its contributions if authors extend the theoretical grounding of their research to draw from debates on development theory and policy.

ICT and development as socio-economic improvements through the transfer and diffusion of ICT and required institution.

This discourse is formed by intertwining the transfer and diffusion perspective of IS innovation with the progressive transformation perspective of development. It tends to take the form of technical rational techno-economic argumentation, presenting the adoption of ICT-based practices pioneered in advanced economies as a necessity for improving life conditions in developing countries. A great deal of emphasis is given to efficiency gains resulting from ICT. The discourse uses the ‘catch up’ metaphor: developing countries should adopt the technologies and institutions through which developed countries are understood to have achieved prosperity and improvements in health, education, political participation to close the gap that separates them. It is recognised that existing institutional conditions in most developing countries are not adequate to support such a vision, and therefore, the argument goes, adaptation is needed (Bada 2002; Struab et al. 2001). One size of ICT and organizational models does not fit all, but the same shape is thought to work for all and local institutions should be bent to match it.
**ICT and development as socio-economic improvements through locally situated action.**

This discourse is formed by the social embeddedness perspective of IS innovation with the progressive transformation perspective of development. It assumes the capacity of ICT to contribute towards improving life conditions, but sees the form and processes of improvements as primarily locally decided in accordance to historically shaped meanings and power relations. Its core argument is that socio-economic change should make sense to the local people, who should be comfortable with the processes of change. There may be obstacles in the harnessing of the developmental potential, stemming from historically developed social orders, such as over-centralised public administration and authoritarian hierarchies, but the belief expressed in this discourse is that these can be addressed with empowering democratic ICT policies and appropriate professional practices, such as allowing for user participation (Braa et al. 2004; Puri 2007; Sahay and Walsham 2005). This discourse acknowledges influences from global actors. It is cautious, but not confrontational about prevailing development ideologies and policies of international organizations. It often has a pragmatic character: technologies and methods transferred from technologically advanced societies do not work. Local improvisations are necessary to close the gap between theory and actual developing countries conditions. An example is Heeks’ paper which suggests improvisations in systems development to avoid failure seen as caused by the inappropriateness of general IS design methods (Heeks 2002).

**ICT does not necessarily result in development for all: the transfer and diffusion of ICT leads to uneven development.**

This discourse combines the transfer and diffusion perspective of IS innovation with the disruptive transformation perspective of development. Its argumentation accepts the logic of ICT as a force for socio-economic change, but finds that it entails risks of reinforcing domination and inequality. Thus, it uncovers distorting effects of ICT and institutional transfer and diffusion, and interests in preserving historically formed privileges (Ciborra 2005; Wade 2004a). It tends to be confrontational, challenging the evidence on the generally seen as beneficial effects of development policies such as globalization, liberalization, ICT and productivity gains (Wade 2004b), and doubting the motives of powerful actors, such as the international development agencies, national policy makers, and corporate managers.

**ICT does not necessarily result in development for all: it is subject to the power dynamics of IS innovation action.**

This discourse intertwines the social embeddedness perspective of IS innovation with the progressive transformation perspective of development. It is a critical discourse in the sociological sense of critical theory, and is concerned with particular biases of power and inequalities in specific socio-economic conditions of a country or a community. The starting position is the local context, with its historically formed patterns of privileges, and may extend its analysis to the biased influences exerted from the power-laden inscriptions carried by particular technologies or institutional reform models and policies. In a study of the potential use of ICT by Egyptian craftswomen, Hassanin points out various structural challenges that inhibit their capacity to trade in global markets (Hassanin 2008). In effect, the socially embedded and disruptive discourse deconstructs the dominant view about ICT and development, juxtaposing it to the local interests and imaginaries of a better life. Its critiques question not only the effectiveness of ICT and development to lead to life improvements, but also the desirability of their projected visions (Stahl 2008; Thompson 2004).
THE FOUR DISCOURSES IN ISDC RESEARCH ON THE SOFTWARE INDUSTRY

Prominent amidst the ISDC literature is a stream of studies focusing on the software industries that emerged in a number of developing countries and compete at the global market, thus forming a substantial part of the ‘global outsourcing’ or ‘offshore outsourcing’ phenomenon (Carmel and Agarwal 2002). India is the most successful country in this business, and the efforts of its software firms have been studied within the ISDC subfield since its early days nearly 20 years ago (Heeks 1990; Nicholson and Sahay 2004; Sahay et al. 2003).

Most research on developing countries’ software industries argue about ICT and development as socio-economic improvements through the transfer and diffusion of ICT capabilities and required institutions. They see the developmental potential of these industries in their capability to compete in global markets. Their achievement lies in being able to master software production techniques and business models that allow them to compete. Thus, many such studies examined the factors that account for software industry success within the global market of services and products of IS innovation (Adelakum 2005; Carmel 2003a). Success factors include technology and project management skills, labour costs, telecommunications infrastructures, English language skills, copyright legislation, and government industrial policy. There are also ongoing studies that assess and compare the relative advantages among developing countries competing for the lucrative markets of industrialized countries (Carmel 2003c). For example, while India is so far considered the most successful DC software exporter, competition from China on the basis of lower salaries may erode its advantage in some important markets, such as Japan.

Some research has focused on the micro-societal processes that constitute the practices of global outsourcing services, highlighted the difficulties of cross-cultural collaboration and the surfacing of multiple political conflicts (Barrett and Walsham 1995; Nicholson and Sahay 2001) and emphasized the significance of organizational identity and the intrinsically tacit nature of the knowledge of software developers (Nicholson and Sahay 2004; Sahay et al. 2003). For example, Nicholson and Sahay’s study of the policy efforts of the Costa Rican government to promote an export oriented industry highlighted the implications of historically formed vested interests in the country, power structures and attitudes towards development (Nicholson and Sahay 2007). Nevertheless the discourse of such research does not challenge an implicit progressive transformation view of ICT as an enabler of economic development by participating competitively in the global free market.

Both these discourses – stemming from the transfer of skills and socially embedded practice perspectives - on the software industry in developing countries tend to focus on their capacity for export of software products and services, taking such exports to be an important source of income and of national prestige. Some comparative analyses of the software industries of major developing countries suggest that there may be trade-offs between efforts to foster an export oriented software industry and IS innovation in domestic organizations (Carmel 2003b; Commander 2005). For example, although successful in exporting software products and services, India’s software industry is much less successful in contributing to domestic organizations’ IS innovation. The ‘trickle down’ effect is too slow to make a difference for the rest of the economy so far.

Indeed there is research from the transfer and diffusion and disruptive transformation perspectives that engages in a critical discourse about the developmental role of the developing countries’ software industry. D’Costa discusses the Indian software sector as a
case of ‘uneven and combined development’, that is, as coexisting with stagnating sectors such as heavy industry and giving rise to tensions that stem from competing modes of production, inequality, and differential growth rates among different regions (D’Costa 2002). D’Costa’s argumentation leads to the suggestion of state action for a balanced development of the economy, by assisting the development of other sectors and thus minimising the social problems of uneven development.

Madon and Sahay focused on changes in the social fabric of the city of Bangalore caused by its booming software industry, and formed arguments from the social embeddedness and disruptive transformation perspectives (Madon and Sahay 2000). They point out that the city has not attracted only affluent professionals but also the very poor, seeking works at the margins of the official economy and living in slums at the borders of the city, and their research concern is how the lives of this section of the population can be improved.

CONCLUSIONS
ISDC has a lot to contribute by engaging with the ongoing research and debate regarding development that produce theoretical views about the role of ICT and underpin policy action, such as international political economy and institutional economics. To that end, empirical ISDC research needs to develop epistemological capacity to associate the study of IS innovation with the particular socio-economic rationale and policies of development that provide its underlying justification and targets.

If it does so, ISDC research faces two major challenges as a subfield of information systems. The first is methodological/theoretical and is related with its recognition of the significance of contextual contingency, that both the diffusion and the social embeddedness discourses share. ISDC studies need to identify the context that matters and develop theory capable of addressing the interrelationship of context with IS innovation. To my judgement the social embeddedness discourse is in a better position to do so. As it has been developed in close association with contemporary social theory, its elaborate socio-technical concepts address more effectively the dynamic interplay between the artefacts/cognitive constructs of IS innovation and the multiple and changing social dimensions in developing countries.

The second challenge is related with the legitimacy of discourses that openly address contemporary political issues. In particular, the disruptive transformation discourses of ISDC research have a kind of criticality that is unprecedented in the IS field. The literature that discusses the developmental potential of ICT and associates IS innovation initiatives with social, political, and economic change articulates critical views about the power relations within specific developing countries and the world at large. The IS field, though familiar with critical discourses, mainly regarding the organizational level politics of the work place (Howcroft and Trauth 2005), has rarely engaged with macro-political analyses regarding ICT and institutional change. ISDC studies that concern the role of ICT in the struggle for the transformation of the life conditions of the billions of poor – with implications for the lives of the affluent – inevitably come to refer to political ideologies of development (such as the ‘Washington consensus’ or ‘basic needs’ views), and to policies and actions of development institutions (such as the World Bank, the aid agencies of ‘Western’ countries, international NGOs). Analyses of the IS innovation context include controversial government policies, such as liberalization of telecommunications for extending connectivity, or the filtering of internet information by national governments.
This is where, I believe, theoretical strengthening is mostly needed. Without diligent theoretical grounding critical discourses on ICT and development run the risk of having a polemic character, unworthy of scholarly attention and unconvincing in policy circles. ISDC research has a great deal to gain from studying theories pertaining to argumentation of development in economics and political sciences, in a similar way that IS research gained strength in its argumentation about the nature of IS innovation from studying theories of technology in sociology.

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**Figure 1.**

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<th>Progressive transformation</th>
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<td>ICT and development as socio-economic improvements through the transfer and diffusion</td>
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<td>ICT does not necessarily result in development for all: the transfer and diffusion of ICT leads to uneven development</td>
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**Chrisanthi Avgerou**
THE ROLE OF THE CITY STATE IN DEVELOPING AN ICT INDUSTRY: THE CASE OF DUBAI

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Abstract: Many developing countries have put in place strategic plans linked to information and communication technology (ICT) industry development. This paper presents a critique of the plans of the government of Dubai for its ICT industry and discusses some tensions and challenges presented by this transformation process. The analysis of the case is informed by the writings in political economy of Philip Cerny on the nature of the Competition State. Specifically, the extent to which Dubai exhibits the characteristics of a Competition State is evaluated across five key characteristics: the changing form and the function of the state; the nature of the policy agency; internationalisation of the policy agenda; proliferation of policy transfer and decline of social solidarity. Drawing on this theoretical lens and longitudinal qualitative data from multiple stakeholders, the paper critiques the policies and city state involvement in ICT industry development. The paper concludes with some implications for stakeholders in Dubai.

Keywords: Dubai, Competition State, ICT industry.
THE ROLE OF THE CITY STATE IN DEVELOPING AN ICT INDUSTRY: THE CASE OF DUBAI

1. INTRODUCTION

Information and communication technology (ICT) industry development is acknowledged as an important engine of economic growth (Carmel 2003, Kambhampati 2002) and stakeholders in many developing countries have become active in setting development goals associated with this sector. Examples amongst others include Iran (Nicholson and Sahay 2003), Costa Rica (Nicholson and Sahay 2008) and Jordan (Al-Jaghoub and Westrup 2003). This paper is concerned with the role of the state in ICT industry development. There are competing views about the role of the state in a globalised world. Some researchers have argued that the state role is seriously curtailed (McKenzie & Lee, 1991; Ohmae, 1995; Reich, 1991); others have asserted that the role of the state is paramount to the success of any development initiative (Hirst & Thompson, 1999). A third school of thought has contended that even though the role of the state is changing and adapting to the forces of globalisation, the state will continue to play a vital role (Cerny, 2000).

Prior research (e.g. Carmel 2003, Heeks and Nicholson 2004; Schware 1992) provides models for ICT industry development that argue strongly for the important role of the state. These authors argue that for ICT industry development to take place, the state must provide an environment that encourages investment as well as the necessary telecommunications and transport infrastructure. The state through advocacy unites the public and private sectors, educates sufficient numbers of qualified graduates, forges appropriate changes to the legal framework and establishes an incentive environment that attracts investment. Prior empirical literature has focussed mainly on the national level of analysis, for example in Jordan (Al-Jaghoub and Westrup 2003), Ireland and India (Kambhampati 2002) but to date limited attention has been focussed on the role of the city state in ICT industry development. The city as a level of analysis is pertinent when examined in relation to literature on the Global City (Sassen 1991) that exist as nodal points in the globalisation “space of flows” (Castells 1989).

This paper aims to improve our understanding of the challenges facing the state role in ICT industry development through a critical analysis of the Dubai case study. Our study is focussed on the following broad research question:

- What is the role of the state in developing an ICT industry in a globalised world?

Drawing on the theoretical work of Cerny (2000) and data from a longitudinal empirical investigation over several years, we contend that Dubai is transforming into a Competition State. Using the theoretical lens of Competition State, we evaluate and critique the plans of the government of Dubai for building its ICT industry and discuss some tensions and challenges presented by this transformation.

This paper is organized as follows: first we present the theoretical framework followed by the methodology. We proceed to the empirical case study data followed by discussion and conclusion.

1 We are grateful to Chris Westrup for this observation.
2. THEORETICAL FRAMEWORK

We chose a theoretical framework derived from political economy (Cerny 2000) as an appropriate lens to inform and explain our findings. A precedent in the use of Cerny’s writings on the Competition State in the analysis of ICT industry development is presented by Al-Jaghoub and Westrup’s (2003) critique of Jordan’s REACH initiative.

Cerny (2000) points out that the main challenge now facing governments around the world is their capacity to adapt to the external constraints and opportunities precipitated by processes of globalisation while maintaining a relatively effective domestic policy programme. In analysing these challenges, Cerny identifies three archetype forms of the State: Welfare, Development and Competition, the main features of which are summarised in Table 1. The welfare state’s core function lies in its ability to insulate key elements from market forces through state provision. Another archetype form of state is the developmental state which focuses on economic development as its primary policy objective (Johnson, 1982). The development state does not simply regulate markets, but actively initiates and distorts them (Amsden, 1989; Wade, 1990).

<table>
<thead>
<tr>
<th>Type of State</th>
<th>Welfare state</th>
<th>Developmental state</th>
<th>Competition state</th>
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<tr>
<td>State role</td>
<td>-insulate key elements from market forces, while promoting other. -champion local and to a varying extent MNCs -extend aid to other countries</td>
<td>-strong control over the public and the private sectors -champion local industry -MNCs are controlled by the state</td>
<td>- Promote activities where the state capacities can be used to achieve competitiveness -promote MNCs -link with external actors such as international organisations, MNCs</td>
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Table 1. Welfare, developmental and competition states (Cerny 2000)

The third archetype, the competition state is summarised in the five features given below:

i. The Changing Form and Function of the State - The competition state involves a restructuring and qualitative disempowering of the state in the face of globalisation and transnationalisation. The state loses some of its domestic intervention powers and promotes international competitiveness and enterprise.

ii. The Nature of the Political Agency - Rather than attempt to insulate the state from key international market pressure, the political actors in competition states embrace openness and marketisation. The state emphasises deregulation, liberalisation and endorses pro-market regulation and intervention. It supports, maintains and promotes trans-national and international governance structures at home and focuses on promoting integration to the global economy and accepting the importance of international competitiveness and customer choice.
iii The Internationalisation of the Policy Agenda - The creation of a competition state involves a policy agenda that seeks to provide the conditions that will help the state to adapt state action to cope more effectively with what it perceives as global realities. These policies include an emphasis on inflation and neoliberal monetarism. The economic policy of the competition state includes:

- Emphasis on the control of inflation or non-inflationary growth
- A shift from macroeconomic to microeconomic intervention in the form of deregulation and industrial policy
- The state does not intervene to maintain a range of strategic industries but emphasis is on diversified economy
- The state intervenes to enforce global, market-rational economic behaviour
- New regulatory structures are established, and there is a shift from the general maximisation of welfare within the nation (full employment, redistributive transfer payments, and social service provisions) to the promotion of enterprise, innovation, and profitability in the private and public sectors.

iv. The Proliferation of Policy Transfer - Policy transfer has become a key mechanism for delivering the policy agenda of the competition state through the elite structure of governance (new powerful agencies such as the central banks, the World Trade Organisation (WTO), and other authorities that are independent of the nation state have been formed). The state’s loss of policy formation to international organisations is spreading globally. A reason for this is globalisation (e.g., through changes in the nature of geopolitics, political integration, the internationalisation of financial markets, and global communications) that has created new opportunities for policy transfer to international organisations. Secondly, the policy transfer is more likely to occur in an era of New Governance (Rhodes, 1996). Thirdly, the shift from traditional government to collaborative governance has increased the range of non-state actors involved in the delivery of public goods. Fourthly, key agents or agencies within the state have become independent such as the central bank that is independent of the state.

v. The Decline of Social Solidarity - The capacity of state institutions to embody communal solidarity gave the modern nation-state its legitimacy, institutionalised power, and social cohesiveness. The cumulative effect of these various pressures and processes is manifested in a redefinition of the boundaries of the political. The restructuring of the political arena has forced parties and governments to redefine their conception of the “social” and the “public” away from the traditional confines of the “modern” state. However, the battle for the hearts and minds of the people is a key problem for the competition state because many of its key reforms rest on changing norms and values, and challenging the dependency culture of the welfare state.

These characteristics of the Competition State will be used to evaluate and analyse the role of the state in the case study of Dubai described in the next section.

3. METHOD

The research method adopted is that of interpretive case study (Walsham 1995) which has involved semi-structured interviews with various stakeholders in the Dubai ICT industry milieu. Interviews and repeat interviews allowed for the collection of in-depth information on the complex interaction between the state, internal and external stakeholders in the industry. In addition, many official and unofficial documents concerning the ICT industry in Dubai were examined. There was no apriori theoretical framework to aid data collection, instead interviewees were asked to explain their involvement in the ICT industry development and
were encouraged to critically analyse the developments from their perspective. These stakeholders included people from academia; Dubai Internet City (DIC) officials; e-government, e-commerce, and e-learning officials; local ICT companies; multinational companies (MNCs), and international organisations such as UNDP. Thirty interviews were undertaken by one of the researchers who is multilingual and has lived and worked in Dubai all her life enabling the collection of much contextual information. This first round of interviews took place from January to March 2002 and an additional 25 repeat follow up interviews were undertaken in 2007. The first round of interviews formed one of the author’s previous doctoral fieldwork on a closely related topic. The subsequent interviews were guided by the research questions outlined in this paper. The earlier interview data was reanalysed and enabled collection of data on the events and changes over the five year period. Interviews were recorded (with permission) and transcribed verbatim. Data was analysed by reading and re-reading transcripts and summarising the themes of the interviews. The current theorisation of the data evolved as a result of ongoing reading in relation to the themes identified.

4. CASE DESCRIPTION- DEVELOPING DUBAI’S ICT INDUSTRY

Dubai is the second largest city in the United Arab Emirates (UAE), a country in the Arabian Peninsula with rich natural resources in oil and gas. It is highly urbanised and has a GDP per capita of $24,000. The country has a population of 4.5 million; Dubai’s population is 1.4 million, of which about 80% is comprised of expatriates or foreign workers and majority of these expatriates are unskilled workers employed in the construction and retail industry (Muysken and Nour, 2006). Dubai is the business centre of the region. In 2000, Crown Prince Sheikh Mohammed bin Rashid Al Maktoum drew up a plan that articulated the initiation of a knowledge-based economy that would be driven by the ICT industry.

Dubai’s approach to planning for the knowledge-based economy directly and indirectly involves ICT industry development. The knowledge based economy is a term that describes trends in advanced economies towards greater dependence on knowledge, information and high skill levels, and the increasing need for ready access to all of these by the business and public sectors. The Dubai plan is divided into three “Horizons”. Horizon one is labelled: “Doing what we do best, better.” In other terms, the industries in which Dubai excels, such as trade, logistics, tourism and transportation can be further strengthened to improve their positions regionally and globally. The focus of the second horizon is to: “Apply the core competencies to new areas.” To achieve this, trade, logistics, and transportation will support the rising industries, such as ICT industry, media, and finance, all of which are ICT enabled. The third and perhaps most difficult horizon requires: “Seeding investment for future competencies.” Building on the success of the two previous Horizons, the returns are to be utilized to build research and development facilities to explore the emerging sectors of biotechnology, pharmatechnology, nanotechnology, and wireless technology.

The strategy for building a knowledge-based economy using ICT initially had the following ambitious targets for 2010: Achieve a GDP of US$ 30 billion; achieve a per capita GDP of US$ 25,000; attract foreign direct investment (FDI) equal to US$ 4% of GDP; strive for the knowledge-based economy to reach 25% of GDP, with the overall service sector representing 70% of GDP; establish a free and open market regulated to ensure competition; and transform at least 15 Dubai-based businesses into market-shaping regional/global corporations (TECOM, 2003).
The government promoted the vision that Dubai can use ICT to transform a relatively small city with limited oil reserves to a major regional cluster by embracing an open market economy, encouraging foreign direct investment (FDI), and becoming the city of choice of the best and the brightest knowledge workers. The plan envisioned that the ICT industry will generate thousands of skilled jobs; transfer the economy into one that is knowledge based, with ICT as the focal point; and use ICT initiatives to diffuse ICT in all sectors of the economy to increase the general competitiveness of all industries.

Government policy towards ICT industry development is two-tiered. The first tier is concerned with building the ICT industry capacity by educating and training the national workforce, attracting substantial expatriate knowledge workers; and collaborating with multinational corporations to establish an ICT industry for services and software development that contribute to economic growth. The second approach is to diffuse IT use in all sectors of the economy for socioeconomic development initiatives such as e-learning and e-government.

The UAE’s succession to the WTO in 2001, as well as the government’s active endeavours to build an ICT industry and attract direct foreign investment to Dubai, set the stage for the government’s major investment in Dubai Internet City (DIC) and other initiatives such as e4all.

4.1 Dubai Internet City
The government of Dubai made a strategic decision to develop a vibrant IT industry by partnering with the private sector. DIC was conceived with the mission of creating an infrastructure and environment for global ICT companies to invest in Dubai. In 2000, Sheikh Mohammed bin Rashid Al Maktoum allocated a free zone for ICT companies to develop software and IT services for the vast region extending from the Middle East to the Indian Subcontinent. The government of Dubai formulated the business plan for DIC with the help of consultants Arthur Andersen and McKinsey. The government of Dubai gave multinational corporations (MNCs) and many small and medium-sized companies lucrative incentives to invest in DIC, including ready to operate, fully serviced office space with advanced digital voice and high-speed data services at competitive rates; exemptions from personal income and corporate taxes for 50 years; 100% foreign ownership; repatriation of profits; and protection of intellectual property (DIC, 2001). UAE is a signatory to all WTO initiatives on Intellectual Property protection and leads the Arab World and the Middle East, including Turkey and Israel, in deterring electronic piracy. The government uses this feature as a means to promote the city and attract ICT MNCs (Madar, 2003).

A new agency responsible for ICT, Dubai TECOM, was established in 2001 to oversee the expansion of DIC and the formation of new entities such as Dubai Media City (DMC) and Knowledge Village. DMC was built to attract media companies that were involved in media and music production, broadcasting, and publishing, all of which are intensive users of ICT. The Knowledge Village was to house Universities and other organisations that would improve the skills of the labour, managerial, and technical workforce and R&D, especially for DMC and DIC. Some 180 companies had signed up as tenants when DIC first opened in October 2000, including such MNCs as Microsoft, Cisco Systems, IBM, HP, Dell, Siemens, Sun Microsystems, and Sony Ericsson. TECOM initiated an electronic transaction and commerce law for the Emirate of Dubai in 2002 to facilitate e-commerce and accept electronic transactions and electronic signature in legal disputes. In 2007, DIC had an international community of 1,000 ICT companies, including MNCs as well as local and
regional companies engaged in software development; web-based design, consultancy, education and training, sales and marketing and back office operations. These companies employ more than 10,000 knowledge workers (DIC, 2007).

4.2 Initiatives to Encourage IT Use
DIC is representative of Dubai’s plan to develop the ICT industry. Although the ICT industry is primarily driven by the private sector, government involvement is instrumental in providing the physical infrastructure and favourable investment conditions.

The government of Dubai plans include wider diffusion of ICT use to all sectors of the economy and among the citizens. The government initiated large investments for e-government, e-learning, and e-commerce initiatives throughout the city in the belief that ICT will play a major role in improving the effectiveness and efficiency of services provided by public and private organisations in Dubai. A major e-learning initiative is the IT Academy initiated in 2001. This targeted all high school students in Dubai’s public schools, where the majority of national, low-income students are educated, to teach basic and advanced courses in IT. The government has stipulated that the school system and local universities should increase broadband access and improve IT literacy among the student population.

The government of Dubai introduced “e4all” initiatives in 2002. This aims to increase the awareness and willingness of the public to improve their “e-skills” in an effort to upgrade Internet literacy in Dubai (Dubai e-Government, 2005). For example, Cisco and Dubai Women’s Higher Colleges for Technology established a centre to improve the technical skills of women in networking and ICT. A digital home and small-business project was set up to increase technology awareness and encourage entrepreneurial activities among students who may not have had the opportunity to work outside their homes otherwise. The impetus behind increasing the diffusion of ICT is to build a highly skilled workforce that will accelerate the demand for IT products and services, which will in turn create demand for the companies in DIC.

5. ANALYSIS
Dubai’s quest to build an ICT industry, detailed in the initiatives above, manifests characteristics of the Competition State identified by Cerny (2000). These are summarised in Table 2 below and discussed further in the critique to follow.

<table>
<thead>
<tr>
<th>Characteristics of the competition state</th>
<th>Example from Dubai case</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The changing form and the function of the state</td>
<td>The state has championed the ICT industry and provided the infrastructure.</td>
</tr>
<tr>
<td>2. The nature of the policy agency</td>
<td>The state has liberalised the economy to encourage ICT investment, gave MNCs tax holiday for 50 years, placed no restriction on expatriate knowledge workers and deregulated the local telecom provider.</td>
</tr>
<tr>
<td>3. The internationalisation of the policy agenda</td>
<td>The state attracted foreign direct investment by attempting to control inflation, diversified the economy with limited concerns for developing indigenous ICT industry; building partnerships and establishing new organisations such as TECOM.</td>
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</tbody>
</table>
4. The proliferation of policy transfer

The UAE is a member of WTO and is signatory to all initiatives on IP protection. Copyright laws are enforced. The ICT industry planning is formulated by international agencies and consultants.

5. The decline of social solidarity

Local ICT companies receive no financial or technical assistance from the government. They compete with MNCs to hire knowledge workers and have limited access to educational and training system. Unemployment is high among young nationals particularly among the female population.

| Table 2. ICT Industry development and the Competition State in Dubai |

The main focus of the Competition State is to promote economic activities at home and abroad enabling the firms that operate within the state to be competitive in the global market (Characteristic one). The Dubai government has formulated a strategy to build an ICT industry and use ICT in all core industries so that Dubai can become more competitive in the international marketplace. This is captured in the mission statement of DIC:

*The mission of Dubai Internet City is to create an infrastructure, environment and attitude that will enable ICT enterprises to operate locally, regionally and globally, from Dubai, with significant competitive advantage.* (www.dubaiinternet.com)

The private sector was invited to invest in this sector after the state took the lead. The government vision for the ICT industry is to transform Dubai to a knowledge based economy that will provide employment for nationals and create local ICT companies with a global reach. However, several industry participants and observers contended the focus on ICT for three reasons: i) unavailability of skilled local knowledge workers, ii) the presence of large numbers of unemployed unskilled foreign workers and; iii) a lack of history of science and technology infrastructure in the country to service and sustain an ICT industry. Other interviewees questioned the timescales. A Chief Executive officer of Tejari, a Dubai based business-to-business marketplace stated:

*There are those who think innovation will come out of DIC from day one. I believe it will take at least five years before we will see any innovation.* CEO of Tejari

Other critics expressed the view that DIC is “no more than another real estate project” with limited capability to build an ICT industry. Additionally, there was resentment that the government is “putting the local business community at a disadvantage” by offering free zone status to MNCs. Free zone status allows MNCs to bypass the local and federal regulation for foreign companies operating in UAE which requires a minimum of 49% national ownership. This appears in opposition to the government’s intention to build “local and global partnerships”. The CEO of DIC told us:

*Strategic partnerships with industry leaders are key to establishing DIC as this region’s robust technology backbone and we are therefore very pleased to partner with Microsoft in our joint vision to transform this region’s economy into one that is knowledge-based.*
The competition state is based on the ideology of the neoliberal state, where the state promotes the process of openness, deregulation, and liberalisation. Deregulation involves discarding old regulations and embracing new ones that are often designed to enforce the global regulations of international organisations. The government has actively encouraged FDI from ICT MNCs by liberalising the local economy. In DIC, foreign companies are given 50 years tax holiday, unlimited restriction to import foreign knowledge workers and there are no limitations on the types of activities companies engage in. There is no mandate for DIC based companies to form the partnerships with local ICT companies or perform value adding research and development activity in Dubai as envisioned in the third planning Horizon.

The government plan promotes the notion that a cluster of global ICT companies will produce local ICT companies that will become global within a decade from inception of the plan. However, a clear strategy to achieve this goal has not been articulated. The strategy appears beneficial to MNCs and other foreign companies with the capabilities to produce ICT products and services for the local and regional markets. Most Emiratis are not benefitting because the companies in DIC are authorized to import expatriate knowledge workers and are not mandated to hire nationals. We were told:

DIC did not apply a quota for hiring local UAE employees; we want the best person regardless of nationality (HR Director, DIC)

The government defend this action by arguing there is lack of highly skilled nationals to populate the job openings in DIC. The shortage of skilled national workers is attributed to the deficient educational and training system which is a serious impediment to the ICT industry. Muysken and Nour (2006) argue that the large number of unskilled expatriate workers and poor educational facilities in the UAE has the effect of poor provision for training, low skill levels and deficient transfer of knowledge. UAE spends only 1.32% of GDP on education, lower than many other countries (McCaleb 2005). The average 2000-2 GDP spend of 132 countries was 4.9% (Nationmaster 2009). These problems have been recognised by the government of Dubai, which set up a new authority for education and training for the Emirate of Dubai in 2007 but the effectiveness of this is yet to be demonstrated.

The ICT industry hires a very small number of UAE nationals in technical jobs with potential for skill transfer. The third planning Horizon is unlikely to be met as inadequate facilities and lack of incentives to improve leads to low levels of research and development. Activities undertaken in the DIC cluster do not comprise of research and development (R&D) and most of the DIC based companies activity consists of sales and marketing. This can be explained by lack of research undertaken in the Arab world more generally which accounts for a meagre 0.2% of GDP (UNDP, 2005; Multinational Monitor, 2004) and correspondingly very little R&D is undertaken in UAE. By comparison, in 2005 the OECD average R&D expenditure accounted for 2.5% of GDP.

Under pressure from the major MNCs in DIC and in line with the recommendation of international agencies, the government deregulated the local telecommunication provider, Etisalat. Investment in telecommunications is regarded as an important factor in assisting ICT industry competitiveness and there is evidence that private investment in some cases has improved efficiency and pricing (Heeks and Nicholson 2004). In Dubai, the deregulation of Etisalat is controversial because although there were benefits for individual consumers and the private sector, it ended Etisalat’s contribution to the federal budget that funds critical developmental project such as education and social service provisions.
The above examples demonstrate the role of the state has been to provide leadership and incentives to the ICT industry. A quote from the CEO of Dubai media city sums up the dominant perspective of minimal state intervention:

*The moment you start interfering in the market and start to mandate you create inefficiencies. This sort of business (ICT sector) will move rapidly elsewhere as there are several pillars around the world.* (CEO of DMC)

This quote is indicative of the belief in market supremacy and that the role of government is in providing incentives and an environment conducive to ICT growth in the marketplace. The Dubai competition state has moved away from protectionist policies favouring national companies and fostered the adaptation of policies mandated by international organisations. An example is the government of Dubai’s signing of WTO protocols on all initiatives related to intellectual property protection. To encourage MNCs to invest in DIC, the government provided the legal infrastructure to provide 100% foreign ownership and changed local laws so that foreigners could own homes in Dubai. It has passed electronic transaction and commerce laws to enhance ICT diffusion in the private and public sectors. In recent years the government has introduced laws where the influence of the MNCs is illustrated in a quote from an interview with a country manager of a major MNC based in Dubai. He told us:

*Although the UAE and specifically Dubai have started to develop an IT sector, one of the few laws on IT are the copyright laws. These have been passed due to the pressure and strong lobbying of the multinational software companies in this sector.* (Country Manager, MNC)

The decline in the role of the state in social solidarity is demonstrated by the increasing discontent of the local indigenous companies. The ICT infrastructure for DIC and e-government are purchased from MNCs. Local companies are denied the opportunity to improve their technical capability because the government as a signatory to WTO may not favour local ICT companies.

As well as the dissatisfaction of local firms, another challenge faced by the government is to provide meaningful jobs for the Emirati people. In recent times, the number of young graduates unable to find jobs has increased and the official statistics published by the government estimated unemployed graduates at 43000, mostly comprised of women. This is a high number in proportion with the small indigenous population (TANMIA, 2006). This poses a major challenge for the government and will continue to a source of political instability in Dubai. This concern is captured by the quote below from an educator:

*Companies come here to sell their software, and that does provide our students with opportunities for learning. But I don’t think that these corporations have the long-term interests of the country in mind, and in that sense, the government policies must not be driven by the companies that come and set up in free zones. It must be driven by the needs of the country.* (Professor at the Higher Colleges of Technology).

6. DISCUSSION AND CONCLUSION

The research question of this paper is concerned with improving our understanding of the role of the state in developing an ICT industry in a globalised world. We discussed the plans by which the government of Dubai is building its ICT industry and critiqued them using the
The theoretical framework of Cerny (2000). A theoretical contribution of the paper lies in the application of the lens of Competition State as a useful framework for critique of ICT industry development. The lessons from the Dubai case will be relevant to many countries in the region with similar demographic and institutional characteristics embroiled in implementing an analogous ICT industry development strategy.

Dubai’s plans for the ICT industry are concerned with building an ICT-producing and an ICT-using industry and the state continues to be actively involved in this pursuit. Attracting investment, encouraging the export of DIC’s initiatives, and becoming competitive in the international market are some of the state’s core objectives. Although it has been argued that the role of the state has become diminished in a globalised economy (McKenzie & Lee, 1991; Ohmae, 1995; Reich, 1991), Dubai’s ICT industry shows a continuing state role. The role of the state in Dubai is visible and provides the leadership, sets the policies, builds partnerships, and meets the requirements of some of the stakeholders in the industry. The state has emphasised the role of providing the conditions for competitiveness and underpinning the market. The analysis revealed that policymaking for ICT industry development adopted by the city state of Dubai is committed to competition state policy direction.

We posit some implications and recommendations for various stakeholders: academics, international organisations, policy-makers and those involved in ICT industry development (consultants, lobbyists etc). Firstly, the development of the local ICT industry, a feature of the strategic plan, appears to be failing as these firms are unable to compete or build capability alongside MNCs. The requirements of international organisations such as WTO and removal of other regulations thus allowing 100% foreign ownership has created an environment where local firms are unable to compete due to tax free status proffered to attract MNCs. Local firms do not experience technology transfer from MNCs and the development of these local firms is also hampered by the strength of the MNC lobby that continues to influence government policy in its favour. Secondly, a further challenge is in the weaknesses in education for capacity building for research and development and employment of local nationals in the ICT industry. The MNCs are not encouraged to employ, develop and train local staff and are reliant instead on expatriate labour. Employment prospects for Nationals in the ICT industry are weak supported by unemployment figures. When these factors are coupled with a tendency for the DIC based MNCs to not engage in research and development activity then the sustainability of the industry cluster is debatable. Support functions such as sales and marketing may be relatively footloose and susceptible to ease of movement to other sites in the region. International organisations argue that FDI from MNCs are the source of innovation and transference of know-how, technology, and skills to developing countries (UNCTAD, 2003). Hence, FDI has gained significance from the point of view of its capacity to transmit technology knowledge and novel management techniques. MNCs are considered leaders in producing innovations of commercial significance. This makes MNCs a potent vehicle for transferring technology (Carr, Markusen, and Maskus, 2001). However, some empirical studies examining the impact of FDIs on international technology transfers have shown a negative relationship between FDIs and the total factor of productivity of domestic plants (Aitken and Harrison, 1999). The example of Dubai demonstrates that dismantling of control systems by developing countries through liberalisation policies to attract FDI does not always help in promoting technology and transferring skills. The mere presence of FDI in Dubai has not significantly changed the situation of technology knowledge and the gains to be derived from it. Thirdly, the problem of unemployment in Dubai has posed a major challenge for the government and will continue as a source of political instability accentuated
by a vicious circle presented by reduced contributions to education and social security budgets following deregulation of Etisalat.

The policymakers in Dubai may consider four key areas of recommendation that emerge from our analysis relating to education, FDI and R&D and promoting local companies. The lack of training programmes for university students in the ICT industry could be addressed by establishing a link between ICT companies and universities so that final-year students can train with these companies. University education could be made more relevant to the needs of the market by company representatives developing curricula alongside academics. No comprehensive plan at the federal level to address the deficiencies in the education system exists (Madar, 2006). Allocation of funds for R&D may help reduce current dependence on foreign import technology. Government may take a lead in the creation of a directive that fosters R&D in basic and applied research, especially in new technology that has a proven efficacy that can be used to produce ICT products/services that are needed locally and regionally. Our final recommendation relates to promoting local companies. The Dubai government has a role to play in providing local ICT companies with access to technology and assisting in the negotiation of collaboration or joint ventures with MNCs. The government also could support local companies’ incentives to invest in R&D and provide markets locally for these companies’ products and services.

Future work could focus on two areas: firstly, comparisons between Dubai and other cities in the UAE and regional context could improve our understanding of where or how policymakers in Dubai could make changes to accommodate the weaknesses identified in this paper. Secondly, this paper does not directly draw on theoretical frameworks focusing on the sustainability of competition state policies in developing ICT industry capacity. Further longitudinal research in Dubai focusing on sustainability will improve our understanding of the long term effects of these policies.

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MAVERICKS, MAVENS AND SOCIAL CONNECTORS: COMPUTER-MEDIATED INFORMATION SEEKING BEHAVIOUR IN RURAL SOCIETIES

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Abstract: This paper discusses what we see as the critical role of individuals and their information seeking behaviour when using information and communication technology (ICT). In a study of several villages in northern Peru, we found that the role of particular individuals was critical in popularising ICT use in those communities. These individuals tended to be people who enjoyed passing on information, and also people who had larger networks than their peers. In this paper, we explore how theories of information seeking, together with social capital theory, might combine to provide a framework to enable further study of such behaviour. We discuss this framework with some illustrations from a case study. We conclude by calling for more research into the role of the individual in ICT for development projects from this perspective.

Keywords: Information seeking behaviour, social capital, computer-mediated information, sense-making.
MAVERICKS, MAVENS AND SOCIAL CONNECTORS: COMPUTER-MEDIATED INFORMATION SEEKING BEHAVIOUR IN RURAL SOCIETIES

1. INTRODUCTION

In the popular and groundbreaking book the Tipping Point, Gladwell (2002) talks of the importance of certain types of people in promoting trends. He introduces the concepts of ‘connectors’ – those individuals who have a gregarious nature and extensive social networks, ‘mavens’ – those individuals who act as information brokers and like nothing better than to educate and help, and ‘mavericks’ – those individuals who are independent thinkers. We uncovered some of these traits in individuals who helped popularise information and communication technology (ICT) use in their rural communities in northern regional Peru in our previous research, where we found that the role and status of some individuals in their community was of significance in disseminating computer-mediated information through their traditional face-to-face networks; these individuals tended to have urban connections, were focused on information of all kinds and showed certain degree of distinctiveness compared to their peers in their own communities (Díaz Andrade & Urquhart, 2009).

In this paper, we seek to extend our understanding of how individuals use and disseminate computer-mediated information in their social capital networks, synthesising theories of information seeking with those of social capital. In producing such a theoretical framework, we plan to explore what we feel is a hitherto under researched area – the role of individuals in popularising computer use in developing countries. Even though development agencies do pay attention to the role of individuals in stakeholder analysis (cf. Dearden, CIDT, Jones, & Sartorius, 2002), there are no specific insights available as to how individuals might engage with ICTs with the purpose of information seeking, especially from a theoretical perspective. Thus the research problem that this paper addresses is:

How do information-seeking theories extend our understanding of individual use of computer-mediated information within their social networks in a rural context in a developing country?

This paper is organised into five sections including this introduction. In the next section, we discuss theories of information seeking, in particular information in its social context and information as a social construct. In the third section, we discuss social capital theory in relation to information, focusing particularly on the cognitive domain in social capital networks. In the fourth section, we put forward an initial theoretical framework based on these two bodies of theory. Finally, we discuss the implications of our framework and relate the theoretical discussion to the findings from our earlier research, explaining the role of individuals who actively use ICT in a rural context.

2. INFORMATION SEEKING BEHAVIOUR

Our starting point is the notion of information seeking behaviour. Information seeking behaviour involves “those activities a person may engage in when identifying his or her own needs for information, searching for such information in any way, and using or transferring that information” (Wilson, 1999, p. 249). It is clear from this definition that the information seeking process starts with recognising a problematic situation that requires information to be addressed properly and may include the passing on of that information. This last part of the process is of particular interest, as will be explained later on in this paper.
Since information becomes the central element in the information seeking behaviour discussion, we present next a theoretical elaboration on this concept.

2.1. Information

Among the different definitions of information provided by the Oxford Dictionary we consider the following two relevant to our discussion. The first one implies the agency action, “Knowledge or facts communicated about a particular subject, event, etc.; intelligence, news”; the second one renders information an inert character, “Without necessary relation to a recipient: that which inheres in or is represented by a particular arrangement, sequence, or set, that may be stored in, transferred by, and responded to by inanimate things” (Trumble, Stevenson, & Brown, 2002, vol. 1, p. 1371). These definitions allow us to expand our discussion on information in general and information seeking, and transmission, in particular. While the first meaning makes explicit the participation of humans in the communication process, the second one hints that humans can be kept out of the process of manipulating information, conceding its living status (cf. actor-network theory, Latour, 1999; Law, 1999).

These conflicting definitions reflect a deeper ontological divergence on what information really is. On the one hand, some authors see information as an objective and inert instrument (Benkler, 2006; Foray, 2004). Stonier (1990, cited by Webster, 2002) affirms that “Information exists. It does not need to be perceived to exist. It does not need to be understood to exist. It requires no intelligence to interpret it. It does not have meaning to exist. It exists” (p. 24). The underlying assumption in this definition is that information can be objectively obtained; that is, information can exist independently of the observer. On the other hand, some scholars grant information more subjective and contextually-bounded characteristics whereby it can be interpreted in many different ways for different purposes (Castells, 2000b; Galliers, 2004). In the latter view, information requires the agency to have meaning.

In this article, we perceive information as a product of human interaction that conveys a common meaning to a particular group of individuals. Thus, we favour Dervin’s (1977) definition of information, which is “essentially seen as a tool that is valuable and useful to people in their attempts to cope with their lives. Information is seen as something that reduces uncertainty. As the individual moves through... the time-space continuum that makes up life... it is assumed that information can both describe and predict that reality and thus allow the individual to move more effectively” (p. 18). This definition confers information the quality of being situated and recognises that information needs an actor that can interpret it and act upon it in a specific time and space context (cf. Giddens’ structuration theory, 1984). Indeed, Dervin (1991) calls to avoid conceptualising information as a thing. This approach amounts to considering information as a social construct, which is “evaluated, transmitted and propagated through social relations and interactions” (Castelfranchi, 2002, p. 384).

2.2. Sense-making

Given that we are adopting the idea of information as a social construct, it is necessary to consider how information is passed to others, and how information is interpreted. The traditional transmission model of communication, whereby the sender sends a message through a communication channel to a receiver, has been much criticised for its linear – and rather simplistic – approach. Dervin (1980) convincingly argues that information transmission is not as simple as just dumping information into someone else’s head; closing the information gap between the sender and the receiver requires a clear understanding of the context of the information transmission process. In order to be effective, the information
transmission process needs a receiver-oriented approach, instead of heavily relying on the sender (Dervin, 1980).

Neither a system-centred approach – which attempts to predict information-seeking depending on the topic (e.g., health information as opposed to economic information) – nor an individual-centred approach – which emphasises personal traits as predictors of information seeking (e.g., demographic profile) – are compelling enough for developing a theory on information seeking behaviour (Dervin, 1992). Alternatively, the sense-making model offers a constructivist approach that takes into consideration the time-space-bound context in order to explain how individuals interpret their experience in problematic situations with an emphasis on the role of the receiver of information in any effort of information transmission (Dervin, 1992, 1999a, 1999b). At the heart of the sense-making model is the cognitive gap that individuals face in ever-changing situations and dynamic, rather than static, process of information seeking (Dervin, 1993). Information seekers should be understood from their own perspectives and situations when “constructing cognitive bridges across [information] gaps” (Dervin, 1989, p. 223). It must be noted that the gap-closing action is motivated by purposes defined by the information seeker and not by the sender, who may or may not be immersed in the receiver’s worldview. Moreover, existing social structures affect how individuals close the information gap (Gladwell, 2002; Johnson, 2007).

In order to address our research question, we are particularly interested in the individual actors’ motivations for finding computer-mediated information, and how it is linked to their collective group’s interest. Thus, we settled on Dervin’s (1989) actor-defined purposes framework, which makes a distinction between the information seeking purposes of individual actors and collective actors (those that act as intermediaries within a social system) as shown in Table 1. It should be noted that these two subsets of purposes are not exclusive; indeed, we see some degree of overlap since the collective actor is an entity grouping individual actors.

<table>
<thead>
<tr>
<th>Individual actor</th>
<th>Collective actor</th>
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<tr>
<td>1. To get ideas</td>
<td>1. To educate</td>
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<td>2. To find direction</td>
<td>2. To interconnect</td>
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<td>3. To acquire skills</td>
<td>3. To achieve consensus</td>
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<td>4. To connect with others</td>
<td>4. To raise morale</td>
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<td>5. To get support</td>
<td>5. To anchor culturally</td>
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<td>6. To be happy</td>
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<td>7. To achieve goals</td>
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<td>8. To belong</td>
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<td>9. To design</td>
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<td>10. To discover</td>
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<td>11. To stimulate</td>
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<td>12. To be heard</td>
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<td>13. To get diverse input</td>
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Table 1: Purposes defined by actors when seeking information (adapted from Dervin, 1989)

In our daily lives of information seeking, we identify different sources of information: people (i.e., relatives, friends, neighbours, colleagues and acquaintances) to whom we may approach for any specific need of information; media (i.e., newspapers, magazines, radio and TV), which give general information on current events; libraries that provide authoritative

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information (which may not be the one that people need for their everyday life); and computer-mediated information (including databases, the Internet and virtual contacts). We highlight that it is the cultural context what makes information relevant, which otherwise may be off the point; moreover, cultural background explains why “most information transfer occurs informally, between friends and colleagues” (Dervin, 1989, p. 224). It is daily practices that influence individuals’ information-seeking habits, since interpersonal communication and social networks are key factors affecting information behaviour (Savolainen, 1995). While this information exchange between friends and colleagues may be considered as the least effort option (Case, 2002), it is nonetheless largely the most important for us. This observation reinforces our argument that information seeking has a cultural context. This last reflection brings us to the concept of social capital.

3. SOCIAL CAPITAL

Individuals are not isolated entities; the human predisposition to constitute strong connections to social groups is well recognised (Simon, 2002). Social capital can be said to have three authors who have introduced it to the current theoretical debate: Bourdieu (1983), Coleman (1988) and Putnam (1993). Bourdieu (1983), from a Marxist perspective, coined the term social capital and defined it as the “aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalised relationships of mutual acquaintance and recognition” (p. 248). Coleman (1988) conceptualises it as a productive function, which makes “possible the achievement of certain ends that in its absence would not be possible” (p. 98). Putnam, who can be credited with popularising the concept, takes a communitarian perspective and sees social capital as the characteristics of “social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions” (Putnam et al., 1993, p. 167) through their linked rules of reciprocity (Putnam, 1993).

Putnam et al.’s (1993) definition identifies three components of social capital. Although an elusive concept, trust is a key characteristic of interpersonal relationships and can be defined as the positive reliance on other parties’ obligations (Abrams, Cross, Lesser, & Levin, 2003; Adler & Kwon, 2002; Coleman, 1988). Norms are the accepted behaviour patterns for the members of a social system (North, 1990; Rogers, 2003) and networks represent the material support for the transactions (Adler & Kwon, 2002; Coleman, 1988; Putnam et al., 1993). The unspoken, yet fundamental, element the above definitions have in common is social interactions; in the absence of social interactions, social capital would not exist.

We have chosen to use the definition put forward by Adler and Kwon (2002): “Social capital is the goodwill available to individuals or groups. Its source lies in the structure and content of the actor’s social relations. Its effects flow from the information, influence, and solidarity it makes available to the actor” (p. 23). First, this definition of social capital makes explicit that social capital can be accessible to both individuals and groups, which will allow us to observe the information seeking behaviour of individuals within a larger community and how the information transits between them. Second, it directs the attention to the elements constituting the network and the nature of the goods, which can be tangible (e.g., money) or intangible (e.g., favours), transacted throughout the network; this characteristic allows us to contextualise the components of the information seeking process. Third, it recognises that information – along with power and reciprocity – takes part in the social interactions.

The previous descriptions emphasise the value of collective action and what networks can achieve, while recognising social capital as a strengthening element for network building. However, since we recognise that not all forms of association necessarily lead to the benefit
of the community, we do not take a normative stance on the concept of social capital. The interested reader can find a discussion on the negative sides of social capital in Field (2003); Field, Schuller & Baron (2000); Portes (1998) and Simon (2002).

3.1. Social capital domains

Huysman (2004) proposes three domains of social capital: structural opportunity, cognitive ability and relation-based motivation, as shown in Table 2.

<table>
<thead>
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<th>Domain</th>
<th>Constitutive elements</th>
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<tr>
<td>Structural opportunity for social capital transaction</td>
<td>Network ties and network configuration, including appropriable organisations</td>
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<tr>
<td>Cognitive ability for social capital transaction</td>
<td>Competences and resources that individuals in the network have through common systems of meaning</td>
</tr>
<tr>
<td>Relation-based motivation for social capital transaction</td>
<td>Linkages developed through consecutive contacts with each other based on tacit reciprocity rules</td>
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</tbody>
</table>

Table 2: Social capital domains (adapted from Huysman, 2004)

These domains should prove to be useful in understanding why and how some individuals embrace the task of not only seeking computer-mediated information but also distributing it among their fellow villagers. The structural opportunity domain is represented by the interaction between human beings, which may take place within social structures represented by both face-to-face and virtual networks (Castells, 2000a). Hence, the “who transacts” and the “how transacted” are the elements to be analysed under this domain (Huysman, 2004). The cognitive ability domain refers to “communicative competence”, the human beings’ capability to communicate with each other with intelligibility and to transform information effectively (Szreter, 2000). The “what is transacted” is to be examined in this domain (Huysman, 2004). The relation-based motivation domain implies reciprocity and trust which contribute to the expansion of networks and are tacit forms of understanding to achieve common objectives (Brown & Lauder, 2000). The “why the transaction” takes place is scrutinised within this domain (Huysman, 2004).

In this study, the focus is informal social capital, which involves trust, norms, reciprocity, networks and connections among individuals, as opposed to formal social capital, which takes place among distinguishable collective entities (MacGillivray & Walker, 2000) – e.g., businesses and government agencies. Rather than exchanging goods or services in these informal interactions, we expect to see information being symmetrically transacted in a diffuse and tacit manner (Adler & Kwon, 2002).

4. A THEORETICAL FRAMEWORK OF INFORMATION SEEKING AND SOCIAL CAPITAL

This framework aims at understanding individual purposes for seeking computer-mediated information, and how the information-seekers’ context and their social group bound the search. We recognise that social context implicitly constrains the possibilities of topics to be searched; our assumption is that the information seeker will not look for something that is not part of their universe. The social group plays a key role in defining the search alternatives,
because ultimately it is they who will be fed the obtained computer-mediated information that is distributed through face-to-face interactions by word-of-mouth. Instead of analysing the feasibility of replicating social capital characteristics on virtual networks (cf. Putnam, 2000), our interest is extending our understanding of how social capital networks affect individual’s information-seeking behaviour in a rural setting. We do not expect that computer-mediated information and virtual interactions will replace substitute face-to-face contacts; rather we foresee a complementary effect (Quan-Haase & Wellman, 2004; Wellman, Quan-Haase, Witte, & Hampton, 2001).

In the framework shown in Figure 1, we bring together Huysman’s (2004) dimensions of social capital and Dervin’s (1989) defined purposes of seeking information for both the individual and the collective actors. We contend that this framework will allow us to understand how the community influences the individual’s search effort, as well as how the information gathered from computers is distributed throughout the existing social networks. These actor-defined purposes (Dervin, 1989) give us insight into the type of information seeking that might be occurring along the three social capital dimensions (Huysman, 2004), and give us a further set of concepts for understanding how people might seek information in their social capital networks.

Figure 1: Theoretical framework of information seeking and social capital

While the actor-defined purposes represent specific activities and motivations in the information-seeking effort, the dimensions of social capital allow us to interpret the translation process from the micro-level – i.e., the individual actor – to the macro-level – i.e., the collective actor. This is the central argument of our proposed model.

5. GROUNDING THE THEORETICAL FRAMEWORK

As a way of illustrating the framework presented in Figure 1, we use it as a lens for the analysis of data collected between July and November 2005 in six rural communities in northern Peru. Among the primary sources of data, we had 32 in-depth interviews with participants coming from three groups of stakeholders: intended beneficiaries, managers of the purposed-built telecentres – known by the locals as infocentros – and the sponsors of the
In our earlier research, we found while that people in the studied communities universally acknowledged the potential contribution of computers, only some individuals made an extra effort to learn how to use computers. These individuals were almost invariably informally trained, and keen on sharing the computer-mediated information with their fellow villagers. We named them “activators of information”, those who connect their local and traditional networks with their virtual and distant networks (Díaz Andrade & Urquhart, 2009). These individuals dynamically use information to build social and/or strengthen social capital and are very conscious of their place in the community. Therefore, we were interested in explaining this phenomenon further, and think that the proposed theoretical framework can assist us in this effort.

Presenting textual data is always a challenging task given the space limitations. Thus, we have been careful in selecting the participants’ expressions that best represent the notions represented in the theoretical framework. In Table 3 we present quotations from the participants reflecting the actor-defined purposes of individual actors when seeking information.

| 1. To get ideas | Edilberto, 25 (La Encañada infocentro manager): “Peasants used to visit me at the infocentro. ‘We have come to look for this [information] that we need; we were told that we can find it through the Internet’” |
| 2. To find direction | Anatolio, 19 (Puruay Alto): “Communication is important because some people give you solutions and advice” |
| 3. To acquire skills | Hermilio, 16 (Chanta Alta): “[My cousin] teaches me many things [like] MS Word® and MS Excel®, recording CDs with music and documents” |
| 4. To connect with others | Alejandro, 33 (Chanta Alta): “I have friends in other countries... They are from Colombia and Venezuela... I met them through the chat” |
| 5. To get support | Ramón, 32 (Huanico): “[I communicate by e-mail] mostly with my relatives who are in Cajamarca City... to ask for a doctor or someone who can help me on this issue” |
| 6. To be happy | Fernando, 23 (Puruay Alto infocentro manager): “Students exclaim, ‘Gee! If we had money we would come all the time. Chatting is awesome... It is exciting to be talking to other people’” |
| 7. To achieve goals | Sixto, 39 (La Encañada): “There are colleagues who know better than me about Internet. ‘I have this problem, what can I do?’ ‘Do in this way’. You know; it helps to improve ourselves” |
| 8. To belong | Justo, 40s (San Marcos): “I needed to be in touch with my classmates and lecturers at Universidad de Lima” |
| 9. To design | Liliana, 28 (San Marcos): “This computer is extremely useful for me, for my job and for everything we have to do at the municipality... I put all my ideas in there” |
| 10. To discover | Hugo, 16 (La Encañada): “Some friends in here have contacts in other countries. They put us through and we talk... how their weather is, and so |
| 11. To stimulate | Darío, 25 (Llacanora): “The infocentro manager should encourage people in the countryside... to come, to learn and let them know, ‘I found this in the computer’. I think many people in the countryside do not know what a computer is... but they do not realise that there is something that may help in agriculture”. |
| 12. To be heard | Manuel, 16 (Huanico): “If you learn computers you would have the information you need to confront the authorities”. |
| 13. To get diverse input | César, 28 (Puruay Alto): “It is important to meet people from other places... because that is the way to development. And also we are informed how they work in that country, in that town, or that village, and how we work in here”. |

**Table 3: Instances of individual actor’s action-defined purposes**

An examination of the aforementioned quotations reflects a wide range of motivation for individuals seeking information ranging from satisfying personal curiosity (e.g., meeting people overseas) to solving urgent issues (e.g., health related problems). It is possible to see these information seekers’ orientation to computer-mediated information as classified in two major categories: cognitive oriented seekers and affective oriented seekers (Savolainen, 1995, citing from Erämetsä 1990). The former group has a preference for technical or cultural information, since they perceive it as an instrument for reaching a specific purpose sometime in the future. Conversely, the latter group perceives information as a means for immediate reward and its preferences are on amusement-style information, or “infotainment” (Webster, 2002, citing from Postman 1986). During our fieldwork we found both kinds of information seekers, but our current research interest is in the former group. Although all of them are driven by an internal stimulus (that is why they are classified as individual actor’s action-defined purposes) it is clear that in the process of information seeking are other parties involved.

We present now in Table 4 some examples of the information seeking effort undertaken by collective actors. While we admit that most of the times an individual performs the task of retrieving information, she/he does so as a proxy of the group for practical reasons, especially in a developing country context such as in this study. It is hard to imagine the convenience of the crowd looking for a piece of information that is required by the group if it can be relatively easy obtained by one of them only; entrusting the responsibility to one individual will not only be more efficient but also probably more effective. We emphasise, however, that this information-search effort is motivated by, and the ultimate beneficiary will be, the collective actor.

| 1. To educate | Alejandro, (Chanta Alta): “I encourage my colleagues [stockbreeding technicians] to visit such and such website, to surf through the Internet, and review that”. |
| 2. To interconnect | Antero, 49 (Puruay Alto): “We can look for markets in other places”. |
| 3. To achieve consensus | Luz, 22 (San Marcos infocentro manager): “A number of [local] organisations and [governments agencies] used to come to organise the work and exchange information”. |
| 4. To raise | José, 21 (Llacanora): “My friends and I always go out from the town and...” |
observe what is going on in other places... [Then], we compare and realise that something is wrong in here”.

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<th>morale</th>
<th>5. To anchor culturally</th>
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<td></td>
<td>Darío, 25 (Llacanora): “I am the founder of ALLATUAR (Llacanora People Association for Action on Tourism, Agriculture and Handicraft), a local organisation that seeks to promote businesses around tourism, agriculture and handicraft... computers can help us in promoting Llacanora”.</td>
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</table>

Table 4: Instances of collective actor’s action-defined purposes

All the instances of action-defined purposes of information seeking shown in Tables 3 and 4 are not mutually exclusive; rather to the contrary, an overlap exists among them. For example, we can see common characteristics among “to acquire skills” (instance No. 3 in Table 3), “to discover” (instance No. 10 in Table 3) and “to raise morale” (instance No. 4 in Table 4). It is not a black or white choice; we maintain that it is a matter of degree what defines whether a particular participant’s expression falls within one action-defined purpose or the other.

So far we have presented the action-defined purposes of information seeking for both the individual and the collective actors. The remaining question is how the information gathered by the individual is transmitted to the social group and vice versa. What connects them – in other words, the missing link, we maintain is social capital: “the goodwill available to individuals or groups, [whose] source lies in the structure and content of the actor’s social relations” (Adler & Kwon, 2002, p. 23). Social capital dimensions (Huysman, 2004) provide us with the analytical elements to observe the transmission process in more detail. At this point, we discuss how the social capital dimensions allow us to see the interface linking the individual and collective actors’ information seeking behaviour.

The structural opportunity for information transmission is reflected by the mere fact of individuals interacting to each other. This interaction could be among individuals either in the vicinity (e.g., through the communal Peasant Organisation or the local council) or over the Internet. In instance No. 1 in Table 3, we see Edilberto interacting with local peasants motivated to get some information and in instance No. 3 in Table 4 Luz explained us how different organisations worked together to exchange information. Both examples illustrate the existence of links among individuals and (not necessarily formal) organisations in a more or less stable configuration whereby information is transmitted.

The cognitive ability for information transmission is exemplified, for the individual actor, by instances No. 7 and 13 in Table 3. They make explicit the need of a common set of meanings for rendering the seeking-information effort viable; if Sixto and César were not able to understand what their counterparts articulate, the exchange of information would be impossible. In Antero’s expression in instance No. 2 in Table 4 is implicit the requisite of a shared communicative understanding at the collective actor level; the fact of Antero’s using the third person in plural is indicative of his assumed representative role of the community – he embodies the collective actor – when suggesting the idea of identifying potential markets for Puruay Alto’s produce.

The relation-based motivation for information transmission conveys the idea of an established relationship. However, every established relationship started with an initial interaction; instances No. 4 and 6 in Table 3 illustrate these early contacts, while instance No. 8 shows a habitual communication. All these are examples of the individual actor seeking information. Conversely, instances No. 1 and 5 in Table 4 illustrate how the information transmission takes place at the collective level.
5.1. Mavens, mavericks and social connectors

Not only from what the participants said in interviews, but also from observation during the fieldwork, we can identify those individuals who share the characteristics, of mavens, mavericks or social connectors, to a greater or lesser degree. However, our intention is not to label individuals in a rather deterministic fashion according to these three typologies; such an exercise will prove problematic and inaccurate. We aim at understanding how individuals use and disseminate computer-mediated information in their social capital networks, synthesising theories of information seeking with those of social capital. In this context, mavens, mavericks and social connectors are descriptors of actions that would shed light on how information is transmitted in a rural environment; we prefer to talk about mavenry, maverickery – taking a linguistics licence to the extreme – and social connectivity.

We observe that giving access to information through computers has a multiplier effect in the presence of mavenry. Individuals showing the traits of mavenry place a higher value on education than their fellow villagers; moreover, they are interested in educating others and generally tend to be receptive to new ideas, such as innovations in farming and stockbreeding. Their cognitive ability for information transmission becomes apparent in relatively small rural settings. The attributes of maverickery are the least manifest; it can be argued that it is visible when certain villagers challenge the status quo of their communities based on information they obtain from other places through computers and virtual friends in somewhere else. However, we found that this is sometimes a shared feeling among the villagers. This observation brings us to the next element.

Social connectivity is the most visible characteristic. In the area of northern Peru where this study took place, the ancient practice of communal work, and the strong influence of the communal organisations, are essential parts of the social network, and tacit reciprocity rules are noticeable. The existing cultural context fosters the passing on of information through the customary face-to-face contacts. It is these traditional and close interactions that make information available to both the individual and collective actors the transmission of computer-mediated information. Indeed, computers can help people to overcome physical distance and can empower the information-disadvantaged (Rogers, Collins-Jarvis, & Schmitz, 1994).

6. CONCLUSION

Our current research is motivated by a question from our previous study: How do information-seeking theories extend our understanding of individual use of computer-mediated information within their social networks in a rural context in a developing country? At this point, we suggest that our combined framework of information seeking behaviour and social capital can inform us better about the role played by certain individuals in disseminating and seeking computer-mediated information. We propose that actor-defined purposes when searching for information (Dervin, 1989), along with social capital domains (Huysman, 2004) will allow us a finer grained understanding of this phenomenon.

By examining individual computer-mediated information seeking behaviour in rural communities in developing countries, and characterising that information seeking behaviour as a social construct in a cultural context, our proposed theoretical framework makes several contributions. First, we make a theoretical contribution by synthesising aspects of social capital theory with information seeking theory. While some might argue that Nahapiet and Ghoshal (1998) also focused on information by looking at knowledge and social capital, our focus here is on the role of the actors – both individual and collective – in their community with regard to information, allowing us to achieve a more information focused understanding of social capital dimensions. We think that looking at the individual and group information

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seeking motivations is as important as it gives us an insight into why certain projects might be successful. Secondly, looking at the sort of information that is valued, and transmitted especially in ICT for development projects, would give a guide to future such projects. Thirdly, we would contend that the framework focuses clearly on the role of the individual in ICT for development projects and that this is also a contribution given the lack of current literature on the sometimes-critical role of individuals to the success of ICT for development. While Rogers (2003) stresses the importance of early adopters, no literature that we are aware of situates those individuals within their community. This last is an important point – we are not privileging the individual over the community and proposing some ‘great man’ theory whereby individual qualities make the difference – rather we contend that understanding the role of the individual *within their community* is critical and at present, understudied. We would say that the computer enthusiasts in our previous study seemed to be more maven than maverick in their willingness to share; they are definitely social connectors and it is this process of connection through information that is of great interest to us. Our earlier research has indicated that this kind of behaviour may be more common than we might think. It is our hope that the framework put forward in this paper will assist us and other researchers in understanding the role of information and the individual in their community, in development-oriented ICT projects, particularly in small and remote rural communities in developing countries. We can also envisage broader applications of this framework – the most obvious being a finer grained consideration of knowledge transfer within organisations and between organisations. This framework would be particularly good for considering tacit aspects of knowledge transfer, by concentrating on the reasons people are motivated to share information, the types of information shared, and how that information is shared.

7. ACKNOWLEDGMENT

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8. REFERENCES


INFLUENCING FACTORS AND THE ROLE OF ICT ON CORPORATE SUSTAINABILITY IN BAHRAIN’S SERVICE INDUSTRY: A FIELD STUDY APPROACH

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Abstract: Corporate Sustainability (CS) has been researched by many scholars in recent years. While literature on corporate sustainability covers various issues, it lacks comprehensive studies of factors and variables and the roles of ICT which influence the practice of corporate sustainability. This paper studies these factors and variables and investigates the roles of ICT on corporate sustainability in the context of some organizations within service industry in Bahrain. A qualitative field study approach is undertaken in this research where seven organizations in Bahrain are studied via interviews with ten key personnel. Content analysis is then performed to extract the factors and variables and a comprehensive model of the antecedents of corporate sustainability practice is developed. The results indicate that networking (internal and external) with a view to creating new knowledge are the significant antecedents of corporate sustainability. In terms of the roles of ICT, it is proposed that collaborative technologies, knowledge management systems, specific DSSs and internet based sustainability reporting are the appropriate ICTs to implement and manage corporate sustainability effectively. The paper also highlights the research and managerial implications of corporate sustainability model.

Key words: Corporate sustainability, Communities of Practice (CoP), Networking, Knowledge Management, Knowledge creation, Bahrain

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INFLUENCING FACTORS AND THE ROLE OF ICT ON CORPORATE SUSTAINABILITY IN BAHRAIN'S SERVICE INDUSTRY: A FIELD STUDY APPROACH

1. INTRODUCTION

The Kingdom of Bahrain – like other Gulf Cooperation Council (GCC) countries – is trying to diversify its economy instead of depending solely on the export of oil (Al-Jasser and AlHamidy 2003). Bahrain Minister of Industry and Commerce Dr. Hassan Fakhro stated that “Bahrain is service-based economy” (The Ministry of Industry and Commerce 2006). Accordingly, the number of national/international service organisations – especially in the financial sector – is increasing rapidly (Central Bank of Bahrain 2004) and ultimately fierce competition is growing. With this highly competitive market environment organisations require to employ strategies to compete and sustain their competitive advantage. Hence the need for understanding, practising, and managing corporate sustainability is vital (Elkington 1998, Frankel 1998).

Corporate Sustainability (CS) has been defined in the literature in many different ways. As the famous quote says “it means something, but not always the same thing to everybody”. Some researchers have defined CS by taking a shareholder, stakeholder, and societal approaches. Others have argued that CS is a process rather than a tangible outcome. However, three most agreed dimensions of Corporate Sustainability are: Ecological (environmental), Social and Economic sustainability (Marrewijk 2003). The bottom line however is that organizations of the 21st century must attain the dimensions of corporate sustainability effectively and become more competitive at the same time. Questions therefore remain: what must be done to practise corporate sustainability? What are the antecedents of CS? What are the roles of ICT in CS? This paper investigates the above questions in the context of some service oriented organizations in Bahrain.

Grant’s (1996) knowledge-based view of the firm argues that knowledge is a critical source for sustainable competitive advantage. Roberts (2006), on the other hand, argues that Communities of Practices (CoPs) provide a suitable environment to create knowledge by facilitating the exchange of knowledge between members. It has also been suggested that development of new knowledge via CoPs depends on social capital comprising trust, norm, among others (Wasko and Faraj 2005, Wasko et al. 2004). On the other hand literature reveals that new knowledge (created through CoPs) contributes significantly towards the sustainability of organizations (Placet et al 2005) – an assertion which will be elaborated later. This paper thus proposes that CoPs will help organizations to create new innovative knowledge which in turn will influence the corporate sustainability. Thus CoPs and new knowledge created through CoPs are considered to be the most important antecedent factors of corporate sustainability. Thus primary objectives of this paper are as follows:

(i) In what forms and shapes do CoPs exist within the service industries in Bahrain?
(ii) What are the roles of CoPs in creating knowledge that are essential for corporate sustainability?
(iii) How does social capital influence the creation of knowledge via CoPs?
(iv) What are the roles of ICT on the implementation and practice of corporate sustainability?

It is noted that above objectives of this paper (specially objective iv) fit very well with the overall theme of the conference which states that “the conference will explore the contribution of ICTs to the achievement of sustainable development”.

We use qualitative filed study as the research method and use structured interview techniques to collect relevant data. In the next several sections we first briefly present relevant background literature. The research method is presented next which describes the process of data collection and data analysis. The results of the study are then presented in detail in the form of a comprehensive corporate sustainability influencing model. The role of ICT in corporate sustainability is then presented which is explicated based on this comprehensive model. Finally, conclusions and future directions are presented.

2. BACKGROUND

Located in the Arabian Gulf on the eastern shore of Saudi Arabia Bahrain has a 5000 years of civilization. It has a relatively small land area and a population of only 680,000 people. But Bahrain has achieved a very high level of social and economic development in the last three decades. In terms of Information and Communication Technology (ICT) Bahrain boasts one of the most advanced infrastructure. It has achieved a PC penetration of 16 per 100 people, Internet penetration of 22% of the population and E-banking adoption of 17% of Internet users (Al-Amer 2005). The Government of Bahrain has also undertaken major steps towards e-Government implementing a series of related projects across all public authorities costing between US$150 million to US$ 200 million. In terms of e-Government readiness Bahrain scores 2.04 compared to the global mean of 1.62 (Al-Amer 2005). The score for USA is 3.11. Almost all local and foreign banks in Bahrain now offer e-banking services. There also has been some innovative applications and uses of ICT in Bahrain, for example e-voting (Al-Amer 2005), Smart Card (Al-Alawi and Al-Amer 2006), among others. But use and application of ICT in facilitating Communities of Practices (CoPs) leading to managing knowledge and corporate sustainability have not been found in any ICT literature on Bahrain. Thus present exploratory study in this domain will contribute significantly to the literature.

2.1 Communities of Practice (CoPs)

Community of practice (CoP) approach was developed in the beginning of the 1990s (Roberts 2006). Despite cautious criticism of this approach by several scholars (e.g. Contu and Willmott 2003; among many others), currently various organisations utilize this approach as a vehicle for analysing and transferring knowledge (Roberts 2006). Under the CoP theory individual’s and group’s tacit knowledge are shared and transferred among the members (Teigland 2003). CoPs exist within an organisation as well as between different organisations (Braun 2002). To take full advantage both internal and external CoPs must be considered. Wenger, McDermott and Snyder (2002) believed that customers and suppliers CoPs are beneficial tools for organisations and individuals.

As mentioned earlier this study attempts to examine the impact of knowledge received from participants in internal and external CoPs on creating new knowledge for corporate sustainability. It is noticed from the literature that that there is a lack of comprehensive study on CoP relationship with corporate sustainability. Therefore, this study will contribute significantly to the literature.
2.2 Knowledge Creation

In the literature two major types of knowledge are dealt with as tacit and explicit (Polanyi 1997). As stated by Nonaka (1994), the formulation and communication of tacit knowledge is harder than explicit knowledge. When tacit and explicit knowledge are shared between individuals and groups inside and outside of the organisation, new knowledge is created (Nonaka and Toyama 2005).

One of the important areas of debate in CoPs is related to knowledge creation. Brown and Duguid (1991) argued that responding to new problems will incrementally improve work practices, thus there is a positive correlation between CoP and knowledge creation. It is noted that in studying the antecedent factors of corporate sustainability, one of the objectives of this study is to discover if the knowledge received from members in CoPs will facilitate knowledge creation.

2.3 Corporate Sustainability

Corporate sustainability has attracted the attention of large and small organisations (Hawken 1993; Elkington 1998; Frankel 1998). According to Porter and Kramer (2006) organisation’s economic, social, and environmental performances are the ultimate principles of sustainability. Organisation’s ability to integrate tacit knowledge embedded in individuals’ minds will provide a source of sustainable competitive advantage. An organisation can reach a sustainable competitive advantage through supporting the creation of new ideas and innovation by increasing the flexibility of knowledge integration.

While literature on corporate sustainability is plentiful, it lacks a comprehensive study on the antecedent factors of corporate sustainability. This paper attempts to fill this gap. As mentioned in the introductory section and further supported by the literature review section above we propose a generic framework as follows to conduct our research:

CoPs $\rightarrow$ Knowledge Creation $\rightarrow$ Corporate Sustainability

We shall use the above framework to investigate the antecedent factors and variables of corporate sustainability which will then help us to understand the role of ICT in the implementation and practice of corporate sustainability.

3. RESEARCH METHOD

3.1 Paradigm, Sample and Procedure

As the study is exploratory in nature, a field study was conducted in the service industry of the kingdom of Bahrain. Thus the paradigm of this research is qualitative. The purpose of the field study was to get a clearer picture of what is happening in Bahrain service industry (e.g. existence of CoPs and issues on corporate sustainability) using the generic high level framework presented above. The data was collected using semi-structure interviews. The interview plan followed the guidelines of Patton (1990). The areas of information that the semi-structure interview questions focused on are: (1) the existence of CoPs and their categories, (2) the characteristics of CoPs, (3) the level of importance of internal and external CoPs, (4) type of knowledge (tacit/explicit) received from CoPs members, (5) how knowledge is created, (6) the creation of new knowledge, (7) social capital level within these CoPs, (8) role of social capital and finally (9) practice of corporate sustainability (organisation’s social,
environmental, and economic performance). The interview questions were first tested by one prospective participant.

Ten managers from middle and top management level were chosen to be interviewed. The selection of the interview participants was based on two main conditions; first the position of the participant and second the industry of their organisation. Seven organisations in the government, private, and quasi-governmental sectors within Bahrain service industry took part in this study. Table 1 shows the demographic information of the interview participants and the organizations they work for. It is noted that three organizations (3, 5 and 6) allowed us to interview two executives each from their organizations.

Table 1: Demographic information of the interviewees

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Position</th>
<th>Nationality</th>
<th>Education</th>
<th>Organisation</th>
<th>Nature of Business</th>
<th>Public/Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Senior Vice President</td>
<td>Bahraini</td>
<td>MBA</td>
<td>Organisation 1</td>
<td>Financial services (Banking)</td>
<td>Private</td>
</tr>
<tr>
<td>2</td>
<td>Executive Director</td>
<td>Non-Bahraini</td>
<td>MBA</td>
<td>Organisation 2</td>
<td>Financial services (Banking)</td>
<td>Private</td>
</tr>
<tr>
<td>3</td>
<td>Manager</td>
<td>Bahraini</td>
<td>Master</td>
<td>Organisation 3</td>
<td>Public services</td>
<td>Public+Private</td>
</tr>
<tr>
<td>4</td>
<td>Director</td>
<td>Bahraini</td>
<td>Master</td>
<td>Organisation 4</td>
<td>Public services (Defence Force)</td>
<td>Public</td>
</tr>
<tr>
<td>5</td>
<td>Director</td>
<td>Bahraini</td>
<td>Bachelor</td>
<td>Organisation 5</td>
<td>Public service (Municipality)</td>
<td>Public</td>
</tr>
<tr>
<td>6</td>
<td>Head of Department</td>
<td>Bahraini</td>
<td>MBA</td>
<td>Organisation 6</td>
<td>Public services (Transportation)</td>
<td>Public</td>
</tr>
<tr>
<td>7</td>
<td>Director</td>
<td>Non-Bahraini</td>
<td>MBA</td>
<td>Organisation 6</td>
<td>Public services (Transportation)</td>
<td>Public</td>
</tr>
<tr>
<td>8</td>
<td>Director General</td>
<td>Bahraini</td>
<td>MBA</td>
<td>Organisation 7</td>
<td>Public services (Transportation)</td>
<td>Private</td>
</tr>
<tr>
<td>9</td>
<td>Chief Executive</td>
<td>Bahraini</td>
<td>PhD</td>
<td>Organisation 3</td>
<td>Public services</td>
<td>Public+Private</td>
</tr>
<tr>
<td>10</td>
<td>Head of Department</td>
<td>Bahraini</td>
<td>PhD</td>
<td>Organisation 5</td>
<td>Public services (Municipality)</td>
<td>Public</td>
</tr>
</tbody>
</table>

3.2 Data analysis

For the ten interviews conducted in this research, over forty pages of interview scripts were produced for analysis. Content analysis technique was used to analyse the interview data (Thomas 2003). The specific approach used to analyse the interview scripts followed Thomas’ (2003) six steps approach of content analysis. A list of variables was prepared on each major area of the study. It is important to highlight that most of the variables were checked for consistency with similar variables from the literature review. After that a comprehensive table was developed showing all the variables found from the field study.
4. RESULTS AND IMPLICATIONS

4.1 Demographic Information

All the interviewees were male except one female manager. It is noticed that seven of them hold top level management positions while others hold middle level management positions. The majority of the participants had Masters degree, while one of them had a Bachelor degree and two are PhD holders. Three of the interviewees work in the private sectors and the others work in governmental or quasi-governmental organisations. In addition, all the participants work in large organisations within the service industry in Bahrain (i.e. financial services, transportation, defence force, municipality, and public services). All the interviewees appreciated the aims and objectives of the study.

We now discuss the major variables which were explicated from the field study scripts via content analysis. We grouped them under major heading of the factors identified in the literature. Altogether 87 variables were identified which were grouped under 18 factors (see Figure 1).

4.2 Existence of Community of Practice

The first objective of this study is to discover the existence of CoP concept within the service industry in Bahrain. It was noticed that the interviewees never heard of the formal terminology called CoP before. Only one of the ten interviewees guessed the right definition of CoP. Interestingly, one of the interviewees admitted that they are applying this concept at his work, but it is the first time he heard about this expression. The researcher did not explain the CoP concept to the participants unless they asked about it. Therefore, the participants would not be given an indication of what answers were expected from them. This was to eliminate the bias of the data collected. For those who asked about the meaning of the CoP concept, the researcher gave them a brief definition of CoP and its origin.

It was however found that there are connections and networks between the interviewees and the people working with them in the same organisation and outside of their organisation. All interviewees agreed that they seek help and advice from the members of these networks whenever they faced a problem at their work. It was also noticed that communication was always two ways. As a result, they benefitted from each other’s knowledge and experiences. This supports one of the CoP indicators specified by Wenger (1998) that is called "sustained mutual relationships". For example one of the participants stated that: "it is a two way communication and cooperation as those people also contact me if they need my help and advice." It was also discovered that all the interviewees participate in formal/informal networks having similar work experience or field of interests to learn from each other.

Thus it can be claimed that in some form CoPs exist within the service industry in Bahrain although none of the interviewees knew the formal terminology.

4.3 Knowledge Creation

We now turn into our second objective of the study which seeks to discover the role of CoPs on knowledge creation.

It is noticed that six of the respondents received both tacit knowledge (skills, abilities, and verbal knowledge) and explicit knowledge (documents, reports, and procedures) from other network members. On the other hand, two of the interviewees received only tacit knowledge.
and two others received only written knowledge. Therefore, there is evidence that both tacit and explicit knowledge are received from CoPs members. It was also found that the knowledge creation process of Fuller et al. (2007) matches with the way the interviewees use these knowledge to generate even new knowledge.

4.4 Social Capital and its Role

We now investigate our third objective. As indicated in the literature several scholars believed that social capital moderates or influences the impact of knowledge exchange (Wasko and Faraj 2005). As a result this study assumed that social capital had a moderating role on the amount of knowledge received from network members. A number of variables from the literature are used to measure the level of social capital from the interviews.

- **Trust:** The majority declared that they have high level of trust with other members in their network. However, some commented that they have low level of trust with others. For example, one interviewee declared that: "I do not trust all of them."

- **Norms:** It was found that the level of norms in these networks was relatively high. Only two of the interviewees showed that they are not open to conflicting points of view. One of them said: "I argue with people who have different point of view. If I am not convinced I will do what I think is right."

- **Identification:** A moderate level of identification was found between networks members. For instance, one participant said: "Regarding the feel of belonging and proud it is something very hard to produce ...".

All the interviewees agreed that trust, norms, and identification have an affect on their decision to accept or reject the received knowledge. However, it was noticed that almost all of them emphasized on the role of trust more than norms and identification.

4.5 Corporate Sustainability:

We now investigate in what ways the knowledge created within the CoPs impact corporate sustainability, ie. the influence of new knowledge – or the knowledge creation outcome – on organisation’s social, environmental and economic performance.

**Social performance:** Majority of the interviewees agreed that there were new ideas generated through knowledge received from their network members which had some influence on their organization’s social performances. Examples of social responsibility projects included: increase the quality of education, contribute to the growth of the country, and sponsor university students.

**Environmental performance:** Most of the respondents also believed that the solutions they came up with were beneficial to the environment. Some of the creative solutions were used either to protect the environment or to help clean it. For instance, one of the interviewees stated that: "... helped in reductions of use of paper, which in turn reduced the demand on cutting trees."

**Economic performance:** All participants agreed that there was major effect of the new solutions on the economic performance of their organisations. Examples of these effects were: increase profit, decrease cost, and enhance organisation’s productivity and performance. For example, a participant stated that: "Again, good solutions have helped a lot in the increase of organisation’s profits and decrease in its expenses."

From the interviews we also discovered other performance measures of corporate sustainability which we call non-economic performance:
Non-economic performance: All interviewees also agreed that the new found solutions had positive impact on organisation’s performance, employees’ productivity, and the growth of the organisation. Moreover, as stated by one of the respondents, employee loyalty towards the organisation also increased. For instance, an interviewee said that: "Solutions always helped in minimising costs, time and efforts and helped the organisation manage its works in a smooth manner."

In summary, based on this field study in Bahrain, it can be argued that there is a hint of possible link between the knowledge received from the members of the CoP networks on the knowledge creation process and the outcome of the knowledge creation process (i.e. new knowledge) may have possible relationship with organisation’s social, environmental, economic, and non-economic performance (corporate sustainability).

For each of the ten interviews corporate sustainability influencing model was developed. Finally a combined model was developed which is shown in Figure 1. It is noted that this is the elaborate version of our high level framework, ie. CoPs → Knowledge Creation → Corporate Sustainability, which we started with at the beginning of this study. Via field studies we had been able to verify and expand this framework into a research model in the context of Bahrain’s service industry. This model has both research and managerial implications as will be discussed later.

![Diagram](image)

**Figure 1: Combined Corporate Sustainability Influencing Model**

### 4.6 Role of ICT on corporate sustainability

We now investigate our fourth objective which is the role of ICT in implementing and practising corporate sustainability. In a way this was our primary objective. But in order to study this objective we needed to explore the antecedents of corporate sustainability which is
shown in Figure 1 above. Sifting through the interview scripts and studying various literature the roles of ICT in corporate sustainability have been identified as follows.

We propose that the roles of ICT in corporate sustainability should be investigated using the framework of input, process and output. That is, we need to investigate the roles of ICT in managing (i) the antecedents of corporate sustainability, (ii) the corporate sustainability itself and (iii) the output of corporate sustainability.

On the antecedents of corporate sustainability, Figure 1 reveals two broad categories of activities: management of CoPs and management of knowledge. We propose that CoPs should be managed by using some form of collaborative technologies (Easley et al. 2003). Examples of collaborative technologies include group support systems, groupware; among many others (Easley et al. 2003, Bajwa et al. 2005). Collaborative technologies can be set up as both synchronous and asynchronous mode. Synchronous collaborative technology is ideal for managing CoPs within the same organization, while asynchronous collaborative technology is ideal for managing CoPs within and outside of the organization (non co-located employees, customers, suppliers, partners etc.). On managing knowledge (outcome of CoPs) we propose to use knowledge management systems (KMS) (Quaddus and Xu 2005). KMS is a specialized form of information systems which facilitates the generation, preservation and sharing of knowledge. Literature on the use KMS in various fields are plentiful. Literature provides descriptions of some KMS applications in leading organizations such as BP, Xerox, KMPG etc. (Sarvary 1999). KMS is therefore ideally suited to manage the new knowledge from CoPs and use them effectively in corporate sustainability.

On the corporate sustainability itself, we propose to use dedicated decision support systems (DSS). Three dimensions of corporate sustainability are social, environmental and economic. For social dimension of corporate sustainability dedicated DSS can be used to analyse the social impact of any corporate decision making. For example, Dey (2004) developed a dedicated DSS to analyse the social issues of a project in Indian oil pipelines industry. The author used a well known DSS tool called analytical hierarchical process (AHP) to develop the specific DSS (Saaty 1994). There are plenty of applications of specific environmental DSS to analyse the environmental impact of corporate decision making. For example Sen et al. (2000) developed a corporate DSS to manage the US Department of Energy’s hazardous waste cleanup efforts. For economic dimension of corporate sustainability dedicated DSS is used to analyse the economic benefit of an organization. For example, the World Bank developed a dedicated DSS to analyse the economic benefit of electrical power districting problem for the republic of Ghana (Bergey et. al. 2003).

On the output of corporate sustainability we concentrate on the reporting of corporate sustainability using ICT. Early reporting of corporate sustainability had been via print media which used a structured approach and format. However, as mentioned by Isenmann (2004) a combination of ICT and internet can be used now for corporate sustainability reporting. Main advantage of using internet based reporting is the flexibility whereby the reports can be fine tuned easily to meet users’ needs.

In summary, we propose that collaborative technologies, knowledge management systems, various dedicated DSSs and Internet based reporting are the ICTs which can be used effectively within the domain of corporate sustainability. In the context of Bahrain these technologies are not used at present to deal with corporate sustainability. However, given the
excellent ICT infrastructure of Bahrain, ICTs, as proposed above, can be easily developed and used for effective management of corporate sustainability.

4.7 Research Implications

Further research can emanate from our study in two ways. First, the comprehensive model of Figure 1 can be used as a research model to undertake empirical test on the model. To do that formal hypotheses need to be developed via further literature review. A causal modelling approach (structural equation modelling) can be undertaken to perform the empirical test. The model in its entirety may be too big for some applications. In that case part of the model can be investigated for empirical verification, for example the later part of the model – from new knowledge to corporate sustainability (see Figure 1).

Secondly, our proposed role of ICT in corporate sustainability can be investigated further taking a case study approach. For example, use of collaborative technologies for CoPs management can be investigated further using a case study approach to explore the factors of successful implementation of CoPs using collaborative technologies. The roles of knowledge management systems, specific DSSs and internet based reporting of corporate sustainability can be investigated in a similar fashion.

4.8 Managerial Implications

Figure 1 also serves as a practical model to implement and practice corporate sustainability. All factors and variables of this model have been obtained from the real world. It is noted that all variables of the model ultimately lead into corporate sustainability. Therefore, organizations planning to embark on corporate sustainability can consider the variables of Figure 1 as basic ‘criteria’ to successfully implement corporate sustainability. Organizations can do a feasibility study based on the criteria of Figure 1. An appropriate decision can then be taken by the organizations to ascertain to what extent they can implement and practice corporate sustainability.

5. CONCLUSIONS AND FUTURE STUDY

This paper presents a comprehensive study to determine the factors and variables to implement and practise corporate sustainability. The paper then explores the role of ICTs in implementing and managing corporate sustainability. The research is undertaken using a qualitative field study approach in Bahrain. Seven organizations from Bahrain’s service industry took part in this study, which resulted in ten interviews. The interviews were transcribed by the researchers and content analysis was used to explore various factors and variables as antecedents of corporate sustainability. The analysis resulted in 18 factors and 87 variables. A combined corporate sustainability influencing model was then developed. In terms of dimensions of corporate sustainability all interviewees agreed with economic performance, nine of the ten interviewees agreed with social performance, while seven interviewees agreed with the environmental performance. On the role of ICTs in corporate sustainability it was proposed (based on the antecedent factors/variables) that collaborative technologies, knowledge management systems, specific DSSs and internet based

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sustainability reporting are the appropriate ICTs for implementing and managing corporate sustainability.

This study contributes to the corporate sustainability literature in two significant ways. First, it uses a qualitative approach to explore a comprehensive list of factors and variables as antecedents of corporate sustainability. To the best of our knowledge it is quite a unique study from this perspective. This study also develops a comprehensive influencing model of corporate sustainability which has significant research and managerial implications. Second, the study also proposes a combination of ICTs which can be used successfully to implement and practise corporate sustainability.

Our immediate future plans is to test the comprehensive model via quantitative empirical study using structural equation modelling.

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What determines broadband uptake in emerging countries?
An empirical study¹

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Abstract: The conventional wisdom is that income is the most important factor that affects broadband uptake in any given country. However, in this paper we hypothesize that income is not the main factor that affects broadband uptake especially in emerging countries. In addition we prove that unlike the developed countries, the hypothesis that PC per hundred inhabitants is considered a determinant of broadband uptake is not really true when it comes to emerging markets. On the contrary, in emerging countries tele-centers and internet cafes or public point of access are the main ways of access to the Internet on the subscriber lines using broadband. In addition we answer the question of what are the most important factors, other than income, that really influence broadband penetration in emerging countries. This paper is motivated by a paradox in figure one in which the low middle income countries have a higher broadband penetration compared to upper middle income countries. The method of estimation is a new approach as it is applying the method of panel data and fixed and random effects, compared to just OLS usually adopted in other studies, in order to determine the factors that affect broadband uptake in emerging countries. The analysis reveals that these countries which we describe as emerging countries, are characterized by the leapfrog phenomena in the field of ICT which includes broadband access. These countries as they attract a big share of the FDI are really challenged by this opportunity and they utilize leapfrog technologies like Asymmetric Digital Subscriber line (ADSL) in order to create an enabling environment to attract and stimulate even more FDI resources.

Keywords: Emerging economies, fixed broadband penetration, panel data, fixed effects, random effects.

¹ Extract from Ph.D. research work by Mona Farid Badran submitted to Cairo University. The author is grateful for the comments of the two reviewers of the IFIP9.4 conference. This is the first academic econometric research study on broadband diffusion in Egypt, other Arab countries and some emerging countries.
What determines broadband uptake in emerging countries?
An empirical study

1. INTRODUCTION

Before recent technological developments in telecom, the use of available fixed telephone subscriber line was limited to voice telecommunication only. At present, the high frequencies on the subscriber line can be used for high-speed internet access. This internet access technology is generally referred to as broadband. A popular example is the DSL, the Asymmetric Digital Subscriber line for broadband Internet access.

Recently, econometric studies performed to evaluate the uptake of broadband have focused on developed economies like USA and OECD countries. However, emerging economies are playing an increasing role in the global economy. These countries are neither developed or least developed countries. They are a heterogeneous group of countries that have certain characteristics in common. Out of 22 emerging economies used in the sample for this study, 15 economies are among the top 75 countries for broadband penetration per 100 inhabitants (ITU 2006c). Recognizing the importance to transform their economies, these countries have adopted policies to transform their economies from production to knowledge-based economies. Broadband uptake was recognized by economists and policy makers as the main vehicle to achieve knowledge-based economy. The purpose of this paper is to determine the factors that impact broadband penetration in emerging countries, and to transform their economies to knowledge-based economies. Broadband uptake was recognized by economists and policy makers as the main vehicle to achieve knowledge-based economy.

Building knowledge-based economy or e-economy is a goal set by the policy makers in many emerging countries. For example, e-strategies are formulated, and increasing internet access and internet penetration is becoming a main goal that policy makers in these countries are trying to reach. In the latest Internet Report 2006 by International Telecommunications Union (ITU), 15 countries (Lebanon, Qatar, UAE, Bahrain, Argentina, Turkey, Mexico, Malaysia, Brazil, Russia, Kuwait, Uruguay, Venezuela, Algeria) out of 75 countries specified as leaders in broadband penetration, are considered emerging countries according to our sample. Their penetration rate ranges from 3.6 to 0.8 penetration rate per 100 inhabitants. In the aforementioned report by the ITU, broadband uptake is in lower-middle income countries (which some of them fall under the concept emerging economies) is much higher than the upper-middle income countries.

2 Extract from Ph.D. research work by Mona Farid Badran submitted to Cairo University. The author is grateful for the comments of the two reviewers of the IFIP9.4 conference. This is the first academic econometric research study on broadband diffusion in Egypt, other Arab countries and some emerging countries.
In the following Figure, we notice that the level of fixed broadband uptake in lower middle income countries is higher than upper middle income countries. This is considered a paradox since the conventional broadband analysis would correlate income level with broadband penetration meaning that the higher the income of a country the higher the broadband penetration rate of that country. This paper attempts to explain this paradox.

Figure 1: Percentage of fixed broadband subscribers by income 2005

Source, ITU Internet Report 2006c, Digital Life

Emerging markets are characterized by high growth potential, and newly developed financial markets. Examples of emerging markets include Brazil, Malaysia, countries in Eastern Europe, and parts of Africa and the Middle East and MENA Region.

Originally, emerging economies used to refer to a narrow list of middle to higher income economies among the developing countries. It actually encompasses economies with stock markets that allow foreigners to participate in their market activities. These markets are immature compared to those of the world's major financial centers, but are becoming increasingly sophisticated and integrated into international markets. They provide potentially high returns but are intensely volatile and involve a relatively higher risk compared to established markets. However, recently the list expanded to include other economies with considerable potential of growth.

1.2 THE IMPORTANCE OF INCREASING BROADBAND UPTAKE IN EMERGING COUNTRIES:

The adoption of broadband, whether wire-line or wireless, has been identified by policy makers and economists worldwide, as the way to achieve the e-economy (Maria Michalis 2001). Thus broadband uptake was carefully analyzed by economists to examine both the

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3 Gross National Income (GNI) per capita of lower middle USD 876–3465, Upper middle USD 3,466–10,725, source: ITU “Digital Life” 2006 P-9. Notice that the ITU report did not provide a concrete set of countries. However, GNI level was used as a benchmark to determine the set of countries referred to by this report. In our empirical study we adopt a set of emerging countries identified by economists in other research based on the criteria mentioned above.

4 www.equanto.com/glossary/e.html
actual role that broadband is playing thus far, as well as the factors that affect its uptake. Broadband technologies would help these countries to accelerate their growth by integrating (ITU 2006b) marginal communities into process beyond the geographical limitations of their specific areas. This refers specifically to wireless broadband. Wi -Max technology has been used in Spain and recently in Egypt, for example, among other countries, to connect villages to high speed internet access in a very short time without relying on telephone fixed line network, the public switched telephone network.

The popularity of A DSL among the various broadband technologies is depicted in the following figure:

Figure 2: Total Broadband by Technology

![Total Broadband by Technology](image)

Source: Point Topic limited, Quarterly reports, Quarter1, 2007

Advantages of broadband also include improving and enhancing business productivity in emerging countries, since broadband would help to reduce overall transaction costs and improve the revenue generating potential of businesses. It would also boost the employment rate as well as the GDP growth rate. The Information Technology, IT sector would be a leading sector to the growth in these countries as for example the Republic of Korea, where the growth in IT sector accounted for 50% of the GDP growth rate in 2002 (ITU 2005).

The digital divide, especially in terms of rural to urban, is one of the major worries that emerging countries have to deal with. Given the promising progress that these economies are undertaking in terms of high growth rates and active and flourishing stock markets, closing the digital divide and training knowledge based economy is an ultimate goal of these countries. Economic development and Social development require devoting great attention to the importance of laying down the foundation of the new, knowledge based economy with all the benefits that comes with such a new paradigm.

1.3. FIXED BROADBAND UPTAKE AND E-STRATEGIES IN THE EMERGING COUNTRIES:

The importance of broadband lies in the e-strategies adopted by the emerging countries in order to induce demand for the high speed internet access. These strategies may include the killer application that would attract people to connect to the internet using broadband
technologies. These strategies include e-government, e-health, e-learning etc. E-Strategies are vital as they empower local communities to shaping a future that is based on Information and Communication Technologies (ICT) and e-applications. E-Strategies are consisted of the following elements: ICT applications or e-applications, E-legislation, Internet protocol, multipurpose community telecenters (MCT), Cybersecurity, ICT awareness. Empirical studies show that broadband subscribers do increase their online research of health information (Kolko 2007). We notice that e-applications are the one dominating the widespread use of e-strategies. In particular e-government seems to be the killer application according to the ITU report (ITU 2006a).

2. LITERATURE REVIEW:

Bauer et al (2003) investigate broadband diffusion in the OECD countries. The sample consisted of the 30 OECD countries for the year 2001 and the method of estimation was Ordinary Least Square (OLS).

The empirical model consisted of a simple cross-sectional design based on the observations for the year 2001. The method of estimation was a multivariate OLS regression method to estimate the model parameters. Broadband penetration is the dependent variable, the independent variables include price of broadband, the price of dial-up service, income as GDP per capita measured in US$, preparedness that reflects the mobile/Internet index which is calculated using the ITU Internet Report, the intensity of local competition, population density and dummy variables reflecting policy regimes like unbundling, cable-teleco cross ownership, and government funding to support broadband. The authors used cluster analysis to identify countries with similar policies and arrange them in homogeneous subgroups of countries, in order to reduce the number of independent variables. The membership in these clusters, mainly three, was translated into a dummy variable, used in several of the empirical models. Five models with different specifications, were estimated.

The preparedness of countries to adopt broadband is an index measuring factors such as the attitude of a nation towards advanced information technology, and the availability of complementary technologies, such as computers, (which is a calculated index of Mobile/Internet).

Ferreruela and Alabau-Munoz (2004) took this methodology a step further, as they studied all three relationships, supply, demand and adoption of broadband. There was a breakdown of the factors forming the supply, demand and penetration of broadband. Groups of variables were formed as they were classified as supply side and demand side and broadband penetration. It uses a comprehensive panel dataset from 30 OECD countries. The period of observation for this study is from 2000-2002. Pooled regression technique was implemented.

Supply side factors:

These are factors that indicate the availability and development of telecommunications services in a country. The groups of indicators are: Group 1: infrastructure availability; Group 2: infrastructure investment; Group 3: market competition; Group 4: prices.
**Demand side factors:**

These are factors that characterize the inclination of the society to adopt telecommunications services, including broadband. This group's indicators are: Group 5: Telecommunications services penetration; Group 6: Internet indicators; Group 7: Economic indicators; Group 8: Demographic indicators; Group 9: Education; Group 10: Social indicators; Group 11: Broadband Penetration

The indicators that represent broadband penetration are given in the group 11 that represent the number of DSL subscribers per 100 inhabitants. It consists of indicators from both supply and demand.

The underlying models for broadband supply, demand, and penetration at a national level are represented as follows:

\[
BS_n = f(X_1, X_2, \ldots, X_n), \text{ where } BSn \text{ is broadband supply side}
\]

\[
BD_n = g(Y_1, Y_2, \ldots, Y_n), \text{ where } BDn \text{ is broadband demand side}
\]

\[
BP_n = h(X_1, X_2, \ldots, X_n, Y_1, Y_2, \ldots, Y_n), \text{ where } BPn \text{ is broadband penetration.}
\]

Applying the condition that must be fulfilled at market equilibrium, which is \(BS_n = BD_n\), we obtain the broadband penetration rate \(BP_n\).

Martha Garcia-Murillo and David Abel (2003) investigated the demand for broadband in 135 heterogeneous countries in 2002 using OLS and logit models as well. The study aimed at finding out the optimal policy for promoting broadband services.

In this analysis, the first hypothesis is that Broadband subscription is positively related to the privatization of the incumbent carrier. The second hypothesis is that broadband subscription is positively related to the availability of domestic content.

Distaso et al. (2006) addressed another factor of broadband adoption, namely the effects of inter-platform competition, i.e., competition between alternative platforms such as T.V. cable access, fiber optic cable, high-speed Internet access, and intra-platform competition, which is competition between different providers of the Digital Subscriber Line (DSL) segment of the market. Data from 14 European countries over four years were obtained. These are all EU countries except Greece (due to lack of data). Each country was observed in quarterly time intervals during the period starting from the 4th quarter of year 2000, until the second quarter of 2004. These constituted 15 time periods. Three models were estimated using well-known panel data techniques. (Notice that there is another set of literature dedicated to measure the effect of various policies on broadband uptake in developed countries, which is given in the appendix).

The contribution of this paper is to present an econometric analysis of broadband adoption in emerging countries. The results obtained in the research will point out exactly the determinants of broadband uptake in the considered set of countries (namely Algeria, Argentina, Bahrain, Brazil, Colombia, Jordan Kuwait, Lebanon, Malaysia, Mexico, Morocco, Oman, Qatar, Russia, Saudi Arabia, Syria, Tunisia, Turkey, Egypt, UAE, Venezuela, and Uruguay). We construct a panel data set and apply the method of fixed effect to determine these determinants. In addition, using the standardized beta coefficients, we are able to clearly identify the most important factors or determinants of broadband uptake in these countries.
countries based on the panel data set. In contrast with applying the method of OLS or logit regression used in many studies like in Bauer et al. and Ferreruela et al., we apply in this research the method of fixed effects to account for the possible omitted variables in this kind of research.

3. THE EMPIRICAL STUDY:

3.1 Data Description:

**Economic indicators** include data for *Gross Domestic Product per capita* (GDP per capita) in current prices ($), GPD per capita using the PPP method and the GNI per capita. These were obtained from the Eurostat website. GNI comprises of the total value of the goods and services produced within a country and income received from other countries (interest and dividends), less similar payments made by other countries. The PPP method is the purchasing power parity method. An economic theory that estimates the amount of adjustment needed on the exchange rate between countries in order for the exchange to be equivalent to each currency’s purchasing power.

**Infrastructure indicators:** Main fixed subscriber lines per 100 inhabitants (Teledensity). Fixed lines are telephone mainlines or landlines connecting customer's telephone to the public switched telephone network, the data were obtained from the ITU database.

**Internet penetration indicators:** Internet host (ITU 2006d) refer to the number of computers directly connected to the worldwide internet network. Note that Internet host computers are identified by a two-digit country code or a three-digit code generally reflecting the nature of the organization using the Internet computer. The number of hosts is assigned to economies based on the country code although this does not necessarily indicate that the host is actually physically located in the economy. In addition, all other hosts for which there is no country code identification are assigned to the United States. Therefore the number of Internet hosts shown for each country can only be considered an approximation. Data on Internet host computers are obtained from Internet Software Consortium and R IPE (Réseaux IP Européens).

**Internet User per 100 inhabitants** is based on nationally reported data. In some cases, surveys have been carried out that give a more precise figure for the number of Internet users. However surveys differ across countries in the age and frequency of use they cover. The reported figure for Internet users—which may refer to only users above a certain age—is divided by the total population to obtain users per 100 inhabitants (times hundred).

**PCs** shows the estimated number of personal computers in terms of PCs per 100 inhabitants. The figures for PCs come from the annual questionnaire supplemented by other sources. Again, this could not reflect the actual usage of PC’s in these set of countries as explained below.

**International Internet bandwidth measured in Mbps,** refers to the capacity which backbone operators provision to carry Internet traffic measured in bits per second. This indicator is intended to represent the quality of the experience of Internet users within a country. If the experience of an Internet user in a country is poor, because of slow speed, then either people will not use ICTs, or they will not be able to use them effectively and
creatively. In many developing countries, most Internet access is to sites abroad and therefore the amount of international bandwidth has a major impact on performance (ITU 2005).

In addition the price of local call \( P(t-1) \) was added in estimating the model lagged by one time period, as a proxy for the price of substitute (dial up).

\( Z \) it refer to the unobserved variable that varies from country to another but does not change over time e.g.: cultural differences toward broadband penetration.

3.2. The Theoretical model:

The structural model for the local level of broadband penetration can be represented by:

\[
q_D = f(\text{price of the commodity, price of substitutes, price of complementary, income, (shift factors)})
\]

\[
q_S = f(\text{price of the commodity, cost conditions, income (shift factors)})
\]

The equilibrium condition is \( q_D = q_S \), where \( q_D \) the local demand for broadband and \( q_S \) is the local supply. To derive the national level of broadband demand and supply, an aggregation rule on the national level was utilized, which is the following:

- \( QD = \Sigma i qD \)
- \( QS = \Sigma i qS \)
- \( QD = QS \) This condition provides the actual level of broadband penetration.

Broadband penetration per 100 inhabitants represents the technology of DSL which is currently broadband technology available for users in emerging countries included in our sample. Fixed effect model will be used to identify the main factors influencing broadband supply, broadband demand and broadband penetration.

The reduced form models of \( BSn, BDn, BPn \) were translated into the following empirical form models.

\[
BSn = \alpha_0 + \Sigma \alpha_i x_i + \epsilon
\]

\[
BDn = \beta_0 + \Sigma \beta_i y_i + \epsilon
\]

\[
BPn = \gamma_0 + \Sigma \alpha_i x_i + \Sigma \beta_i y_i + \epsilon
\]

Where \( BS \) is supply of broadband, \( BD \) is demand for broadband, \( BP \) is the level for broadband penetration.

Due to this aggregation rule, the aggregate supply and demand relations remain functions of the prices and competitive conditions etc. However, at the national averages level, we have:

\( Q = f(\text{GDP per capita, tertiary school enrollment, population density, number of pcs per 100 inhabitants, internet hosts, number of main fixed line, number of internet subscribers, price of} \)

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local call P-1). These factors include both supply and demand side factors of broadband penetration.

This methodology was developed by Bauer & al (2003) in investigating broadband diffusion in OECD countries.

**Figure 3: Total broadband penetration per hundred inhabitants in 2005**

Note: The ITU broadband penetration rate per 100 inhabitants is misleading e.g. for Egypt, since it does not include the effect of mass usage such as internet cafes into consideration, moreover it neglects the social structure of the population since e.g. 40% of inhabitants in Egypt are rural population with very limited exposure to IT.

The empirical model is constructed as follows:

\[
BP_{i,t} = CONS + \beta_1 INC_{i,t} + \beta_2 SCHOOL\ ENROL_{i,t} + \beta_3 PCS/100_{i,t} + \\
\beta_4 INTERNET\ USERS_{i,t} + \beta_5 POPD_{i,t} + \beta_6 FIXED\ LINES/100_{i,t} + \beta_7 HOSTS_{i,t} + \beta_8 P(t-1)_{i,t} + \beta_9 z_i + \epsilon_{i,t}
\]

where \( \epsilon_{i,t} \sim (N, \sigma) \) iid (identically, independent, distributed errors)

Where: \( BP \) is the dependent variable and refers to Total broadband per 100 inhabitants which is a measure for broadband penetration, \( CONS \) is the intercept (constant), \( INC \) is income as GDP per capita measured in US$, \( SCHOOL\ ENROL \) refers to the percent of the population that have obtained tertiary education. Demographic indicators: \( POPD \) is population density. Population Density is based on land area data from the UN.

The methodology used is performed as follows:

1. **Pooled OLS estimation method** (Greene 2003):
The first attempt is to construct a multiple regression model and estimate it using OLS, this is the pooled OLS technique. This method pools or combines all the time series or cross section data and estimate the underlying model using OLS.

\[
BP_{i,t} = CONS + \beta_1 INC_{i,t} + \beta_2 SCHOOL\ ENROL_{i,t} + \beta_3 PCS/100_{i,t} + \beta_4 INTERNET\ USERS_{i,t} + \beta_5 POPD_{i,t} + \beta_6 FIXED\ LINES/100_{i,t} + \beta_7 HOSTS_{i,t} + \beta_8 P(t-1)_{it} + \beta_9 INT\ Band_{i,t} + \varepsilon_{i,t}
\]

Where \(n=88\)

This model assumes that both the constant term and the estimated coefficients are fixed. Another assumption is that \(E(E_{it},E_{jt})=0\). All the classical assumptions hold for the error term (spherical disturbances). The degrees of freedom are \(n-t-k\). Thus the number of degrees of freedom is high and this means more efficiency. This is the most restricted model and the most elementary pooling technique. However this model does not include the effect of time nor the effect of country over the cross section data or groups that constitute the sample.

2. Fixed effects model:

This is another way to overcome the problem of omitted variables in a panel data where the omitted variables vary over across entities (countries) and over time. The obtained estimated coefficients are called the within estimators because it uses the time variation within each cross section.

We can determine whether pooled OLS or fixed effect model by using the F-test. Where the null hypothesis indicates that there is a common intercept. Thus the pooled OLS would be the appropriate model while not accepting the null would indicate that the intercepts are not the same, thus we have to use fixed effects to estimate the model.

The Fixed effects model for broadband penetration is the following:

\[
BP_{i,t} = CONS + \beta_1 INC_{i,t} + \beta_2 SCHOOL\ ENROL_{i,t} + \beta_3 PCS/100_{i,t} + \beta_4 INTERNET\ USERS_{i,t} + \beta_5 POPD_{i,t} + \beta_6 FIXED\ LINES/100_{i,t} + \beta_7 HOSTS_{i,t} + \beta_8 P(t-1)_{it} + \beta_9 z_i + \varepsilon_{i,t}
\]

Notice that this method requires the addition of dummy variables for time effects and for country effects, in order to capture the unobserved heterogeneity across countries and over time. This method is called least square dummy variables model (LSDV). Then we apply OLS to this model and we would obtain consistent unbiased estimators for \(\beta\)’s.

The Least Square Dummy Variable Model: (Lsdv)

We introduce the dummy variables that allow the intercept term to vary over cross section units, only.

\[
BP_{i,t} = CONS + \beta_1 INC_{i,t} + \beta_2 SCHOOL\ ENROL_{i,t} + \beta_3 PCS/100_{i,t} + \beta_4 INTERNET\ USERS_{i,t} + \beta_5 POPD_{i,t} + \beta_6 FIXED\ LINES/100_{i,t} + \gamma_2 D_{2i} + \ldots + \gamma_{23} D_{23i} + \varepsilon_{i,t}
\]

where \(D_{ni}\) denotes the dummy variables or binary variables that are equal one when \(i=1\) and in this case it is Egypt (base group) and equals zero otherwise.
2. The Random Effect Model:

This is also called the error –component model, where the error term includes cross section error component, time series error component and combined error component.

We also assume that the individual error components are uncorrelated with each other, and they are not auto-correlated. This model includes observable and non observable effects. This model describes the lack of knowledge through the disturbance term. The advantage of the random effect model is that it is a cure for the loss of degrees of freedom found in the model of LSDV.

3. Fixed vs. Random effect: The Hausman Test:

To choose between the two models, we performed a Hausmann specification test of the null hypothesis of the random effect model in comparison to the alternative hypothesis of fixed effect follows a chi-square distribution.

We will estimate the pooled regression with no fixed effects, then calculate the F-test. This is followed by estimating the fixed effects model (within model) and the individual country effects, the LSDV model. Finally, we estimate the random effects Model and Hausman test.(see appendix for more details)

4. ANALYSIS OF THE RESULTS:

In general, the obtained results from table 4 are consistent with the previous literature discussed earlier concerning broadband uptake in developed countries. Compared with previous studies that discuss factors i.e. indicators affecting broadband penetration we find that common factors or indicators used in previous and the present study include population density, internet subscribers, price of dial up, school enrollment, sites are found to be statistically significant. New indicators were added namely, PC/100 and fixed main lines/100 inhabitants. (See table 7)

In Table 4 of fixed effects models for broadband penetration, GNI per capita is the right measure for income, and is statistically significant in model 3, meaning that the higher GNI per capita in the emerging countries the more the penetration of broadband take place. The GDP per capita measure for the income variable is not statistically significant and economically not significant as well. An explanation to this result is found in the study of democracy and interconnectivity based on simultaneous equations analysis growth in Internet nodes, by Kedzie (1997). In his study "statistical test results do not support...economic development as an founding of interconnectivity and third variable...neither democracy nor GDP prove to influence interconnectivity strongly". Another explanation of the statistical and economic insignificance of GDP per capita is that in the countries included in the sample, the officially reported income is very small compared to the actual earned income to individuals especially government employees. In addition the informal sector in these economies is relatively large.

The population density is statistically significant which is also coinciding with a priori expectations, and it means that in densely populated areas it is much easier to connect people to the internet and broadband.

Furthermore, the more people are exposed to the internet, the more the uptake of broadband will increase as the internet users variable in all the three models are statistically significant.
These users are more likely to be appreciative of the benefits and advantages of high speed internet access. This is consistent with the previous literature that emphasizes the importance of internet exposure in increasing internet penetration rate.

School enrollment especially the tertiary level of education is a significant determinant of the broadband uptake in these countries. Although some reports indicate that basic literacy indicators should serve as an appropriate measure for the population ex ante capability for Internet access, which includes broadband penetration. However, we argue that the level of education indicates the exposure to the language as well as sophistication in thinking which is a prerequisite to be able to navigate online and benefit from online activities. According to GlobalReach (UNCTAD 2006), 43 per cent of online users and 68.4 per cent web content use English, down from the 80 per cent of English language web pages in the late 1990s. Thus in depth human development indicators like the level of tertiary education is necessary variable to control for when studying the broadband penetration in emerging countries especially in Arab and emerging countries.

Number of Fixed Main lines per 100 inhabitants or Teledensity are considered the infrastructure requirement for broadband penetration in any country, especially the wire line broadband is statistically significant, as it plays a major role as a determinant of broadband penetration in these countries under study. Moreover, this is consistent with a priori expectations and the literature as well.

The present PC’s per hundred inhabitants indicator is statistically insignificant and with the wrong expected sign which needs a different methodology for its calculation. As a matter of fact, access to a PC depends mainly in emerging countries on the popularity of low cost Internet cafes and other public point of access that daily attracts hundred of users at a very low cost. This requires a special study to assess its true value.

The variable controlling for the number of Internet hosts is becoming statistically significant in the last model at a 1% level of significance. This is consistent with the fact that an increasing number of Internet hosts implies increased ability to handle, service and store large amounts of data. The hypothesis tested by Martha Garcia (2003) whether the local internet hosts are determinants of broadband penetration, and the empirical study indicated that it is not statistically significant. This means that it is not the local number of Internet hosts rather the international number, because according to the UNCTAD Report 2006 the internet hosts are commonly registered in generic top-level domains like com, org, net or edu rather than country domains like cl or us, and the statistics are based on these top level domain names. Furthermore, people in low-income countries who wish to reach a global audience have an incentive to place content on servers in high-income countries with fast, reliable connectivity at relatively low prices. This method may even improve domestic access.

The price of 3 minute local call is used as a proxy for the internet access charges for dial up not broadband. This is due to the lack of data on time series data for rates on internet access specifically broadband.

We included this proxy in the model as the price of the substitute which is the dial up internet access. As the price of this mode of access to the internet becomes less expensive, the demand on dial up access will be more popular versus the broadband access, and broadband penetration rates could be adversely affected.
To overcome the problem of endogeneity which is inherent characteristic in any model that controls for prices, we utilize the lagged variable of the price of local call, lagged one year in our model.

There are however certain limitations on this proxy. For Example: Charges may be fixed or flat rate regardless of call duration. There could be price discrimination or off peak and peak pricing or the rate could differ whether the call is for Internet access; and finally, operators may provide discounted calls to user-specified numbers. The estimated coefficient is statistically significant, with the right sign consistent with a priori expectations. When the price of dial up increases, broadband service becomes more attractive and people switch to broadband, ceteris paribus. This can be referred to as the “switching effect” (Flamm et al 2005).

The R-squared as a measure for the goodness of fit of how much of the variations in dependent is explained by the variations in the independent variables. In our fixed effect model number 3, the R-squared relevant in these models is the within R-squared and it has all the properties of the overall R-squared. The within estimator maximizes the R-squared within. In the three models chosen, the within R-squared is relatively high indicating that the explanatory variables explain much of the variation in the dependent variable. We notice that when we controlled for income using the GNI per capita in model 2, the R-squared within improved, indicating that the these set of explanatory variables do explain better the changes in broadband penetration in these set of countries.

As to the paradox which was presented in figure one of fixed broadband penetration in lower middle income countries, from abovementioned analysis we can conclude that this set of emerging countries have some characteristics of the developed countries, in addition to some other idiosyncratic characteristics. Actually, population density of these countries as well as their Internet user rate outweigh the negative or no effect that their relatively low income might exhibit on broadband adoption. In addition, it manifests really the leapfrog phenomena that the emerging countries are experiencing when using the new technologies like ADSL, using high speed Internet access instead of just dial up service to connect to the Internet.

Furthermore, these countries are target to many multinational companies and attract a substantial amount of FDI. This stimulates the economy and compels the market players to adopt the latest technologies, namely fixed broadband on subscriber line to benefit the most from these new investments. The successful role that is played by e-applications like e-commerce and on line banking as well as e-government in these set of countries contribute to the enhancement of broadband uptake in them. Among the advanced services that use fixed broadband is video conferencing and teleworking.

It was found that School enrollment was the most important indicator affecting broadband uptake in these set of emerging markets. This no surprise since the computer illiteracy rate is high and the generation that was exposed to the computer at school is the one who is using the Internet, and in this regard the high speed internet access. One important conclusion from the above analysis is that despite that broadband uptake is related GNI per capita as in the developed countries, this doesn’t really seem to be the dominating factor that affects broadband uptake in these countries. Rather school enrollment and population density and Internet user rate drive the increase in broadband penetration in these set of countries.
5. LIMITATIONS OF THE STUDY:

The study provides a positivist’s view of broadband uptake not taking into consideration the broadband uptake could be affecting some of the mentioned factors as well, i.e. it could be considered a two way relationship between broadband uptake and its determinants.

6. CONCLUSIONS AND POLICY RECOMMENDATIONS:

From the economic perspective, it seems obvious that broadband penetration is determined by the controlled variables, also called indicators, that are referred to in the literature and theory. However, in this paper we have proven that income is not the most important factor determining broadband uptake in the emerging countries. This is due to the leapfrog phenomena that characterizes these countries and the externalities and spillover effects that is related to ICT diffusion, and the increased presence of ICT and to the increased presence of FDI in the emerging countries. In addition, although the positive relationship between PC per 100 inhabitants and broadband uptake is expected and exists in developed countries, in the case of emerging countries, the independent variable PC per 100 inhabitants, given by ITU cannot be considered as a true value and hence does not give the true effect on broadband penetration. A different method to assess the actual value of this indicator in emerging countries is needed that would take into account the public usage of broadband internet access at low cost, such as internet cafes, schools, clubs and public libraries. Other factors/indicators that seemed to impact broadband uptake in these set of emerging countries other than income include tertiary education and population density.

It is found that the deployment of more fixed lines would increase broadband penetration. Thus governments should expand the existing public switched telephone network and utilize the latest technologies in this field. Furthermore, governments can explore the option of leasing the subscriber lines to competitors to open new markets for potential entrants in this telecom market segment. The issue of “build or buy” has caused a big debate among Telecom economists and policy makers regarding the advantages and disadvantages of allowing service based competition like local loop unbundling. Governments in these countries should definitely explore the option of service based competition more seriously. A set of policies like tariff rebalancing, collocation and interconnection arrangements should be addressed before the commencement of the unbundling of local loop policy.

Countries with high population density, should find it easier to increase broadband uptake compared to population that is scattered like in rural areas ceteris paribus. This is due to the fact that a large number of people would be connected to the telephone exchange and thus it would be easier for new entrant to lease the local loop from the incumbent telephone company and install his new additional (ADSL) equipment. In densely populated areas, the distance between the local exchange and the subscriber is short which allows a better quality of broadband service to the end user.

The set of countries that constitute our sample in this research are unique in that they are the target of many FDI (foreign direct investments) and thus steps are taken toward transforming these economies to new economies by finding incentives to increase broadband uptake. This approach is considered an important signal to these new investors. Measures taken to accelerate this process would indicate how serious these economies are in entering the new paradigm of knowledge-based economy.
Thus it is imperative to determine exactly what enhances broadband penetration, especially given the idiosyncratic features of emerging economies.

Further empirical research is necessary to evaluate the policies implemented so far by governments in these countries, such as subsidy choices on both the demand side and the supply side. The percent of population living in urban areas and the language of the content, like the arabization of websites to induce non English speaking people to use the Internet are significant, and thus can increase the chances of broadband penetration. Market structure of telecom sector could also be controlled for in the following new studies. Thus, with the increase of available data, more profound empirical research by economists will be fruitful for these countries in the future.

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Appendix:

Table 1: Description of the Variables and their expected signs:

<table>
<thead>
<tr>
<th>The control variables</th>
<th>Description of the variable</th>
<th>The expected signs A priori</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Indicators</td>
<td>INC</td>
<td>GDP per capita measured in US$ or GDP per capita using PPP GNI per capita</td>
</tr>
<tr>
<td>Education Indicators</td>
<td>SCHOOL ENROLLMENT</td>
<td>% of population who have completed their tertiary education</td>
</tr>
<tr>
<td>ICT Indicators</td>
<td>PCS/100</td>
<td>PCs per hundred inhabitants</td>
</tr>
<tr>
<td>Demographics Indicators</td>
<td>POPD</td>
<td>Population density in square km</td>
</tr>
<tr>
<td>Internet penetration Indicators</td>
<td>INTERNET USERS</td>
<td>Internet User per 100 inhabitants</td>
</tr>
<tr>
<td>Infrastructure Indicators</td>
<td>FIXED LINES/100</td>
<td>main telephone lines (fixed lines) per 100 inhabitants</td>
</tr>
<tr>
<td>Internet penetration Indicators</td>
<td>HOSTS</td>
<td>number of computers directly connected to the worldwide Internet network</td>
</tr>
<tr>
<td>Prices Indicators (price of dial up as substitute for BB)</td>
<td>P-1</td>
<td>Price of a 3-minute fixed telephone local call (peak rate telephone – US$) one year lagged</td>
</tr>
<tr>
<td>Capacity of the Internet</td>
<td>International bandwidth</td>
<td>International Internet Bandwidth (Mbps)</td>
</tr>
<tr>
<td>Broadband indicators</td>
<td>Dependent variable BP</td>
<td>Broadband penetration per 100 inhabitants</td>
</tr>
</tbody>
</table>

⁶ This hypothesized relationship is made by Gabel and Kwan (2000) and Madden, Savage, and Simpson (1996). Both studies uncover the anticipated coefficient, however, only the latter study finds a statistically significant relationship.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP per capita ($)</td>
<td>1.775</td>
<td>43110</td>
<td>7556.554</td>
<td>8979.485</td>
</tr>
<tr>
<td>GNI per capita ($)</td>
<td>1110</td>
<td>30630</td>
<td>6754.148</td>
<td>6831.16</td>
</tr>
<tr>
<td>SCHOOL ENROLLMENT (%)</td>
<td>9.95</td>
<td>70.67</td>
<td>30.52409</td>
<td>14.40877</td>
</tr>
<tr>
<td>PCS/100</td>
<td>1</td>
<td>75</td>
<td>38.94318</td>
<td>21.28048</td>
</tr>
<tr>
<td>POPD</td>
<td>1</td>
<td>56</td>
<td>27.30682</td>
<td>16.11621</td>
</tr>
<tr>
<td>INTERNET USERS</td>
<td>1.59454</td>
<td>42.36923</td>
<td>12.85715</td>
<td>8.815323</td>
</tr>
<tr>
<td>FIXED LINES/100</td>
<td>2.822633</td>
<td>30.95388</td>
<td>17.4811</td>
<td>7.828698</td>
</tr>
<tr>
<td>Internet HOSTS/</td>
<td>1</td>
<td>63</td>
<td>31.61364</td>
<td>19.2649</td>
</tr>
<tr>
<td>P-1 ($)</td>
<td>0</td>
<td>0.2452316</td>
<td>0.0627284</td>
<td>0.0591719</td>
</tr>
<tr>
<td>International bandwidth (Mbps)</td>
<td>16</td>
<td>29200</td>
<td>3646.21</td>
<td>6148.705</td>
</tr>
<tr>
<td>BP</td>
<td>0</td>
<td>3.634331</td>
<td>0.6400611</td>
<td>0.8214905</td>
</tr>
</tbody>
</table>

Table 3: Regression Results of Pooled Ordinary Least Square:  
Dependent variable broadband penetration rate per 100 inhabitants:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>INC</td>
<td>GNI_per_100</td>
<td>GNI_per_100</td>
<td>GDP_per_100</td>
<td>GDP_per_100</td>
</tr>
<tr>
<td></td>
<td>-0.0006 (0.0012)</td>
<td>0.0001 (0.013)</td>
<td>0.0004 (0.001)</td>
<td>0.00106 (0.001)</td>
</tr>
<tr>
<td>SCHOOL ENROLLMENT</td>
<td>0.0084336 (0.006)*</td>
<td>0.0189071 (0.007)**</td>
<td>0.199 (0.072)**</td>
<td>0.022 (0.008)**</td>
</tr>
<tr>
<td>PCS/100</td>
<td>-0.0000554 (0.003)</td>
<td>-0.001424 (0.0037)</td>
<td>-0.0012959 (0.004)</td>
<td>-0.0023106 (0.004)</td>
</tr>
<tr>
<td>POPD</td>
<td>-0.0064313 (0.005)</td>
<td>-0.0018035 (0.005)</td>
<td>-0.0018 (0.005)</td>
<td>0.00214 (0.006)</td>
</tr>
<tr>
<td>INTERNET USERS</td>
<td>0.045351 (0.010)**</td>
<td>0.0375 (0.106)**</td>
<td>0.0375 (0.10)**</td>
<td>0.0337 (0.113)**</td>
</tr>
<tr>
<td>FIXED MAIN LINES/100</td>
<td>0.259948 (0.112)**</td>
<td>0.220885 (0.112)**</td>
<td>0.0204 (0.115)*</td>
<td>0.017083 (0.131)</td>
</tr>
<tr>
<td>INTERNET HOSTS</td>
<td>-0.0008898 (0.005)</td>
<td>-0.00160 (0.0046)</td>
<td>-0.0019 (0.0046)</td>
<td>-0.0017461 (0.005)</td>
</tr>
</tbody>
</table>
Table 3 represents the Pooled Ordinary Least Square regression (OLS) which was performed for 4 models that we estimated. In this research, the difference between the 4 models are in the independent variables that we controlled for in each one, in addition to whether we controlled for GNI per Capita or GDP per Capita in the model. Standardized Beta coefficients were also calculated in order to be able to compare and determine which of the independent variables (indicators) affect broadband penetration the most. The four models were all statistically significant as the P-value of the F-statistic was zero. GNI per Capita and GDP per capita were divided by hundred in order to facilitate the interpretation of the regression models. The latter was not statistically significant in all four models. On the other hand, school enrollment, Internet users were statistically significant in all four models, which is consistent with Ferreruela and Alabau (2004). Price of dial up lagged one time period was statistically significant when controlled for. In addition the International bandwidth was significant. These all are consistent with the literature.

The calculation of beta coefficient is regarded as an important addition to the analysis, as it indicated that Internet users is the most important factor that affects the uptake of broadband, followed by school enrollment. Finally, fixed main lines and international bandwidth have also an important impact on broadband penetration this appears in the less restricted model that includes international bandwidth. Then fixed effects model, table 4 and Random effects model table 5 were estimated. Then two tests were employed to decide whether fixed effects (FE) or random effects (RE) should be applied. First the LM test is performed to assess whether the estimates of OLS model without country effects, based on pooling the data, are consistent, or there are specific country effects that should be incorporated into the estimation by using suitable procedure such as RE. Second, Hausman test is used to compare the FE and the RE models. Both tests are significant at 0.05 level and thus the FE model cannot be

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRICE OF DIAL UP T-1</strong></td>
<td>2.104908 (1.216)*</td>
<td>2.19782 (1.231)*</td>
<td>1.9448 (1.29)*</td>
</tr>
<tr>
<td>INTERNATIONAL BANDWIDTH</td>
<td>0.0000305 (0.001)***</td>
<td>-0.4057278 (0.277)</td>
<td>-0.748408 (0.3059)**</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>-0.77363 (0.29)**</td>
<td>-0.748408 (0.3059)**</td>
<td>-0.77363 (0.29)**</td>
</tr>
<tr>
<td>N</td>
<td>88</td>
<td>84</td>
<td>84</td>
</tr>
<tr>
<td>F-statistic</td>
<td>9.10</td>
<td>8.55</td>
<td>8.59</td>
</tr>
<tr>
<td>P &gt; (F-statistic)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.44</td>
<td>0.47</td>
<td>0.47</td>
</tr>
</tbody>
</table>

Standard Error between brackets.

* significant at 90% significant level
** significant at 95% significant level
*** significant at 99% significant level
rejected in favor of OLS and RE models. In table 3 the OLS results were reported and in table 4 FE estimates were reported.

The Hausmann test was performed, with Ho: random effect model and H1: no random effect model. The P value of the X2 test is 0.000 which means that we cannot accept the null hypothesis and that the model is not a random effect model. Taking the LM and the F test into consideration, we can conclude that the fixed effect model is the appropriate model to implement.

Along the fixed effects models, F-test was performed to test the null hypothesis of common intercept. According to the results, we cannot accept the null hypothesis and the fixed effect model is again the right model, which is consistent with the literature.

Since the calculated F-test is less than the F- tabulated, the conclusion is to reject the null hypothesis of common intercept and to use the fixed effect model as the intercepts are different over cross section units.

Table 4: Dependent variable BP per hundred inhabitants:

<table>
<thead>
<tr>
<th>Fixed effects model</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>INC</td>
<td>Gdp per capita (0.000021) 0.000095 (0.000004)</td>
<td>Gni_per capita (0.000065) 0.000065 (0.000004)</td>
<td>Gni_per capita (0.00005) 0.00005 (0.000004)</td>
</tr>
<tr>
<td>SCHOOL ENROLLMENT</td>
<td>0.065 (0.031) ** 0.69 (0.0313) **</td>
<td>0.05 (0.28) *</td>
<td></td>
</tr>
<tr>
<td>PCS/100</td>
<td>-0.01 (0.004)</td>
<td>-0.005 (0.0038)</td>
<td>-0.0018 (0.033)</td>
</tr>
<tr>
<td>POPD</td>
<td>0.01 (0.004) *** 0.011 (0.004) ***</td>
<td>0.013 (0.004) ***</td>
<td></td>
</tr>
<tr>
<td>INTERNET USERS</td>
<td>0.09 (0.026) *** 0.08 (0.27) ***</td>
<td>0.095 (0.024) ***</td>
<td></td>
</tr>
<tr>
<td>FIXED MAIN LINES/100</td>
<td>0.079 (0.034) ** 0.09 (3.0) ***</td>
<td>0.08 (0.036) **</td>
<td></td>
</tr>
<tr>
<td>INTERNET HOSTS</td>
<td>0.009 (0.006)</td>
<td>0.009 (0.006)</td>
<td>0.01 (0.006) *</td>
</tr>
<tr>
<td>PRICE OF DIAL UP T-1</td>
<td>2.05 (1.101) *</td>
<td>1.62 (0.945) *</td>
<td></td>
</tr>
<tr>
<td>CONSTANT</td>
<td>-4.45 (0.807) *** -4.9375 (0.869) ***</td>
<td>-4.47315 (0.946) ***</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>84</td>
<td>84</td>
<td>88</td>
</tr>
<tr>
<td>R-squared within</td>
<td>0.7130</td>
<td>0.722</td>
<td>0.697</td>
</tr>
<tr>
<td>F-statistics</td>
<td>11.52</td>
<td>13.61</td>
<td>12.11</td>
</tr>
<tr>
<td>P&gt; F statistics</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>F-test</td>
<td>7.21</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>P&gt; F</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Between brackets are the standard errors. The within estimators have heteroscedastic robust standard errors.
Table 5: Random Effects, LM test and Hausman Test:

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>INC</td>
<td>Gdp per capita_100</td>
<td>Gni per capita_100</td>
<td>Gni per capita_100</td>
</tr>
<tr>
<td></td>
<td>(0.0014)</td>
<td>(0.0006)</td>
<td>(0.0008)</td>
</tr>
<tr>
<td></td>
<td>(0.0013)</td>
<td>(0.00214)</td>
<td>(0.00224)</td>
</tr>
<tr>
<td>SCHOOL ENROLLMENT</td>
<td>0.0312</td>
<td>0.0286</td>
<td>0.01496</td>
</tr>
<tr>
<td></td>
<td>(0.014) **</td>
<td>(0.015) **</td>
<td>(0.0103)</td>
</tr>
<tr>
<td>PCS/100</td>
<td>-0.004</td>
<td>-0.0035</td>
<td>-0.0020</td>
</tr>
<tr>
<td></td>
<td>(0.0035)</td>
<td>(0.0035)</td>
<td>(-0.003)</td>
</tr>
<tr>
<td>POPD</td>
<td>0.004</td>
<td>0.00397</td>
<td>0.0012</td>
</tr>
<tr>
<td></td>
<td>(0.0038)</td>
<td>(0.00397)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>INTERNET USERS</td>
<td>0.065 (0.17) ***</td>
<td>0.0689 (0.0189) ***</td>
<td>0.075 (0.173) ***</td>
</tr>
<tr>
<td>FIXED MAIN LINES/100</td>
<td>-0.0005</td>
<td>0.0033</td>
<td>0.0072</td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
<td>(0.018)</td>
<td>(0.0188)</td>
</tr>
<tr>
<td>INTERNET HOSTS</td>
<td>0.0028</td>
<td>0.0038</td>
<td>0.0047</td>
</tr>
<tr>
<td></td>
<td>(0.0056)</td>
<td>(0.0054)</td>
<td>(0.0049)</td>
</tr>
<tr>
<td>PRICE OF DIAL UP T-1</td>
<td>2.11 (1.976)</td>
<td>2.0144 (1.943)</td>
<td></td>
</tr>
<tr>
<td>CONSTANT</td>
<td>-1.393 (0.4231) ***</td>
<td>-1.377 (0.443) ***</td>
<td>-1.013243 (0.3666) ***</td>
</tr>
<tr>
<td>N</td>
<td>84</td>
<td>84</td>
<td>88</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.4415</td>
<td>0.4406</td>
<td>0.3935</td>
</tr>
<tr>
<td>Breusch Pagan LM test</td>
<td>6.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hausman Test</td>
<td>66.79</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The estimators have heteroscedastic robust, standard errors.

* significant at 90% significant level
** significant at 95% significant level
*** significant at 99% significant level

Table 6: The least square dummy variable model: (LSDV)

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>INC</td>
<td>GDP _ PER _100</td>
</tr>
<tr>
<td></td>
<td>(0.0014)</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
</tr>
<tr>
<td>SCHOOL ENROLLMENT</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>(0.025) **</td>
</tr>
<tr>
<td>PCS/100</td>
<td>-0.016</td>
</tr>
<tr>
<td>Variable</td>
<td>Estimate</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>POPD</td>
<td>0.01</td>
</tr>
<tr>
<td>INTERNET USERS</td>
<td>0.102</td>
</tr>
<tr>
<td>FIXED MAIN LINES/100</td>
<td>0.068</td>
</tr>
<tr>
<td>INTERNET HOSTS</td>
<td>0.010</td>
</tr>
<tr>
<td>PRICE OF DIAL UP T-1</td>
<td>2.05*</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>-2.858</td>
</tr>
<tr>
<td>N</td>
<td>88</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.8482</td>
</tr>
<tr>
<td>F-statistics</td>
<td>11.77</td>
</tr>
</tbody>
</table>

**Country Individual Effects**

<table>
<thead>
<tr>
<th>Country</th>
<th>Estimate</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>1.038607</td>
<td>(0.453)**</td>
</tr>
<tr>
<td>Argentina</td>
<td>-2.60719</td>
<td>(0.9766527)***</td>
</tr>
<tr>
<td>Bahrain</td>
<td>-2.009598</td>
<td>(0.9154849)**</td>
</tr>
<tr>
<td>Brazil</td>
<td>-0.1114034</td>
<td>(0.8424158)</td>
</tr>
<tr>
<td>Colombia</td>
<td>-0.697141</td>
<td>(0.6824453)</td>
</tr>
<tr>
<td>Jordan</td>
<td>-1.470616</td>
<td>(0.489608)***</td>
</tr>
<tr>
<td>Kuwait</td>
<td>-1.583238</td>
<td>(0.8126848)**</td>
</tr>
<tr>
<td>Lebanon</td>
<td>-0.9131862</td>
<td>(0.7388813)</td>
</tr>
<tr>
<td>Malaysia</td>
<td>-3.995006</td>
<td>(0.8472238)</td>
</tr>
<tr>
<td>Mexico</td>
<td>0.2486153</td>
<td>(0.3703413)</td>
</tr>
<tr>
<td>Morocco</td>
<td>0.4591973</td>
<td>(0.6870918)</td>
</tr>
<tr>
<td>Oman</td>
<td>-1.418148</td>
<td>(1.172587)</td>
</tr>
<tr>
<td>Country</td>
<td>Previous Study</td>
<td>Previous Study</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Qatar</td>
<td>-1.8596</td>
<td>(1.194793)</td>
</tr>
<tr>
<td>Russia</td>
<td>-3.20506</td>
<td>(0.9463197)***</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>-0.6767447</td>
<td>(0.5422591)</td>
</tr>
<tr>
<td>Syria</td>
<td>0.1469914</td>
<td>(0.5853474)</td>
</tr>
<tr>
<td>Tunisia</td>
<td>-0.3630942</td>
<td>(0.4436462)</td>
</tr>
<tr>
<td>Turkey</td>
<td>-1.78378</td>
<td>(0.9984924)***</td>
</tr>
<tr>
<td>UAE</td>
<td>-3.050677</td>
<td>(1.073251)***</td>
</tr>
<tr>
<td>Uruguay</td>
<td>-2.825692</td>
<td>(1.06753)***</td>
</tr>
<tr>
<td>Venezuela</td>
<td>-0.5968216</td>
<td>(0.4726513)</td>
</tr>
</tbody>
</table>

Table 7: Factors (Indicators) affecting broadband, comparison and summary

<table>
<thead>
<tr>
<th>Independent variable (indicators)</th>
<th>Previous study Bauer</th>
<th>Previous Study Ferreruela</th>
<th>Arab &amp; Emerging Countries</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Income GNI /capita</td>
<td>Significant/not significant</td>
<td></td>
<td>Significant</td>
<td>In 5 models Depending on the model</td>
</tr>
<tr>
<td>2. School Enrollment</td>
<td>Significant</td>
<td></td>
<td>Significant</td>
<td></td>
</tr>
<tr>
<td>3. Population density</td>
<td>Significant</td>
<td>Not significant</td>
<td>Significant</td>
<td></td>
</tr>
<tr>
<td>4. Fixed lines /100</td>
<td></td>
<td></td>
<td>Significant</td>
<td></td>
</tr>
<tr>
<td>5. Internet hosts</td>
<td>Not Significant</td>
<td>Significant/not significant</td>
<td></td>
<td>In 3 models Depending on the model</td>
</tr>
<tr>
<td>6. Price of local call( dial up )</td>
<td>Significant</td>
<td></td>
<td>Significant</td>
<td></td>
</tr>
<tr>
<td>7. PC/100</td>
<td></td>
<td></td>
<td>Is not a reliable indicator</td>
<td></td>
</tr>
<tr>
<td>8. Internet users</td>
<td>Significant</td>
<td></td>
<td>Significant</td>
<td></td>
</tr>
</tbody>
</table>

Legend

For Arab and Emerging countries, ITU statistics is the main source.
Panel data for 22 countries from the years 2002-2005. Fixed effect model.


Notes:

1. Bauer & al used other indicators that include: price of broadband, preparedness, competition and dummy variable for policy regimes.

2. Ferreruela & al used other indicators that include available bandwidth per $, lagged variable of DSL enabled Local loop, Unbundled local loop/100 access lines, monthly price of internet access and % of homes served by cable TV network.

3. For Arab and emerging countries, indicators used in the table are mainly according to ITU available data.

Table(8): Comparing Previous Empirical Broadband Studies In USA And OECD Countries:

<table>
<thead>
<tr>
<th>Author</th>
<th>Research Topic</th>
<th>Methodology</th>
<th>Used indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inmaculada Cava Fereruela, Antonio Alabau-Munoz (2004),</td>
<td>Key constraints and drivers for broadband development: a cross national analysis.</td>
<td>Pooled OLS for 30 OECD countries f or t he years 2000-2002</td>
<td>bandwidth per $, lagged variable of DSL enabled Local loop, Unbundled Local loop/100 access lines, monthly price of internet access and % of homes served by cable TV network, school enrollment, Internet host, Internet users.</td>
</tr>
<tr>
<td>Martha Garcia-Murillo and David Gabel (2003)</td>
<td>International Broadband Deployment, the demand for broadband</td>
<td>Logit regression and standard regression</td>
<td>% of Internet users, population density, GDP per capita, literacy rate, Residential monthly telephone subscribers, % of population with broadband, % of hosts in the country, % of PCs in the country, competition and ownership variables.</td>
</tr>
</tbody>
</table>

Source: author’s research

Table(9): Results Review of Empirical Broadband Studies in USA and OECD Countries:

<table>
<thead>
<tr>
<th>Paper reviewed</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bauer &amp; al 2003. Investigated broadband diffusion in the OECD countries</td>
<td>The authors concluded that population density and preparedness (where the latter means the attitudes of the population toward information technology) are statistically significant.</td>
</tr>
<tr>
<td>Ferreruela and Alabau-Munoz break down the factors forming the supply, Internet subscribers is the most influential factor for DSL</td>
<td></td>
</tr>
<tr>
<td>Paper reviewed</td>
<td>Results</td>
</tr>
<tr>
<td>----------------</td>
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<tr>
<td>Demand and penetration of broadband. Groups of variables were formed as they were classified as supply side and demand side and broadband penetration.</td>
<td>Adoption followed by the one year lagged availability of DSL infrastructure.</td>
</tr>
<tr>
<td>Distaso &amp; al addressed the effects of interplatform competition, i.e. competition between alternative platforms such as cable access, fiber optics, high-speed Internet access, and intraplatform competition, which is competition between different providers of the Digital Subscriber Line (DSL) segment of the market.</td>
<td>Competition between broadband providers with different platforms increases broadband penetration rate. However, competition among the providers of the same platform like DSL does not play a significant role in increasing broadband penetration.</td>
</tr>
<tr>
<td>Scott Wallsten (2005) “Broadband penetration, an empirical analysis of state &amp; federal policies”</td>
<td>3. Population density is positively correlated with broadband penetration and connection speed. 2. Regulations that promote mandatory unbundling slow down the penetration growth of broadband. 3. Mandatory on-site collocation is correlated with faster penetration growth of broadband.</td>
</tr>
<tr>
<td>Scott Wallsten (2006) “Broadband and Unbundling Regulations in OECD Countries control for the different types of unbundling regulations implemented in the OECD countries</td>
<td>Every extensive unbundling mandate and some types of price regulation can reduce broadband investment incentives. According to the findings of this paper there is no government policy that has a strong and clear positive impact on broadband penetration.</td>
</tr>
<tr>
<td>A. Goolsbee (2002) “Subsidies, the value of broadband and the importance of fixed costs”,</td>
<td>1. Markets in which broadband service is available, subsidizing the demand will increase consumer well being by less than equivalent policies that subsidize supply e.g. subsidizing investment in underserved markets.</td>
</tr>
</tbody>
</table>

Source: author’s research
IT INNOVATION IN A HEALTH INFORMATION SYSTEM IN KENYA: IMPLICATIONS FOR A SUSTAINABLE OPEN-SOURCE SOFTWARE MODEL IN DEVELOPING COUNTRIES

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Abstract: The paper proposes a business model analysis framework to identify the main issues that need to be addressed within the context of a specific developing country for the sustainable development and growth of OSS. Based on the longitudinal case study of the Ministry of Health in Kenya, the paper analyses how the adoption and usage of technology has influenced the structures of its health management information systems and the related implications for the health service delivery. The analysis focus onto the human-mediated interplay between the intrinsic material features of the IT artefact and the main elements of the surrounding institutional and technological environment and their influence in relation to the donor-driven reforms of the health sector. Empirical results are then used to critically discuss the main implications of the institutional and technological environment characterizing Government IT innovations in developing countries such as Kenya for the development of local OSS sustainable products. Finally, the main factors identified are then used to build an OSS business model analysis framework. The framework can be used to better understand the major issues that need to be addressed at different institutional levels for the sustainability of OSS in the Governments of developing countries.

Keywords: Open source software, public sector IT innovation, developing countries, health information systems
IT INNOVATION IN A HEALTH INFORMATION SYSTEM IN KENYA: IMPLICATIONS FOR A SUSTAINABLE OPEN-SOURCE SOFTWARE MODEL IN DEVELOPING COUNTRIES

INTRODUCTION

Information and Communication Technology has been recognised as a key enabler of human development and poverty alleviation. The strategic role of ICT for development (ICT4D) is voiced in the United Nations’ Millennium Declaration (UN, 2000) as one of the targets of Millennium Development Goal Number 8.

The Millennium Development goals were endorsed in the year 2000 by the member States of the United Nations in response to the declining development scenario of most developing countries. From this time on, the MDGs represented the main framework of reference within which most development and technical assistance projects were conceived, particularly, in the area of essential public services such as health care (UN, 2000).

Hence, following the international endorsement of the MDGs, one of the major areas of intervention of development programmes has been the restructuring of the public service of developing economies in order to improve accountability and good governance (Ciborra, 2005; Fountain, 2002; Heeks, 2001; World Bank, 1997). Being informed by the New Public Management doctrine (Hood, 1991), most of these programmes leverage IT to transform hierarchical structures into flatter, more information efficient organisational forms (Dada, 2006; Osborne & Gaebler, 1992).

With particular reference to the health care service, since the early 80s the donor community has stressed the need to decentralise the health care system to the districts to guarantee increased efficient service delivery and equitable access to the health care for the local communities (Kimaro & Sahay, 2007; WHO, 1978). As the call for efficiency and equity in the health service intensifies (MDGs 4, 5, 6), the decentralisation efforts is now followed by the need to integrate the health care system to rectify the inefficiencies caused by the donor-driven development of stand-alone vertical programmes (e.g. HIV/AIDS, Immunisation, Malaria, etc.) (Chilundo & Aanestad, 2004).

In both processes, decentralisation and integration, the performance of Health Management Information Systems is a key issue to be addressed. On the one hand, timely and accurate managerial and epidemiological information can be used to empower the planning and decision-making capacities of the districts to better provide for the health care needs of local communities. On the other hand, integrated health information can support coordinated and effective actions in the health care delivery. Based on this consideration, Information Technology is viewed as a critical investment for the restructuring of HMIS and the Health care system overall.

Still, the usage of Information Technology in the improvement of health care systems in developing countries seems to have produced very poor results. The literature on health management information systems depicts a failure scenario whereby most systems are still manual with the exception of few “islands of automation” (Saxena & Aly, 1995) represented by stand-alone computer databases mostly concentrated at the central national level, but also scattered across the subordinate levels of the health care systems (Chilundo & Aanestad, 2004; Kimaro & Sahay, 2007). This has been mainly attributed to: the piecemeal approach of donor funding to IT systems (Ciborra & Navarra, 2005; Kimaro & Nhampossa, 2005); high...
financial risks and maintenance costs due to the vendor lock-in to foreign proprietary software solutions (Ciborra, 2005; Simon, 2005); the adoption of top-down technology-centred approaches (Lee et al., 2008) against the inclusion of local stakeholders’ prerogatives in the system design, adaptation, and implementation (Krishna & Walsham, 2005; Macome, 2008).

Open Source Software has widely been proposed as the right solution to the unsustainability of most IT systems in developing countries (Braa & Muquinge, 2007). Due to its non-proprietary nature, OSS is believed to enable the production of local information technologies that can bring more sustainable and effective development results, particularly, in the framework of poor contexts such as the public sector in Africa. In particular, OSS can facilitate the development of local IT expertise (Camara & Fonseca, 2007), major flexibility in local customization, and guarantee low costs, interoperability and the “avoidance of vendor lock-in” (Simon, 2005).

Still, there exist many challenges that prevent the development dividends of OSS and locally produced technologies from being fully achieved. These are related to a poor supportive institutional environment including the lack of a policy-enabling framework, the low perception of the business opportunities for the thriving of a local open-source industry exacerbated by the hostility of multinational manufacturers of proprietary software, and the lack of a human capacity building infrastructure for the training of local developers (push factor) which is also due to the poor attractiveness of open-source in terms of job-opportunities (pull factor).

In consideration of the ascertained limitations of OSS, the paper aims to propose a business model analysis framework to identify the main issues that need to be addressed within the context of a specific country for the sustainable development and growth of OSS. The model will address the main requirements for the development of OSS core applications in public service management and delivery (e.g., health management information systems).

This will be achieved by analyzing the case study on the adoption, usage, and evolution over time of a computerized epidemiological information system in the Ministry of Health in Kenya. The analysis will focus onto the human-mediated interplay between the intrinsic material features of the IT artefact and the main elements of the surrounding institutional and technological environment and their influence in relation to the donor-driven reforms of the health sector. Although the computerised information system studied is not open-source, empirical results provide a solid basis of discussion of the main implications of the institutional and technological environment characterizing Government IT innovations in those developing countries like Kenya for the development of local OSS sustainable products. An OSS business model analysis framework will hence be suggested to better understand the major issues that need to be addressed at different institutional levels for the sustainability of OSS in the Governments of developing countries.

THE OPEN-SOURCE SOFTWARE MODEL: MAIN CHALLENGES FOR DEVELOPING COUNTRIES

Open-source can overcome the shortcomings of proprietary foreign applications through drastically reduced costs, international independence from powerful commercial entities, and local ownership of software solutions (May, 2006; Weber, 2003).

The main model underpinning the development of most OSS products is the distributed development process, whereby, OSS developers launch a product or contribute to the
development of an existing one on a voluntary basis without the expectation of a secure and immediate earning income (David, 2006; Weber, 2003).

Most programmers are attracted by the “community-oriented” approach of OSS as it provides the opportunity of training and attempting something new. However, this approach is not completely free from a commercial logic.

Participating to OSS projects is viewed as an effective means to attract future income (David, 2006). Thus, the legitimacy of OSS comes from the Open Source technological environment and the awareness of the business opportunities it offers.

Still, if on the one hand the voluntary and communitarian approach offers a space for gaining new skills and capacity building for developers, on the other hand, most projects do not pass the development phase, and most of them are dropped, unless they are not taken over by a software vendor (Simon, 2005).

Thus, the traditional development model of OSS products does not seem to favour innovation as it does not have a strong basis of investment to sustain it. In contrast, the commercial-driven model seems to be the most effective at the moment for the sustainability of OSS products: “the industry needs the profits from proprietary software to help fund open-source development” (cited from Simon, 2005).

The main OSS products targeted by this model are either infrastructural applications (e.g., Apache Web Server, operating systems) or established commercial software products (e.g., Open Office) (Camara & Fonseca, 2007). Generally, one of the main revenue approaches characterizing the commercial-led model is “value-added service-enabling”, whereby a company gains competitive advantage by offering a series of support and consultancy services targeting specific open source products (Fitzgerald, 2006).

On the one hand, the community-led model has not the investment capacity to guarantee sustainable OSS products and innovations. That is why, successful community-led projects usually target the development of products that have a “high degree of shared conceptualisation”, based on established and popular conceptual models (e.g., Open Office Suit) and standards (e.g., mySQL) and high modularity, whereby the project can be broken into many independent modules (Camara & Fonseca, 2007) allowing the setting up of distributed development teams. The downside of this approach is that it limits innovation to “reverse-engineering existing designs or following accepted standards” (Camara & Fonseca, 2007).

The commercial OSS model, on the other hand, does not provide the incentive to invest in innovative open source business administration and service industry systems (e.g., financial information management systems, health management information systems, etc.). In fact, most private software businesses do not want to take on the risk of an innovation that will not guarantee enough sustainable competitive advantage due to its non-proprietary nature. Like the community-led model, most OSS commercial products have a “high degree of shared conceptualisation” as they propose products based on established standards or similar to existing commercial products with little innovation. Users and developers already know these products reducing the design effort and benefitting from the low risks of “reverse engineering” (Camara & Fonseca, 2007). Since the design process is centrally controlled and tied to the company’s commercial objectives, OSS products characterized by low modularity are usually preferred (Camara & Fonseca, 2007). A major risk of these products is that they may face a low competitive advantage with respect to incumbent vendors who own large
amounts of resources to quickly emulate OSS products and anticipate them with a more innovative product on the market (Simon, 2005).

Both the community-led and commercial OSS model, thus, have a very low driving force towards innovation. This “conservative trend” is particularly common in developing countries where most programmers prefer to work to adapt existing western developed applications and be paid. Most IT managers do not want to take the risk of developing new OSS products to substitute legacy systems (Camara & Fonseca 2007). This hinders the social and economic impact of OSS by limiting its potential to create local knowledge, and meet different end-user requirements (Braa & Muquinge, 2007; Weber, 2003).

This raises the need to have a sustainable model which allows high levels of innovation in OSS projects that have a low degree of shared conceptualization, meaning a high potential towards innovation, and high modularity (Camara & Fonseca, 2007), which, in turn, enables to cope with the production of high complex IT business and service systems (David, 2006).

The main challenges towards the development of this approach are not purely economical as illustrated above. Other issues are involved, such as the kind of expertise needed to design and manage high modular software with low interdependence between modules, the lack of documentation, and the need to create a sustainable critical mass of users (David, 2006).

The technical knowledge and expertise required for the implementation of complex OS management and service architectures (e.g., health management information systems) are particularly lacking in developing countries (Tierney et al., 2008). Under these circumstances, OS solutions involve reduced costs only partially. The costs to sustain local products may be higher than on developed countries’ markets.

Likewise, in developing countries OSS benefits from an even smaller base of users than in developed countries limiting their power to contrast the land-locking hegemony of proprietary platforms.

This issue is particularly challenging as OSS users need to be more skilled than average proprietary software users. Whereas proprietary software is tested before being released to the market, OSS applications are tested along usage after having been made available to the public. Users have thus the possibility to contribute to fix bugs and may contribute to the final release of the products (Simon, 2005). This approach may constrain the growth of OSS users’ base in developing countries where most users do not have programming skills. Thus, the diffusion and sustainability of OSS solutions will strongly depend onto a business model that targets the larger sections of the population providing user-friendly interfaces, linguistic translations, and user manuals (Simon, 2005).

In developing countries, there is need for applications that meet information needs of average users (Camara & Fonseca, 2007). This does not happen as most applications developed are infrastructural (web servers, OS, programming languages). The adoption of OSS products needs large investments to adapt them to the local markets.

THE CASE STUDY OF A HEALTH MANAGEMENT INFORMATION SYSTEM IN KENYA

THE MULTIVOCAL AND MULTILEVEL INSTITUTIONALIST FRAMEWORK

The case study adopts a multivocal and multilevel institutionalist perspective to analyse how new and old rules, norms, and cultural meanings influence technology innovation and the
usage of IT in information processing within the national health management information systems of the Ministry of Health in Kenya.

The paper posits that the context of the African public sector is characterized by complex interlinkages between various actors (e.g., international agencies/donors, ministries, public employees, etc.) (Kimaro & Sahay, 2007) who act under the pressure of multiple rationalities (Chilundo & Aanestad, 2004). In particular, the paper recognizes two main logics (or sets of meanings) underpinning the actions of these actors. These are either embedded in imported reform models such as the New Public Management (Hood, 1991) competing with the logics of the Old Public Administration (Lynn, 2006). The latter characterizes the “personal nature of African bureaucracies” and is supposed to inform the actions of local public employees in contrast with the “managerialist” rationality enshrined in exogenous reforms (Smith et al., 2008) (Table 1).

The conflict between these two different sets of meanings influences the misalignment between the formal rules (e.g., policies, planning and data reporting structures) underpinning the implementation of health information systems and the informal constraints to its prescribed usage arising from the divergent interpretations of local IS users (Chilundo & Aanestad, 2004; Kimaro & Sahay, 2007).

<table>
<thead>
<tr>
<th>New Public Management Logics</th>
<th>Old Public Administration Logics</th>
<th>Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managerialism</td>
<td>Bureaucracy and politicisation</td>
<td>(Bajjaly, 1999; Hope, 2001; Olowu, 2006)</td>
</tr>
<tr>
<td>Increased responsibility and decision-making power to middle-management (disaggregation, agencification)</td>
<td>Decision-making is concentrated at top of hierarchy</td>
<td></td>
</tr>
<tr>
<td>Decentralisation of power to the periphery</td>
<td>Centralised input controls, rules and procedures</td>
<td></td>
</tr>
<tr>
<td>De-politicisation of implementing structures and functions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accountability</td>
<td>Political affiliation</td>
<td>(Grindle, 1997; Hope, 2001; Owusu, 2006; Peterson, 1998)</td>
</tr>
<tr>
<td>Result and performance-oriented management system</td>
<td>Political rewarding system</td>
<td></td>
</tr>
<tr>
<td>Market</td>
<td>Monopoly</td>
<td>(Ciborra, 2005; Grindle, 1997; Hope, 2001)</td>
</tr>
<tr>
<td>Competition</td>
<td>Weak market economy</td>
<td></td>
</tr>
<tr>
<td>Externalisation of the public service to market</td>
<td>Internalisation of service delivery (insourcing)</td>
<td></td>
</tr>
<tr>
<td>Customer-orientedness</td>
<td>Politicisation of service</td>
<td>(Ciborra, 2005; Drori, 2008; Grindle, 1997; Owusu, 2006)</td>
</tr>
<tr>
<td>Responsive, diversified and “exclusive” service</td>
<td>Central (external) political control</td>
<td></td>
</tr>
<tr>
<td>Customer identity of beneficiaries</td>
<td>Public service complies with international/national policy priorities</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Institutional logics of the New Public Management and Old Public Administration

Under this perspective, the case study presented in this paper provides an historical longitudinal analysis of the opportunities of change enabled by the institutional environment and by the resource-material environment (IT technical features, human resources,
information tools). Drawing from a multilevel institutionalist perspective (Chreim et al., 2007), the context of HMIS of developing countries is viewed as made of three levels, the macro or policy level e.g., formal policies), the meso or organisational level (e.g., management structures) and the user or agency level (Kimaro & Sahay, 2007). Macro and meso levels institutions are interlinked (Chreim et al., 2007) and enacted by IT users at the micro or agency level. The way IT users enact competing sets of meanings encoded in the institutional environment affects the development, integration and usage of a technology conditioning its organisational impact.

The three-level perspective is quite relevant in the context of the African public service. The macro or policy level is where institutional arrangements accompanying IT implementation entail political solutions (Horn, 1995; North, 1990) emerging from the intersection of interests of various actors, including Governments, donor agencies, and international commercial entities (Ciborra & Navarra, 2005; Kimaro & Nhampossa, 2005; Sander et al., 2005). However, the meso or organisational level may have important mediating and, at times, moderating affects (Dada, 2006) onto policies and other external environmental factors, in particular, where organisational behaviour is informed by different professional norms (e.g., medical management, data management staff, etc.). Finally, the micro-level is where the linkage between macro and meso level institutions is shaped (Madon et al., 2007), at times, through personal or social relationships that may substitute bureaucratic official procedures (Smith et al., 2008) (Figure 1).
In addition, the enactment of institutions at different levels is associated with the means enabling the mobilization of interpretive resources of the institutional environment (Sewell, 1992). These means are represented by the technical features of the IT artifact and of the surrounding technological/material resource environment, including the physical and human resources available. Therefore, if on the one hand the mobilisation of interpreting and legitimating resources conditions the enactment of the material properties of IT, the design of the latter may facilitate new meanings and practices underpinning technological innovation, thereby, reshaping the institutional order of the public health sector.
METHODOLOGY

The paper illustrates the adoption of a new computerized health management information system at the Division of Vaccines and Immunisation of the Ministry of Health in Kenya. The division represents one of the units of analysis of the case study of three health management information systems in Kenya: the central Health Management Information System, the Disease Surveillance and Routine Immunisation Information System of the Division of Vaccines and Immunisation, and the HIV/AIDS information system of the National AIDS Programme. Data were collected during a field visit at the Ministry of Health in Kenya. For the Division of Vaccines and Immunisation a sample of eleven out of thirty-eight semi-structured interviews (one hour average each) were collected. These were corroborated with around 2,000 pages of documents out of a total sample of approximately 5,000 pages.

Staff members with the earliest date of deployment were selected in order to capture the longest longitudinal accounts possible. Moreover, the sample included not only health records officers, the direct users of the information system, but also medical management and technicians, i.e., the indirect users of the information system. The inclusion of different organisational roles into the sample of informants was part of a “comprehensive sampling” strategy (Miles & Huberman, 1994, p. 38) in order to have a more systemic view of the evolution of the information system and technological changes.

The questionnaire was structured according to the theoretical framework in Figure 1. Questions were asked regarding their main functions in the division, changes in their working practices, professional values, technological changes and institutional reforms.

Documents were collected from the archives of each division and the central library of the Ministry of Health. These included Government policy documents, minutes of meetings and reports from the information systems covering a period from 1980 up to date. Relevant international agencies’ policy and project documents were also retrieved online.

Data analysis was also framed within the theoretical framework of Figure 1.

Interviews were first transcribed and coded in NVIVO 8. Starting from a pre-defined set of codes for each level (macro, meso, and micro) and pillar (regulative, normative, and cognitive), new codes were created along the process of data analysis (Miles & Huberman, 1994 p. 58). Time-series codes were also created starting from 1980 with a five-year interval. After coding each set of interviews for one division, codes were reviewed and similar codes were grouped under common categories (“pattern coding”, Miles & Huberman, 1994, p. 69). As a consequence, all data from the first division had to be reviewed and analysed again to take into account the new concepts.

Once the coding of interviews had been completed, an “interim summary” of findings (Miles & Huberman, 1994, p. 77) was drafted to review emerging issues. The interim analysis allowed to better identify the issues that needed to be corroborated or complemented by the subsequent analysis of documents.

Like interviews, the coding of sets of documents per each division was alternated with the grouping of similar codes into broader categories. For each division, new data from collected sample of documents were searched, analysed, and coded until a stage of saturation where no more concepts could be developed was reached (Strauss, 1987, cited in Miles & Huberman 1994, p. 62).
DESCRIPTION OF THE CASE STUDY

In 2004 the Division of Vaccines and Immunisation (at the time called Kenya Expanded Programme on Immunisation) adopted EPI-Info, public domain (free-of-charge) statistical software for epidemiology, in order to decentralise health information processing to the field. EPI-info was developed by the Centers for Disease Control (CDC) which supported its implementation in the division together with WHO. EPI-Info is a no-charge, non-exclusive, royalty-free, and irreversible license product. Its simple programming language allows non-programmers to easily build and customise data based management systems. Its first Windows version, Epi Info 2000, was released in 1999. Until then, it could be run as a DOS program in a Windows-environment (Harbage & Dean, 1999).

Official documents evidence that health records officers started advocating for a decentralised integrated computerised system in 1997. Still, the management did not fully engage in it until the stepping in of a new contributor to the mission of the global immunisation programme, i.e., the Global Alliance for Vaccines and Immunisation (GAVI).

Founded with the objective to mobilise resources for vaccines to developing countries, GAVI started its activities in Kenya around 2000 and supported the immunisation programme not only through the introduction of new vaccines (e.g., HiB in 2001) but also by contributing to the strengthening of the monitoring and evaluation system through its “performance-based grant programme.” In order to monitor the performance of the health information system, GAVI started performing periodic Data Quality Audits (DQAs).

However, contrary to expectations, the chip in of the Global Alliance for Vaccines did not succeed in increasing the level of donor funding. On the contrary, donor contribution to the Programme shrank from 83% in 1999 to 47% in 2001 (WHO, 2001) as external resources were diverted to other priority areas (e.g., HIV/AIDS). At the same time, there was an increase in the national public expenditure on vaccines from 17% in 1999 to 53% in 2001.

This notwithstanding, the perception of the need for reliable quality data to justify funding was still high, putting emphasis onto the strengthening of the information processing capacity at the lower levels. Thus, based on the recommendations contained in GAVI DQAs, the Management Unit of the Programme started mobilising donor funding for the decentralisation of the information system.

It followed that between 2001 and 2003 the Programme Management Unit asked for donor support for the set up of a “decentralised […] multiuser window based programme which can be used in a networking environment”. The proposed system was an ambitious project meant to decentralise data processing to the lower levels, starting from the provinces all the way down to the facilities. It represented a radical shift from the Computerised EPI Information System (CEIS) in place at that time.

CEIS was an unlimited license software installed at the central Management Unit in the early 90s with the support of USAID in order to accelerate the “analysis of epidemiological data”. CEIS was a dos-based and centralised IT system designed for the management and statistical analysis of epidemiological data. Due to its stand-alone architecture, it only provided a single-user environment and hence a centralised processing of information. Immunisation and surveillance data for immunisable diseases were sent from the field and entered into the system by a health records officer at the central management unit in order to generate reports on immunisation and diseases incidence rates.

The DPT-III indicator measures the injection of the three doses of the trivalent vaccine against Diphteria, Pertussis, and Tetanus.
The division was not satisfied with CEIS performance due to its lack of stability (“it keep on crashing”) and cumbersome data processing determined by its centralised architecture: “the section is constrained by lack of sufficient computers to amicably handle the data sent to KEPI. Data entry is done in an old Olivetti computer donated by UNICEF 10 years ago […]. Following the need of timely and complete data, KEPI would like to utilise the current modern technology to access data from the districts…”

Still, it took almost four years before the implementation of the new system started. Until then there are reports of misalignment between type of technologies and information processing practices on the ground and inconsistent data processing across the different levels of the information system causing duplications and delays. In particular, not all districts were equipped with information technology. Some keyed in data collected from the health facilities into Excel sheets to be printed and sent to the national level. Others still relied on a manual reporting system with a higher risk of “arithmetic errors introduced during manual aggregation of data”.

In the meantime, between 2003 and 2004 CEIS broke down forcing the programme to rely on Excel, which, although being an efficient data analysis tool, posed no little constraint to the maintenance of an updated immunisation and disease data base given its low data storage capacity.

Finally, in 2004 Epi-Info was implemented in the provinces which became in charge of data entry whereas data analysis was still performed by the central data management unit. More specifically, the provinces would receive data from the districts and enter them into the system. Data would then be shared with the central data management unit of the programme either remotely through the network server or by sending data sheets by e-mail.

However, the partial decentralisation of the information system did not bring about the decentralisation of planning and management structures at the lower levels. In fact, being the adoption of the new IT system limited to decentralisation of data entry to the provinces, both districts and provinces were not empowered in decision making as data analysis was still performed at the central level. Moreover, the Government commitment to decentralisation was still very low as district budgeting and financing mechanism had been left out of the reform. According to the final evaluation report of the World Bank project for the “Decentralisation of HIV/AIDS and Reproductive Health”, “the centralised financial management system […] limited the ability of the system to disburse resources to the districts […]. This failure […] has frustrated implementing districts as they have very little control over resolving implementation constraints and created service delivery gaps in the supported districts”. This involved the low ownership of the new computerised information system at the provinces and districts which were not motivated to ensure an efficient functioning and maintenance of the system and its expansion to district and facility levels.

**DISCUSSION OF FINDINGS**

Data show that discourses in favour of a new computerised system enabling the decentralization of the health information system initiated a few years earlier than the beginning of GAVI performance-based scheme. In particular, these discourses originated at the meso level from health information officers. These discourses were apparently motivated by the poor performance and reliability of the old system CEIS. It is arguable that the perception of such inadequacy was characterised by the technological environment in which actors where embedded. More specifically, the “framing” (Davidson, 2006; Orlikowski & Gash, 1994) of CEIS as an inefficient centralised Dos-based system might have been determined by an increased awareness of the possibilities offered by the new material
technological environment (“current modern technology”). Based on this argument, the major promoters for a new system within the programme management unit might have been the health records information officers who, most likely, were more exposed to certain technological advancements, in particular, after the introduction of Windows and more easy-to-use data analysis application suits such as Excel.

The exposure to more advanced technologies was also due to their frequent relationship with international development partners and consultants. Thus, if on the one hand the exogenous influence of international partners at the macro-policy level was instrumental for the transfer of new IT-related knowledge, the endogenous normative pressure of health records information officers facilitated the legitimacy of new integrated and networked information systems contributing to reduce the gap between institutional accounts and enactments of decentralisation. It was under this institutional pressure, that health records officers started a persuasive action to convince their leaders of the importance of a more advanced IT system in exchange of additional financial resources, thereby elevating the cognitive legitimacy of a decentralised computerised system to the middle-management level.

This persuasive action was facilitated by the new endogenous ownership and, hence, legitimacy, of the Programme represented by the increase in Government funding against a decrease in external donations. This time the need for a new system was not anymore to be accountable to donor partners but was made necessary to have a major stake in the Government budget. Apparently, compared with donors’ external legitimacy, the government endogenous legitimacy offered more opportunities for durable funding and, hence, continuity of the Programme’s activities. Under this perspective, the Government funding scheme represented a stronger incentive for the management programmes to actively engage in fund raising for a sustainable well functioning computerised system.

At the same time, however, this raises the question of why the implementation of the IT system was delayed for so long? Being it a free-of-charge and easy-to-customise system, one would have expected a faster process. Moreover, the institutional accounts for accountability underpinning GAVI’s recommendations for a well functioning routine immunisation information system let assume a more responsive support by the donor community, if not towards vaccines funding, at least, in relation to a new computerised system.

It is arguable that the slow pace through which the whole process was carried out was due to a discourse misalignment between the cultural-cognitive legitimacy of the new IT system driving the supportive action of the health records officers and management at the meso level and the socio-political legitimacy of a well functioning monitoring and evaluation system by donor partners and decision makers at the macro level.

Although donors recognised the importance for a more efficient information system at all levels, they might not have been ready to commit considerable funding for its automation. One of the reasons behind it might be the higher demands of the Programme with respect to 10 years before with CEIS. This time there was not only the need to equip the management unit with a computer and a software tool for central data analysis and storage. The set up of a networked and decentralised IT system required a lasting large-scale effort involving the equipment of all provinces and districts with IT tools and the necessary human capacity. This kind of engagement was too demanding if compared with the preferred piecemeal and short-term approach of donor-funded initiatives which had led to the fragmentation of the health information system reinforcing the institution of disaggregation. Along with this argument, international partners’ donations for vaccines were not that high to justify such a massive investment in technology.
Likewise, the macro-level endogenous socio-political legitimacy of the information system was lacking, particularly, with regard to its automation needs. At that time the central government support to automation was still very poor. IT investments were hardly considered as a priority, being the Government torn between shrinking budgets and high demands for primary commodities such as vaccines. In addition to this, there was little awareness among decision makers of IT as a powerful control and monitoring tool.

That is why the Programme management was still forced to plead for donor funding for the new IT system with all the drawbacks that the lack of continuous commitment by donors implied, not only in terms of delays, but also reduced scope witnessed by the roll out of the new system only up to the provinces and not at districts and facilities as planned.

Data evidence low Government commitment not only in relation to IT but also in relation to decentralization which influenced the low ownership of the health information system at the lower levels of the health system. In fact, the Government delayed all substantive reforms for the effective decentralization of decision making structures within the health sector meaning that the socio-political legitimacy of decentralisation at the national macro level was still very weak if compared, on the contrary, with the strong cultural-cognitive legitimacy of centralisation. Such legitimacy of decentralization was therefore reflected at the micro-level of action of the information system. As districts and provinces did not perceive any change towards the decentralization of decision making, they envisaged a “passive” utility of the health information system, limited to the administrative task of reporting immunization and disease data for usage by the central level. This lied at the root of the lack of any entrepreneur action at the lower levels of the health care system for the strengthening of the information system.

OPEN SOURCE SOFTWARE BUSINESS MODEL ANALYSIS FRAMEWORK

The case study raises useful implications for the identification of the main factors that may affect the development of a sustainable development model of Open Source Software in developing countries. The focus onto the public sector provides even more salience to such implications. In fact, the Governments of developing countries can constitute the major adopters and, consequently, promoters of local OSS innovations. Governments can ensure a more sustainable funding to OSS projects (Camara & Fonseca, 2007). Moreover, given the inclusiveness and equity values underpinning the delivery of public services and the monopolistic (or quasi-market) regime in which public sector organizations operate, the development of OSS is less driven by competitive advantage opportunities in the market but more by the effective needs of the service itself. Thus, public-led models of OSS development could produce more innovative and complex OSS products than the private sector.

The main OSS-relevant issues raised by the case study are:

a) There is need for macro-level endogenous legitimacy of Government organizations’ mission and goals to motivate meso-level management towards innovation. Such legitimacy provides management and other professional cadres with the incentive to advocate OSS solutions fuelling local demand for OSS (*OSS-innovation pull-factor or trigger*).

b) The legitimacy of OSS comes from the Open Source technological and material resource environment and the awareness of the business opportunities it offers. Such legitimacy can rise from the exposure of key professional staff at meso level to open-source software and their development environment. The main vehicles of OSS products and methodologies could be NGOs, donor partners, and foreign universities. This is particularly important in
public administration of developing countries characterized by a low presence of programmers. If new professional opportunities are perceived, some categories of public sector employees may be induced to change their roles as it happened after the first wave of automation in the early 90s in the Ministry of Health in Kenya. On that occasion, clerks upgraded to more technical expertise (e.g., programmers, and information officers). The awareness of new opportunities of professional growth motivate technical cadres at meso level to look for donor funding for their professional development (OSS-innovation pull-factor or trigger).

c) Donors can’t support long-term high scale IT projects due to their piecemeal approach. This prevents a thriving and sustainable OSS business environment, given that OSS needs the mobilization of large amounts of resources and big investments especially for large management and service systems integrated suits. Thus, the approach of donors in OSS would resemble that of the “low-low OSS model” (Camara & Fonseca, 2007) characterized by low shared conceptualization and low modularity. Based on this model, developing teams are supported for the development of software tools that have a reduced scope or a piloting dimension. Although these projects propose innovative solutions, these cannot be extended to a larger-scale and be made available to the user as full-fledged user-friendly products (exogenous OSS-innovation push-factor).

d) There is also lack of endogenous legitimacy of OSS – and IT solutions in general – at the macro-policy level. This prevents Governments top-down sustainable support that, by leveraging from the normative value system of professional cadres at the meso level, can guarantee longer-term and more sustained support than donors. Following an appropriate financial and revenue strategy, the public sectors of developing countries can attain high achievements in translating “low-low OSS models” to “low-high OSS models” (Camara & Fonseca, 2007) (endogenous OSS-innovation push-factor).

e) A more complex issue is related to the subtler linkage between the endogenous legitimacy of the major needs motivating the adoption of a software innovation particularly under the framework of donor-driven public sector reforms (or policies). The case study has shown that the clashes between different legitimacy discourses at the macro-policy level due to the non-overlapping between donors’ and national Governments’ agendas can actually hinder the enactment of donor-driven public sector reforms. This affects the legitimacy of the new IT system at the micro/users’ level which is not supportive of the IT system. Similar situations are common to most developing countries and can seriously affect the sustainability of OSS given the particular engagement that it needs from the users’ community. A poor engagement, in fact, can prevent the evolution of local information-needs oriented solutions hindering the development of a critical mass of users that can sustain the growth of a local OSS business model and industry (endogenous OSS-sustainable growth factor).

Based on these issues, a framework to guide the analysis of the OSS-viability of certain business environments in developing countries has been drawn (Table 2). The framework can provide guidance in the understanding of the international development and national reforms efforts that need to be undertaken for the promotion of a sustainable local OSS business model in developing countries.

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The framework needs to be verified through the analysis of real cases of adoption of OSS solutions in different public sector contexts: different countries and public sector histories, different government systems (e.g., national vs. local), different types of services (e.g., health vs. immigration services). For example, there might be cases where the exposure to an OSS technological environment does not constitute a sufficient incentive for the development of local OSS expertise. Thus, the framework sets the ground to explore alternative explanations which can then be used for its self-enhancement.

<table>
<thead>
<tr>
<th>OSS innovation pull-factor</th>
<th>Exogenous OSS- innovation push-factor</th>
<th>Endogenous OSS innovation push-factor</th>
<th>OSS sustainable growth factor</th>
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<tbody>
<tr>
<td><strong>Macro</strong></td>
<td>Endogenous legitimacy of public service/organisation (mission/goals)</td>
<td>Donor-driven OSS pilot (low-low model: low shared conceptualization and low modularity)</td>
<td>Endogenous socio-political legitimacy of OSS solutions (Governments' sustainable support of OSS solutions)</td>
</tr>
<tr>
<td>OSS technological/material resource environment (Vehicles: NGOs, international donor and academic community)</td>
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<td><strong>Meso</strong></td>
<td>Management/professional cadres demand for OSS innovation (cultural-cognitive legitimacy)</td>
<td>Small (exogenous) developing teams</td>
<td>OSS cultural-cognitive legitimacy (professional core value systems support OSS)</td>
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<tr>
<td><strong>Micro</strong></td>
<td>Resource mobilisation for professional development (increased capacity in OSS development)</td>
<td>Pilot OSS products, low sustainability, non-fully fledged user friendly solutions, small users' base</td>
<td>Long-term support of distributed developers team for modular development of complex OSS products (Translation of low-low models into low-high models)</td>
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Table 2. OSS Business Model Analysis Framework

**CONCLUSIONS**

Following the analysis of the case study of a computerized epidemiological information system in the Ministry of Health in Kenya, the paper has proposed a business model analysis framework to identify the main issues that need to be addressed within the context of a specific country for the sustainable development and growth of OSS. The framework focuses onto public organizations as major promoters of sustainable OSS.
In particular, four main sustainability factors of OSS have been identified. These are OSS innovation pull factors, OSS exogenous and endogenous innovation push factors, and OSS sustainable growth factors. All these factors may affect the diffusion, adoption and growth of OSS at different levels of the public sector. The extent and modality in which these factors interact may vary depending on their embedding context.

That is why the framework needs to be validated or extended through comparative research between different developing contexts. Among the major issues that need particular attention are: the relationship between meso-level forces (e.g., management and professional cadres) increasing the demand of innovation and the enabling macro-policy environment; and the linkage between the sustainability of OSS and the development and implementation process of public policies that new OSS products are supposed to enable.

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Abstract: Over the recent past, developing countries have been heavily reliant on advanced Information Communication Technologies (ICTs) as part of efforts aimed at competing globally, or at least, being considered as part of the ‘global information society’. Central banks of these countries have been part and parcel of this socio-technological phenomenon. The function of central banks to control other commercial banks within their scope of administrative jurisdiction constitutes a financial challenge. This work studies the Central Bank of Omega which set up the Omega Electronic Inter-bank Settlement (EIS) System as the standard for huge-value and high-volume funds transfers. Pragmatically exploring the matrix of control espoused by Nidumolu and Subramani, this study seeks to understand the manifestations and implications of control at different levels of a decentralised administration. Findings suggest that relationship management is key to institutional control strategising. The paper is of the opinion that control should be administered in a portfolio fashion so as to maximise the potential benefits of ICT use in any joint organisational undertaking.

Keywords: developing countries, inter-bank settlement, electronic funds transfer central banks, control.
INTRODUCTION

ICTs in Developing Countries

The challenge and the quest for more investigations into contemporary application of Information Communication Technologies (ICTs) in developing countries have been profound in recent times (see, for example, Sahay and Avgerou, 2002). The rationale for this drive is not far-fetched. Developing countries have been adopting and deploying ICTs in an increasing manner as part of an attempt to confront some of the challenges that demand the effective use of Information Technology (IT) in modern societies (Avgerou, 1995). There is some appreciable degree of conviction, and even evidence, to suggest that ICTs have the potential to enhance today’s information-driven economic and social services in the specific areas of finance, education and health (Odedra et al., 1993a). This notwithstanding, various researchers, particularly those fascinated by how ICTs are implicated and become accommodated in different fields of collective engagements in developing economics, have documented proof of certain apparent failure and success stories (for example, Stalder, 2002, Heeks, 2002) in the utilisation of ICTs.

Over the recent past, there have been burgeoning studies in developing countries regarding the particular use of ICTs in motley societal commitments (Avgerou, 2003, Avgerou and Walsham, 2000, Barrett et al., 2001) illustrating the dynamic dimensions of the instrumentality of ICTs in the transformation of developing societies. Other studies have devoted their attention to the heavy reliance on ICT infrastructure by financial institutions like banks (Gosling, 1997, W oherem, 2000) in their effort at automating certain core procedural activities. This body of research has specifically focused on the institutional changes and implications associated with technology investment in such phenomenon like Automated Teller Machines (ATMs), smart-card engineering, among others. It is this latter group of researchers that this study aligns itself with. Though this decision is arbitrary, it is tempered with the researcher’s interest in gaining insights into the implications of technology intervention in financial institutions, especially from the standpoint of developing countries.

Inter-bank Settlement

The financial literature is enormously broad in its contextual orientations. It is not difficult to locate emerging understanding on online transactions, inter-bank settlements and others in the mushrooming financial literature, (see, for example, G up, 2003, Litan and Rivlin, 2001, Keyes, 1998, A sokan et al., 1997, C respi et al., 2004, Vital and Mengle, 1991, Zaki, 1983). These have varied in their angles of reflection and analyses as they have on their thematic research directions. Some have underscored the growing electronic trading in global financial markets and their inherent collaborative and coordinating endeavours (Cetina and Bruegger, 2002). Others have concentrated on the economic benefits of online banking transactions to highlight the rising acceptance of electronic inter-bank settlements in contemporary economies. The objectives of these studies have been promising as they have succeeded, to a greater extent, in enlightening us on some of the problems, uncertainties, benefits, risks, security concerns intrinsic in inter-bank payments and electronic transfers. Lacking in these
academic works however a re insights on how interbank settlement is administered by a central bank in developing countries particularly in the area of control. Understanding control in this context is informing our understanding on the mechanics of the concept in electronic banking transactions. Discussing these realistic concerns would be seen as fruitful in broadening our perspectives on the theorising of control at the practice level within the financial environment from the standpoint of developing countries. In an attempt to make a legitimate contribution towards this lacuna in the literature, we are motivated by, and sensitised to, this question: How do central banks control commercial banks through electronic inter-bank settlements? Exploring issues to engage this question as a means of providing the trajectory to the destiny of this study, demands responses to a query like how control is initiated and developed.

One caveat should be observed before proceeding to outline the various segments of this paper. Control in this study should not be viewed from risk management perspective with its derivative financial control that seeks to identify risks, by instituting comprehensively dependable operational risk countermeasures (Pyle, 1997). Recently, academics have done some work in this area; Scott (2000) provides a ready example. Rather, control in this work looks at mechanisms and procedures involved in the elicitation of acceptable behaviour and outcome in the appropriation of a technological intervention. The rationale is to bring out the pillars of ideas that have enduring lessons for both practice and research in sync with the application of ICTs in developing countries.

The paper is structured as follows. A review of the relevant literature on payment systems immediately follows this introductory phase. Next is the outline of the background of the study and the research methods employed to solicit data for the write-up. The theoretical orientation that guides the research is outlined to precede the context of the study. Analysis and discussions come next with concluding remarks pointing out implications of the research to end the paper.

EVOLUTIONARY TRENDS IN THE PAYMENT SYSTEM

Electronic Funds Transfer

Electronic funds transfer is fundamental to the performance of monetary economics (Haldane and Latter, 2005a) and so putting rigorous measures in place by means of control to ensure its robustness cannot be overemphasised. For all evidence points to the fact that electronic Funds Transfer (EFT) has become an indispensable accessory to the contemporary financial settlements for not only advanced economies but also developing countries (Hamilton, 1986, Cetina and Bruegger, 2002) Logically, “if transactions are the lifeblood of market economics, then payment systems are the circulation systems for these transactions” (Haldane and Latter, 2005b, p.66).

The above quote reinforces the significance and the crucial role of payment systems in any economic entity (Fry et al., 1999, Goldfinger and Hayim, 2001). It is against this backdrop that central banks provide the necessary backing for at least one system of payment that is generally accessible to banks (Padoa-Schioppa, 2003) both locally and internationally. The banking industry, with the aid of electronic banking, and subsequently the deployment of Secure Electronic Transactions (SETs) is thought to be the vehicle for driving security and reliability of worldwide financial transactions (Alhadeff and Cohen, 1997).
The electronic inter-bank transfer is no foolproof as a system of payment. Indeed contemporary electronic inter-bank settlements have to struggle with such security worries as the intrusive tendencies of hackers (Sommer, 1998, 2004), social and psychological matters pertaining to trust (Backhouse et al., 2003, Yousafzai et al., 2003) and administrative concerns regarding control (Bachmann, 2001, Abramson, 1989). Certainly, trust, security and control of exchange activities are still implicit in today’s settlement system, and are areas of immense significance (Haddawy et al., 2004).

EFT has attained a considerable popularity since the early 1970s as a technological financial innovation in spite of the established presence of cheques and cash as means for the transfer of value (Zaki, 1983). Its global critical mass is on the upward surge. Generally, electronic settlements must demonstrate a high measure of the basic security principles like confidentiality, integrity, availability, non-repudiation and authorization (Anderson, 2001). It is from this window of concrete security that people can see reliability beforepossibly switching to centrally controlled electronic means of payment.

Central banks on control

There have been multiple and sometimes contradictory notions on the key functions of central banks. The area of control is particularly contentious. Some contend that the central bank is not the only institution charged with the duty of financial control and stability (Sinclair and Healey, 2003); others insist that central banks, since time immemorial, had been in the forefront of ensuring prudential control of financial practices (World Bank, 2004).

Indeed, there is a school of thought that argues a case for decoupling control from central banks as pertains in the UK, whereas others disagree; strongly contending for the need of central banks to retain such a vital role (World Bank, 2004). Others also suggest that central banks, like German Bundesbank, lack the capacity to act as a lender of last resort and, for that matter, have reduced supervisory and control abilities (Canzoneri et al., 1992).

The central banks of most developing countries are entrusted with the duty of directly controlling the financial activities prevailing within its territorial boundaries to avert monetary debacles that can potentially cripple the country’s economic activities. Alan Greenspan clearly expresses this concern by succinctly suggesting that:

“Second only to its macrostability responsibilities is the central bank’s responsibility to use its authority and expertise to forestall financial crises (including systemic disturbances in the banking system) and manage such crises once they occur” (Greenspan, 1997).

Clearly, the disintegration of a nation’s system of payment can upset its entire economic set-up. It would mean the collapse of many businesses due to the potential ripple repercussions on other sectors of the economy (Solow, 1982, Goodhart, 1987, Summers, 1991). The crucial importance of central banks can better be understood by taking a step backwards with a look at the nature of payments prior to their worldwide institutionalisation. For instance, before the creation of the United States central Bank in 1914, there was sporadic disturbance of the systems of payment prompted by ‘banking panics’ (Summers and Gilbert, 1996).
It was during this period that central banks acted to control the issuance of bank notes and served as the bank of the Government (Canzoneri et al., 1992). Undoubtedly, control and supervisory responsibilities entrusted to central banks in developing countries, for instance, grant them the ability to have insights to adopt strategic techniques that squarely confront both current and contingent challenges (Adams and Mehran, 2003).

**Background to the EIS system**

Until the introduction of the EIS system in 2003, nearly all the settlements among the banks in the Omega were made via the Bank Clearing System (BCS) in which payment instructions were sent in the form of giros, vouchers and cheques. This approach to payment settlement among banks was extensively manual. It took several days (usually between 3 to 5 working days) for these human-driven payments to go through to the BCS for their subsequent reconciliation. Lack of instantaneous settlements that characterised the BCS system encouraged ‘float’; technically explained by one commercial bank officer as ‘money lying idle’, which has the potential of limiting liquidity for transactions.

Problems of monitoring and indecision characterised the operations of this process from the standpoint of the central bank and the individual banks, prompting improper planning and control of liquidity and its inherent risks of inestimable financial loss. The desire to overcome these challenges necessitated the introduction of the EIS system by the central bank. Routing payments from the premises of the participating banks via the EIS system at the central bank was immediate, real-time activity. There are traces left on all transactions made through the system, which enhanced the monitoring mechanisms inherent in the operation of the EIS facility.

The application of the EIS ensured that the participating banks no longer had to transport large bundles of cash from their premises to the central bank. Transaction cost reduction and the attendant incidents of robbery are part of the underlying motivation behind the EIS technological drive. The desire of the central bank to significantly cut down on paperwork to the barest minimum was also within the scheme of the EIS system. The EIS is thought of as a realistic response to the complaints by the commercial banks of the loss of many man-hours in peak-time traffic jam as they travelled to the BoO head office to close their respective daily transactions. With the EIS participating banks are required to install computer terminals in their various premises. The banks then exchanged SWIFT authentication keys to enable them route their daily settlements through the EIS from their respective locales.

**Administrative set up of BoO**

The BoO structure is administratively hierarchical. At the top is the governor who is appointed by the head of state for a fixed, four-year, renewable tenure. The governor is flanked by two deputy governors, also government appointees. The departments whose activities have direct links with the EIS are Computerisation and Systems Department (CSD), Treasury, Budget and Accounts, Banking and the Banking Supervision (BS). However the bulk of activities on the EIS falls within the Banking Department (BD), which is divided into four units, namely, Payment Systems, Automated Clearing House, EIS section and Society for Worldwide Interbank Financial Telecommunication (SWIFT). These can be represented by the chart below.
RESEARCH METHODS

This study was conducted in a central bank of a developing country in the Sub-Saharan Africa. BoO was identified for this study because it has the official mantle, as a central bank, to see to the efficient administration of the EIS coupled with the writer’s ready access to resources, both documentary and human. It was also chosen to de-mystify the notion of ‘technological desert’ once attributed to the sub-region because it is the ‘least computerised’ (Odedra et al., 1993b p. 25) in the world.

Philosophical stance on research

This work employed an interpretive perspective together with the techniques of qualitative analysis bearing in mind that the researcher engaged in no settled presumptions (WenShin and Hirschheim, 2004). Again the phenomenon under study has its own inimitable, cultural and social conditions within a particular context (Walsham, 1995). Hence it is believed that the adoption of this strategy is suitable for capturing the direct knowledge and experience of professionals in the field (Benbasat et al., 1987).

Case study is being used as a preferred technique in this research. The reasons are first, to appreciate a ‘contemporary phenomenon within some real-life context’ (Yin, 2003 p.1). Second, to discover reality in a more considerable detail, thereby sanctioning the application of sufficient amount of variables (Yin, 2003, Galliers, 1991) to be included in the analysis. Lastly, the researcher has almost a negligible control over the unfolding events on the subject under study (Yin, 2003).

Data collection techniques

Before the commencement of the data gathering exercise, a short meeting was arranged with the head of CSD for a briefing on where and when to get the right personnel responsible for the identified key departments for the study. Pieces of information gathered from this opening encounter proved helpful. For instance, it was during this occasion that the head of CSD...
intimated the need to be present at the SWIFT help desk early in the morning. Acquiring firsthand experience of what really transpires was the reason for that suggestion; as volumes of transactions made on the EIS usually take place during this period.

Qualitative interviews are one of the most significant forms of collecting data for qualitative studies (Myers and Newman, 2007). To this end open-ended, semi-structured qualitative interview questioning technique was adopted which involved 52 banking officers including departmental heads, middle level staff and those at the very bottom of the organisational hierarchy. The number of interviewees is representative of all the participating banks. This provided a lens that allowed certain things to be observed ‘…which is not ordinarily on view and examine that which is looked at but seldom seen’ (Rubin and Rubin, 2005 p. vii). The responses solicited from both senior departmental managers and banking officers spawned the need for more probing questions in line with the theme of the study.

Matters ranging from the central bank’s capacity to cope with the technological challenges posed by EIS system, system interoperability, disaster recovery, back-up measures and security implications were raised. Concerns about the architectural platform on which the EIS run were also addressed. Similarly, the reason for the introduction of the EIS, the conditions for a bank’s participation, how the central bank was managing the relationship with the other banks, and the control mechanisms in place were all queried.

Most of the interviews lasted just over an hour. However two or three interviews nearly hit 80 minutes. The reason was due to periodic telephone interruptions which one of the respondents described as “equally pressing matters”. The important parts of the interviews were recorded in hand-written form and put within quotation marks. They were later read out to the respondents for their consent and comments for reasons of validity and legitimacy. Mention should also be made of the use of informal conversation with some of the people at the lower echelons of the BoO management hierarchy as a means of avoiding data bias, and filling data gaps to widen the scale of analysis.

Documentary evidence like BoO annual reports, the banking act 2004, past speeches by the current governor and previous governors of the BoO, press releases, flyers, media articles and EIS terms and conditions are incorporated in the overall data structure. Pieces of information gleaned from these sources are instrumental in making valid comparisons with the responses solicited from the interviews. In addition, telephone discussions and e-mail communication were used as clarification on specific issues that emerged during the write-up. This iterative approach is to augment the on-site interviews, thereby enhancing the richness of the research findings as a way of guaranteeing validity (Stake, 1995).

THEORETICAL ORIENTATION

Introduction to control

The subject of control persists as a dominant part of, and fundamental challenge to, organisational sociology and management theory (Simons, 1995). The framework selected for this study is the matrix of control designed by Nidumolu and Subramani (2003), which was used to study a group of software firms to understand the mechanics of control in coordinating group activities. Control is fundamentally understood to be a set of laid-down structural guidelines, policies, procedures, rules and regulations to achieve stated organisational goals. The underlying principles of control especially, acceptable behaviour,
by means of aligning objectives with specific methods, (Tillquist, 2002) standardisation, decentralisation and autonomy can all be inferred in the study under consideration. The control matrix delineates two essentially different but complementary approaches; process and structure.

Controlling through process
This facet of control deals with regulating performance by putting in place managerial procedures to direct and inform activities (Snell, 1992, Flamholtz et al., 1985) in a specified format. Process control strategy of an institution finds expression in the practice of ‘monitoring, evaluating, and rewarding’ staff (Ouchi, 1977). This strategy can be context-dependent such as situations that require the adjustment of action to suit local peculiarities (Storey, 1987). Conversely, within a given organisational environment a similar bundle of controls can constitute what is called ‘Weberian iron cage’ (Weber, 1958 p. 180-181) that restrains the controlled to adhere to hostile rule. The aim of which is geared towards the fulfilment of predetermined objectives in a persuasive proof for a more suitable action (Klagge, 1997).

Two sub-distinctive forms of control can be extrapolated from process control, namely, behaviour control and outcome control. While behaviour control specifies the mode of conduct expected of an entity, outcome control emphasises and compares results, thereby demanding tangibles by means of “benchmarks, quality metrics, and performance criteria, such as productivity standards, budgets, and schedules” (Nidumolu and Subramani, 2003 p. 163).

Controlling through structure
The exercise of structure-driven control on the other hand depends on directing actions to conform to objectified rules and formalities through legally established authority. Control through structure requires providing subordinates the leeway to use their sense of judgment to analyse and relate rules, standards and policies based on prevailing local situation. To this end, rules of acceptable practice are distributed across separate entities, and as such, satisfactory practices are meant to be tempered with local convenience in the course of their application. The foregoing reveals the concepts of standardisation and decentralisation as essential components of control through structure. Upton (1995) suggests therefore that intermeshing standardisation with decentralisation could make a possible combination for improving organisational performance.

The control matrix outlines four major components that constitute the synthesised effect of control through behaviour and standardisation on one hand and through outcome and decentralisation of authority on the other as illustrated in the diagram below.

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<th>Control via behaviour</th>
<th>Control via outcome</th>
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<tbody>
<tr>
<td>Standardisation of methods</td>
<td>Control through standardisation of methods</td>
<td>Control through standardisation of performance criteria</td>
</tr>
<tr>
<td>Decentralisation of authority</td>
<td>Control through decentralisation of methods</td>
<td>Control through decentralisation of performance criteria</td>
</tr>
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</table>

Figure 2 Four constituents of control; a modified version of the control matrix by Nidumolu and Subramani, 2003.
Standardised methods, standardised performance criteria, decentralisation of methods and decentralisation of performance criteria would be the focus of discussion in the analysis section of this work. The reason stems from the observation that these have tremendous application to the context of the case study. Using figure 2 above as a basis of analysis, the EIS implies a form of control that blends the elements of standardisation and decentralisation of authority to elicit a specific behaviour and outcome.

RESEARCH FINDINGS

Ground rules

Before the EIS system was rolled out in 2003, the BoO met all the eighteen banks concerned to establish the standard operating procedures. Recounting on the need for this initiation, the head of payment systems pointed out that:

“We are not yesterday’s central bank; but a modern central bank which does things transparently by involving the participating banks before decisions are made”.

The participating banks were made to use their own terminal(s), service pack 4 to run on Microsoft Windows, magnetic card reader and internet browser from version 6 and above. In addition, the banks exchanged SWIFT authentication keys with the central bank, and amongst themselves through which daily transactions are routed to the EIS system. The introduction of the EIS system served to electronically process payments on real time and also to cut on the extent of paperwork.

“We want to see many transactions routed through the system and limit the use of cheques as it brings about loads of paperwork” – Officer, SWIFT help desk.

The EIS was also to get the banks to encourage their customers to alter their attitude towards transaction settlement. But the commercial banks were not altogether convinced on this motivation. One officer remarked:

“The mental attitude of the business community is one based on long held perceptions about traditional trading; sticking to the old ways of doing things” – Treasurer, Prudential Bank Ltd.

BoO maintains the duty of ensuring and enforcing the security of the EIS.

“We put control processes into the system and that failure to observe them means you (a reference to the banks) are not efficient or playing according to rules” – officer, SWIFT help desk.

The EIS server is physically sited at the BoO head office. All the banks are hooked onto this server through Radio, Integrated Services Digital Network (ISDN) and Fastnet. To this the head of CSD pointed out that

“All the participating banks have terminals at EIS which grants them the opportunity to know the state of their transactions in real time” Head – CSD.
Security

Banks are given unique password at periodic intervals as a security safeguard. This was done via a built-in technological component on the EIS and it was seen as part of

“The control procedures that were put into the system and so access into it required password which are given to authorised personnel in the various banks; and this in itself is a mark of standardisation...every bank is responsible for managing its exposures....a case of decentralisation of central bank operations”, – head, CSD.

The EIS system is supposed to provide a dependable, safe, secured and integrated settlement system that meets the financial challenges of a growing economy. Due to security reasons the EIS was made to run on the SWIFT platform as SWIFT is considered by BoO as a tested and trusted network. This was highlighted by the head of the Banking Supervision Department

“There hasn’t been any case of theft or fraud on the SWIFT” – Head, Banking Supervision Department.

His strong conviction was re-echoed in the following words:

‘EIS works on the SWIFT because that is a secured network for high value transactions’ –head of SWIFT.

However an officer in the Banking Department admitted that:

“...all systems are not fraud free; and that they are vulnerable to people’s manoeuvrability so we put in systems that can frustrate the occurrence of fraud”.

EXAMINING THE EIS SYSTEM

The main purpose of this section is to analyse the research findings in the light of the framework outlined in the theoretical orientation section.

Homogenising control procedures

As is evident from the findings, the canonisation of procedures was instrumental in regulating the conduct of the participating banks toward the attainment of a specific outcome in the inter-bank settlement. The BoO decides solely on what methods to standardise and what not to. This was meant to strengthen BoO’s controlling influence. Control was seen to be tightly enforced where standardisation of methods was concerned. This is reminiscent of “Weberian iron cage”, whereby subjects are made to align their interests to their superiors for the fulfilment of predetermined objectives.

Standardising control methods continues to remind us of how difficult it is to influence subjects in a situation where conflict of interests exists between the controller and the controlled. This observation came to light when the issue of float was raised between the commercial banks and the central bank. For instance, the BoO sees float as unhealthy for Omega’s economy, while the commercial banks viewed it as something beneficial. Enforcing
behaviour against a background of conflicting motivational approaches to a common objective therefore remains a challenge to standardised operations.

Decentralisation of activities

One of the primary reasons for the institution of decentralised methods in the application of EIS is to give banks the opportunity to use their own methods for executing inter-bank transactions. The reason, as can be mirrored by the framework, was to motivate accountholders to heighten their morale to achieve the needed outcome. Even though control via decentralised methods permits output measurement, no aspect of the EIS system demonstrably highlights this position. One remarkable revelation, nevertheless, was that decentralised methods inspired the installation of backup systems by the participating banks to ensure that they were adequately prepared and resourced against unexpected system breakdowns. There is the potential enhancement of group and organisational creativity which could have some bearing on positive performance.

Standardising performance criteria

Standardisation of performance criteria indicates the degree to which standards of performance are predefined for the execution of tasks in routing transactions through the EIS. Empirical evidence of the EIS system indicates that all high value, cross bank settlements were accomplished through the SWIFT network. Consequently, the EIS was modelled on the SWIFT network which the bank officers praised for efficiency and effectiveness. This could be due to its world-wide usage and sustained, undiminished integrity from the viewpoint of security. Findings indicate that high value transactions were controlled through standardised performance criteria which affords the central bank the opportunity to fashion ‘one size fits all’ solution(s) for the participating banks. This enhances the predictive power of BoO and therefore can act from a position of strength to handle unforeseen events.

Decentralised performance criteria

This control technique underscores the discretionary opportunity given to individual entities to use their sense of judgement to identify the decisive factors for job outcomes. This does not indicate a abdication of the key responsibility of the controller. For instance, BSD submits a weekly report to the BD that shows the balance status of each of the banks on their daily activities. Monitoring behaviour this way sharpens the ability of the BoO to control the outcome of electronic inter-bank transfers in terms of making the participating banks keep to their required daily minimum balance. The central theme underlying control through decentralisation of performance criteria is the dynamic challenge associated with remote surveillance.

DISCUSSION

Implications of decentralised-standardised duality

The human-based control measures on the EIS system mainly took the form of phone calls, imposition of prohibitive fines, and exceptionally high interest rate charges on overnight loans to offset debit balance at the close of the day’s banking activities. These measures were strong enough to deter the participating banks from frequently going below their mandatory, minimum deposit at the central bank. There were certain instances that both human and non-human mechanisms combined to ensure effective administration of control, which goes to
emphasise the centralised and decentralised nature of performance criteria. For instance, the BoO, through the EIS remote terminal, maintains a constant monitoring on the inter-bank activities of the participating banks, which is a reflection on standardised performance. In this situation there was human element that mounted surveillance over the entire EIS network while technology conterminously brings all the activities taking place on the account holders’ terminals into close scrutiny.

With these checks, when a particular bank runs out of funds to settle transaction initiated against it, the embedded control mechanism (technology) in the system flags up the situation by alerting the BoO promptly. The BoO then picks it up from there by carrying the next line of action (human) against the bank(s) concerned. Given the context of this study it is not difficult to suggest that control becomes quite difficult to regulate and enforce when both parties are operating from differing financial priorities and objectives. The BoO, for instance, complains of the lackadaisical attitude on the part of the commercial banks to encourage their customers to channel their settlements via the EIS. The commercial banks, in turn, blame the central bank for not doing enough to get the public acclimatised to the current trends in the payment system. This however presents a worrying concern to the central bank. And as of the time of this study, nothing concrete has been done to resolve this nagging, lingering issue.

This study unexpectedly uncovered the key issue of relationship management in the exercise of control. Noticeably absent from the control matrix, and overlooked by an overwhelming majority of the literature, is relationship management in the exercise of control. Or, to sustain the unalloyed cooperation in aligning the interests of the banks to the aspirations of the EIS requires managing the relationship of all parties. Since the BoO sees relationship management as equally important ingredient of control, it has formed the Inter-bank Committee of Payment Systems, the purpose of which is to manage the inter-bank relationship among the participating banks. The BoO seeks to enhance this interorganisational rapport by periodically meeting with the banks and finding common ground for matters of mutual concern about the general operations of the EIS system. This interaction fosters the exchange of information vital for developing innovative forms of communication for information sharing.

The study has unearthed how control mechanisms are incorporated in different processes and structures by a financial institution in a developing country to induce the demonstration of acceptable behaviour and outcome from various corporate entities. The findings suggest that both control through process and structure are best administered when fused together in the specified areas of their categorical versions to widen the scope of its applicability on the EIS. However, it is apparent that exercising control over institutions via proliferation of methods and standardisation of procedures is necessary but altogether insufficient to bring the desired mode of behaviour.

The EIS system reveals the vital role that technology plays in the identification of the expected boundaries, desired behaviour and outcome come as a against the crucial significance of deploying the human element in behaviour enforcement. While technology punches holes in the limits of the human constituent in control, humans also pinpoint the spots of technological inadequacies in the exercise of control. Hence there are some areas of control that cannot be trusted to technology alone and vice versa. Thus, any temptations of, and promptings to, deterministic tendencies should not be encouraged in the exercise of control. Indeed managing the socio-technical relationship should be a constituent part of control as this study intends to advocate.
CODA

One cannot ignore the fact that control is a definite part of building institutional, regulatory structures for mutual cooperation when undertaking a venture of mutual interests. The study has revealed the respective strengths and weaknesses of both human and technology in the event of technological intervention from the point of view of a developing country. The recurring message from this study is revealing in several ways. For example, there is ample evidence to suggest that it does not make sense to anticipate gaining control over key entities in a joint undertaking will yield the desired result. To this end, sight should not be lost of the fact that control rotates around human beings and so has dynamic relationship with social systems. This view has been the ‘gospel’ and the philosophy the socio-technical school has been preaching for over a century (Galliers and Newell, 2001).

The EOS holds a profound challenge for both academics and practitioners in the IS field, especially those with a bent on developing countries. Control needs to be seen as an ongoing, negotiation process, not a one-off activity. It is possible for other equally important psychological concepts like trust to supplant control in certain situations. Therefore control should however be approached from a pragmatic point of view, implying a combination of different contingent strategies as diverge a s the nature of the interests of subjects to be controlled. It can therefore be assumed that the insights provided by his experience could possibly be a source for gathering a more cogent data for a related work in other developing economies in the foreseeable future. Exploring other themes like trust, power, collaboration and coordination from the standpoint of developing countries are likely to provide insights to widen and deepen our scope of understanding as IS researchers and practitioners.

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THE RELATIONSHIPS BETWEEN ECONOMIC, CULTURAL FACTORS, AND THE NETWORK READINESS OF AFRICAN NATIONS: A TEN-COUNTRY DATA ANALYSIS

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Abstract: This paper examines the relationships between cultural and economic factors, on the one hand, and the network readiness of African countries, on the other. For illustration purposes, data from ten (10) countries on the continent was used for analysis. The data came from reputable secondary sources, including the World Bank. A conceptual framework was developed, and relevant hypotheses tested. Correlation analysis and a series of multiple regressions were used to analyze the data. The results showed that the dimensions of culture related to individualism and masculinity and national economic wealth were positively related to network readiness. Further, the study’s results indicated that economic wealth of a nation was a better predictor of its ability to participate in and benefit from information and communication technologies (ICT) use for socio-economic development than cultural values and orientations. The study’s implication for policy making and research are discussed.

Keywords: National culture, economy, network readiness, Africa, ICT for development
THE RELATIONSHIPS BETWEEN ECONOMIC, CULTURAL FACTORS, AND THE NETWORK READINESS OF AFRICAN NATIONS: A TEN-COUNTRY DATA ANALYSIS

1. INTRODUCTION

According to the futurist, Toffler (1980) in his book, *The Third Wave*, the world’s civilization is at a stage where information, knowledge, and to some extent, Information and Communication Technologies (ICT) are among its most valuable assets. Indeed, ICT is critically important in the policy decisions of developed countries that continue to invest heavily in such products (Turner, 2001; Bui et al., 2003; Erunbam and de Jong, 2006). On the other hand, less developed parts of the world, including Africa, are only beginning to grasp how ICT-enabled services could be used to hasten development (Molla, 2000; G8 DOT Force, 2001; Ifinedo, 2005; 2006). Development reports (e.g. G8 DOT Force, 2001) and academic studies (e.g. Odedra et al. 1993; Avgerou, 1998; Bui et al., 2003; Mbarika et al., 2005; Ifinedo, 2005; Ifinedo, 2006) indicate that African countries are not fully ready to integrate into the information age. Several world bodies, including the United Nations have also recognized the debilitating nature of this imbalance (UN ICT Task Force, 2004; WEF, 2007). For example, the former United Nations Secretary General, Kofi Annan commented:

"Countries where most people don't have access to this [information] technology cannot play a full part in the new global economy, ... And, the countries which are least integrated into the global economy are, not surprisingly, those with the highest proportion of very poor people" (People’s Daily, 2000).

In the same vein, Avgerou (1998, p. 4) writes that "At the present, most developing countries are severely disadvantaged within a global economy which is increasingly more technology and information intensive: Unequal distribution of resources, such as telecommunications and technical skills, causes concern about the ability of developing countries to participate in the emerging world economy." African countries cannot afford to stand by the sideline and watch as the rest of the world integrates into this network economy (InfoDev, 2007; Ifinedo, 2005). A recent report on Africa stated “that future socio-economic development will need to embrace the use of ICT” (InfoDev, 2007, p.5).

In the developed countries, cross-country studies on the use of ICT for development have appeared (e.g., Caselli and Coleman, 2001; Comin and Hobijn, 2004; Waarts and van Everdingen, 2005; Erunbam and de Jong, 2006). Erunbam and de Jong (2006, p. 203) comment: “[w]hile some countries are receptive to [technological] changes, other countries appear to be less so.” Differences across nations (and regions) have been attributed to influences stemming from both economic and non-economic factors, i.e., “national culture.” Comin and Hobijn (2004), Caselli and Coleman (2001), and Gregorio et al. (2005), among others, suggest that national income levels and wealth could explain the differences among countries when it comes to each adopting ICT products and services. On the other hand, other researchers (e.g., Nath and Murthy, 2004; Waarts and van Everdingen, 2005; Erunbam and de Jong, 2006) have shown that the influence of national culture could explain the divergence. Our understanding of the factors impacting network readiness among countries in Africa is limited. Bridges.org (2001) suggests: “… the unique cultural and historical environment of a region must be taken … to truly gauge the country's e-readiness [similar network readiness] for the future.” This paper is motivated, in part, by the need to fill this gap in the research.
What do we know about African countries’ readiness for the network world? Which factors should the continent pay more attention to in order to integrate into the information age? And, what would the impacts of selected exogenous factors be on such an indicator? Suffice it to say that answers to the foregoing questions would be welcomed by policymakers on the continent and elsewhere (see G8 DOT Force, 2001).

Studies have discussed reasons why societies in Africa and in other comparable developing regions of the world lag behind advanced regions on the use of ICT for development, and terms such as “digital divide” have surfaced to underline such differences across nations (see e.g., Odedra et al., 1993; Agerou, 1998; Udo and Edoho, 2000; Mbarika et al., 2005; Ifinedo, 2005; 2006). However, not many studies have investigated the relationships between national culture and economic, on the one hand, and the network readiness of Africa’s countries, on the other. National culture and economic considerations, which previous studies have noted as being crucial in how nations adopt and use ICT, will be used in this study’s model. The two factors were chosen for illustration purposes, as it would be simplistic and spurious to suggest that Africa’s countries’ inability to fully integrate into the information age is attributable only to cultural and economic factors. Even in the context of network readiness assessment, it is accepted that a host of other factors may impact the preparedness of nations to use ICT for development (Bui et al., 2003; Ifinedo, 2005).

2. BACKGROUND

2.1 Network readiness of nations

The degree of preparation of a nation to participate in and benefit from ICT for socio-economic development is assessed by the Network Readiness Index (NRI) (WEF, 2007). Other organizations and researchers (e.g., Bui et al., 2003; Ifinedo, 2005) have used e-readiness to describe the same concept. The measure is developed by the World Economic Forum (WEF), and it accepts that ICT products and services have important roles to play in the advancement of societies and economies. The NRI provides scores for some 122 countries. It consists of three sub measures that assess the following: (a) - the supporting environment for ICT in a country, (b) - the readiness of the country’s key stakeholders [individuals, businesses and governments], (c) - the usage of ICT among these stakeholders.

2.2 National culture (cultural factors)

Hofstede (2001) defines culture as the collective programming of the mind which distinguishes the members of one group from another. The work of Hofstede has been widely recognized as the most dominant framework for theory development and validation in cross-cultural studies, and several studies have used it (e.g., Myers and Tan, 2002; Waarts and van Everdingen, 2005; Erunbam and de Jong, 2006). The four main cultural dimensions in Hofstede’s typology are briefly described below. The four main cultural dimensions in Hofstede’s typology are explained as follows: The Power Distance Index (PDI) measures the degree of equality, or inequality, between people in the country. The Individualism (IDV) index measures the degree to which a society reinforces individual or collective achievement. The Masculinity (MAS) “focuses on the degree the society reinforces, or does not reinforce, the traditional masculine work role model of male achievement, control, and power” (ITIM, 2009). The Uncertainty Avoidance Index (UAI) measures a society’s level of tolerance for uncertainty and ambiguity. Table 1 shows the scores of each dimension for the countries used in this study.
2.3 National economy (economic wealth)

It has been shown that the use and adoption of ICT across countries differ by the amount of wealth available to any given country (Caselli and Coleman, 2001; Bui et al., 2003; Comin and Hobijn, 2004; Gregorio et al., 2005). The Gross Domestic Product (GDP) per capita is among the most widely used measures for comparing the wealth of nations. It refers to the value of the total goods and services produced within a nation in a given year, divided by the average population for the same year (see the World Bank, 2007). Likewise, the World Bank also makes available data for GDP purchasing power parity (PPP). This measure gauges national wealth or standards of living across countries by adjusting for differences in the cost of living in different countries. The data for the selected African countries in this paper is presented in Table 1. Importantly, an attempt was made to select countries from the geographical regions (sub-regions) of Africa.

<table>
<thead>
<tr>
<th>Country</th>
<th>Economic climates</th>
<th>National cultural dimensions</th>
<th>NTR</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Africa</td>
<td>$10,600</td>
<td>$467.6 bil.</td>
<td>49</td>
</tr>
<tr>
<td>Egypt</td>
<td>$5,400</td>
<td>$431.9 bil.</td>
<td>80</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>$700</td>
<td>$55.07 bil.</td>
<td>64</td>
</tr>
<tr>
<td>Nigeria</td>
<td>$2,200</td>
<td>$294.8 bil.</td>
<td>77</td>
</tr>
<tr>
<td>Algeria</td>
<td>$8,100</td>
<td>$268.9 bil</td>
<td>80</td>
</tr>
<tr>
<td>Kenya</td>
<td>$1,600</td>
<td>$57.65 bil.</td>
<td>64</td>
</tr>
<tr>
<td>Benin</td>
<td>$1,500</td>
<td>$12.18 bil.</td>
<td>77</td>
</tr>
<tr>
<td>Zambia</td>
<td>$1,400</td>
<td>$15.93 bil.</td>
<td>64</td>
</tr>
<tr>
<td>Mali</td>
<td>$1,200</td>
<td>$14.18 bil.</td>
<td>77</td>
</tr>
<tr>
<td>Tanzania</td>
<td>$1,100</td>
<td>$43.49 bil.</td>
<td>64</td>
</tr>
</tbody>
</table>

Legend: bil. = billion; NTR = network readiness

3. RESEARCH FRAMEWORK AND HYPOTHESES

The research framework of this study is shown in Figure 1. It suggests that national culture and economic factors positively impact nations’ network readiness. Reports and studies have shown that the diffusion of technological innovations has been relatively lower in developing parts of the world partly due to unfavorable economic conditions (see e.g., Caselli and Coleman, 2001; Comin and Hobijn, 2004; UNECA, 2007; InfoDev, 2007). Others have indicated that differing cultural values and orientations may be the causes of disparities with regard to the diffusion of innovations (e.g., Hofstede, 2001; Warts and van E verdingen, 2005; Ernabam and de Jong, 2006). In brief, the foregoing detail provides some rationale for the proposed conceptualization. Next, the hypotheses to be tested are formulated.
The global data for the network readiness shows that several high and middle-income countries have higher scores on the index than do their poorer counterparts (WEF, 2007). Other studies (e.g., Caselli and Coleman, 2001; Nath and Murthy, 2004; Comin and Hobijn, 2004; Gregorio et al., 2005) have also shown that wealthier countries tend to have more access to resources to build on potential of ICT-enabled services such as e-business and e-government, which invariably help to increase their network readiness. Given the critical importance of economic resources in enhancing a country’s capability to adopt and use technological innovations for development, it is likely that wealthier African countries will have higher network readiness scores than those with lesser economic resources. Thus, it is hypothesized that:

H1: There will be a significant positive relationship between national economic climates and network readiness for African countries.

It is reasonable to suggest that countries with high Power Distance Index (PDI) scores would have lower network readiness because in such nations the “inequalities of power … have been allowed to grow within the society” (ITIM, 2009). Waarts and van Everdingen (2005, p. 305) note that “centralized decision structures, authority and the use of formal rules are therefore often the characteristics of organizations in countries with a high degree of power distance.” In other words, entities in countries with high PDI scores would expect their governments and other higher authorities to provide leadership roles for most initiatives, including the adoption of ICT products for developmental purposes. In contrast, it is more likely that entities in countries with lower PDI scores would be autonomous in their use of such products. Thus, it is hypothesized that:

H2a: Countries in Africa with higher PDI scores will have lower network readiness index scores

In brief, in more individualistic societies, emphasis tends to be placed on the performance of the individual rather than that of the group (Hofstede, 2001). According to Kovačić (2005, p.147), “time management [issues] would be [considered] important and any technology that could help individuals to perform more efficiently would be highly regarded and quickly accepted.” The foregoing may suggest that countries with higher IND scores would be the
ones with higher network readiness scores. That is, such countries would not find it difficult
to use ICT-based products for development. Thus, it is predicted that:

**H2b**: Countries in Africa with higher IND scores will have higher network readiness index
scores

As was noted above, the MAS dimension describes the extent to which any society reinforces
masculine achievement and control. It is to be expected that regions where material success
and achievement are valued highly would also have a positive attitude toward implementing ICTs if
the technologies improve performance, increase the chance of success and support competition,
which are all key factors of a masculine culture.” To some degree, this foregoing assertion
could be interpreted to mean that more masculine societies are prepared and ready to use ICT
products and services for advancement. It is hypothesized that:

**H2c**: Countries in Africa with higher MAS scores will have higher network readiness index
scores

UAI refers to how a society deals with uncertain and ambiguous situations that it may
confront. Countries with strong uncertainty avoidance would be averse to adopting or
accepting new technological products and services, including IT-related ones. On the
contrary, nations with lower uncertainty avoidance scores would be more likely to adopt ICT-
based initiatives for development. Nath and Murthy (2004) found positive relationships
between the diffusion of the Internet and UAI. Thus, it is hypothesized that:

**H2d**: Countries in Africa with higher UAI scores will have lower network readiness index
scores

4. RESEARCH METHODOLOGY

Data for this study came from reputable sources, including the World Bank, and the World
Economic Forum (WEF, 2007). As was noted above, the cultural dimensions of each country
was obtained from the work of Hofstede (2001), which is also kept online at:
http://www.geert-hofstede.com/hofstede_dimensions.php (ITIM, 2009). For illustration and
simplicity purposes, this study used ten (10) countries, which are shown in Table 1. As noted
above, effort was made to include countries from the sub-regions – North, West, South, and
East - of the continent. The economic variables used to gauge national wealth or economic
strengths across the chosen countries included GDP per capita and the GDP-PPP. The
summaries were extracted from the World Bank (2007) and CIA World Factbook (2007). The
GDP and GDP-PPP variables were transformed and normalized with a logarithmic function,
i.e., \( \ln \). Pearson’s correlation and regression analysis were used for data analysis on the SPPS
14.0 software.

5. DATA ANALYSIS

The correlation matrix is shown in Table 2. It can be seen that the two variables used to
operationalize national economic wealth have strong positive relationships with network
readiness. (The correlations were significant at the 0.01 level). As such, the hypothesis, H1
can not be rejected. With regard to the cross-cultural dimensions, the data analysis found
support for the following hypotheses: H2b and H2c. No support was found for the other two
cultural dimensions, i.e., H2a and H2d. (The correlations are significant at the 0.01 level).
In order to gain a deeper understanding of the effect of the exogenous factors on the network readiness variable, stepwise regression analysis were performed on the dataset. The effects of economic wealth and national culture were separately regressed on the dependent construct: network readiness. Next, all the variables together were regressed on the dependant variable. The three regression models used are represented as follows:

\[
NTR_j = \alpha + \beta_1 \text{IDV}_j + \beta_2 \text{MAS}_j + \beta_3 \text{UAI}_j \tag{1}
\]

\[
NTR_j = \alpha + \beta_1 \text{GDP}_j + \beta_2 \text{GDP-PPP}_j \tag{2}
\]

\[
NTR_j = \alpha + \beta_1 \text{GDP}_j + \beta_2 \text{GDP-PPP}_j + \beta_3 \text{IDV}_j + \beta_4 \text{MAS}_j + \beta_5 \text{UAI}_j \tag{3}
\]

The \( \alpha \) and \( \beta \)s are parameters to be estimated, and the subscript \( j \) are used to indicate the countries. SPSS 14.0 dropped the PDI variable perhaps due to the insignificant nature of this particular dimension in the model. In all the analyses, multicollinearity was not seen to be a major problem for the study. The effect of multicollinearity was assessed by checking that the variance inflation factor (VIF) of each variable was not beyond acceptable limits. The t statistic and its significance value are used to test the null hypothesis that the regression coefficient is zero. The coefficient of determination, \( R^2 \) is used to assess the amount of the variation explained by the regression model. The results in Table 3 show that 70% of the variation in the model is accounted for when only the cultural variables were regressed on the dependent construct. Seventy eight percent (78%) of the variations in the main construct was explained by the economic indicators.
Table 3. Regression analyses results of each of the factors on network readiness

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>R²</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td></td>
<td></td>
<td>0.70</td>
<td>8.03</td>
<td>.016</td>
</tr>
<tr>
<td>IDV</td>
<td>.008</td>
<td>.011</td>
<td>.771</td>
<td>.470</td>
<td></td>
</tr>
<tr>
<td>MAS</td>
<td>.037</td>
<td>.022</td>
<td>1.691</td>
<td>.142</td>
<td></td>
</tr>
<tr>
<td>UAI</td>
<td>.003</td>
<td>.012</td>
<td>.262</td>
<td>.802</td>
<td></td>
</tr>
</tbody>
</table>

Cultural variables regressed on Network readiness

Economic variables regressed on Network readiness

Table 4. Regression analyses of all the factors on network readiness

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>R²</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td></td>
<td></td>
<td>.821</td>
<td>.803</td>
<td>1.022</td>
<td>.364</td>
<td></td>
</tr>
<tr>
<td>IDV</td>
<td>.341</td>
<td>.250</td>
<td>1.367</td>
<td>.243</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAS</td>
<td>.076</td>
<td>.011</td>
<td>-1.98</td>
<td>.853</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UAI</td>
<td>-.002</td>
<td>.026</td>
<td>.357</td>
<td>.739</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>InGDPc</td>
<td>-.018</td>
<td>.015</td>
<td>-1.204</td>
<td>.295</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>InGDPP</td>
<td>138</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When all the factors together were regressed on network readiness index construct (see Table 4), again 78% of the variation in the model is accounted for. The seemingly high $R^2$s (in all the analyses) suggest that the exogenous factors considered in this study are relevant to the dependent variable, at least in the context of the data used for this study.

6. DISCUSSIONS AND CONCLUSION

The purpose of this study is to increase our understanding of the network readiness of Africa’s countries. To that end, data from ten (10) countries on the continent were used in this preliminary analysis. The premise is that by researching the network readiness of Africa’s countries vis-à-vis such factors as national culture and economic wealth, among others, Africa’s policy makers would gain insights into issues that could hasten the integration of the continent into the emerging global network economy (and information age). From the perspective of the selected countries in this study, this paper has shown that there is a strong relationship between some dimensions of national culture, i.e., individualism and masculinity and economic wealth, on the one hand, and network readiness, on the other.

For the economic wealth variables, the data showed that wealthier African countries are better poised to reap the benefits of using ICT for development in the information age. Such countries are more likely to have higher network readiness scores. More importantly, the economic wealth of a nation was found to be more important in its capability to use ICT for development than cultural norms and values. (The percentage of the variation explained by economic indicators alone in the model compares with the result for all the factors combined) (Please see Table 4). This information implies that the more economic resources an African country possesses, the more likely it is for it to integrate into the evolving network world. Cultural values and norms, though important, may not be as critical as the availability of economic resources.
The statistical analysis using data for the ten Africa’s countries provides support for two out of the four hypotheses that were formulated for the relationships between national culture and the network readiness index. The results showed that there was a negative relationship between PDI and network readiness as predicted; however, the relationship was seen to be insignificant. This result permits us to suggest that stakeholders across African societies might have fully understood the value and import of ICT for development to such an extent that support from a higher authority is no longer considered vital in shaping perceptions. This conclusion may be at odds with conventional wisdom suggesting that strong leadership on the African continent is needed in moving forward technological-related initiatives (G8 DOT Force, 2001; Mbarika et al., 2005; Ifinedo, 2006; InfoDev, 2007). Similarly, the data did not provide support to the prediction that African countries with strong uncertainty avoidance would be averse to adopting or accepting new technological products and services, including IT-related ones. This permits the suggestion that all the countries hold comparable view of the benefits of ICT. Overall, a prior study in the literature by Nath and Murthy (2004) offered an analogous interpretation to our result; they reported that the PDI may not permit meaningful conclusions with regard to ICT and cultural issues.

Masculinity was found to be positively related to network readiness, confirming the proposition that countries with preferences for material success and achievement would value and use ICT products to their advantage more than their counterparts with lesser inclinations toward such things. In the same vein, countries with higher individualistic scores tended to outperform those with lower scores on the network readiness index. This may suggest that African countries that encourage the exploitation of technological innovations for the benefit of the individual rather than for the group will continue to fare favourably in their quest to reap the benefit of the information age. Researchers (e.g. Comin and Hobijn, 2004; Waarts and van Everdingen, 2005; Erunbam and de Jong, 2006) have suggested a nexus between the individual use of technological innovations and the advancement of the nation state. Naturally, African societies tend to place more emphasis on “the group” than on the individual (Hofstede, 2001). In that regard, the result suggests that countries in the region where attention is paid to the individual would have more capacity for the information age. This finding, by means, suggests that ICT adoption has tallied in collectivistic countries. Evidence from China and elsewhere speaks to this reality (Chau et al., 2008). Rather, what is suggested, based on the study’s data, is that individualistic countries appear to outperform group-oriented cultures with regard to their network readiness index scores.

There study offers implications to both researchers and policy makers. The degree of data’s variability for the relationships between the selected factors infers that the Africa’s countries cannot be taken as a monolith, at least in the context of network readiness as assessed. Although African countries have relatively poor scores on the network readiness index, it may be misleading to lump all the countries on the continent into one pot. This study has shown that there are salient differences that should not be overlooked. For example, the NRI scores for South Africa and Egypt are significantly higher than those of Zambia and Mail (see Table 1). Researchers are alert to relevance of such factors as national culture and economic climates vis-a-vis technological innovations. This present effort complements the works of others (Odedra et al. 1993; Molla, 2000; Mbarika et al., 2005) that have discussed ICT and developmental issues on the African continent. In particular, the statistically significant relationships in the study’s variables make a contribution to the growing body of knowledge on developmental ICT issues in Africa. Empirical evidence in this study provides support for the studies of others (e.g. Caselli and Coleman, 2001; Comin and Hobijn, 2004;
Gregorio et al., 2005) that have highlighted the relevance of economic resources for the diffusion of technological innovations across countries.

Recently, WEF (2007) notes that some African countries have started to spend heavily on ICT products with a view to redressing their poor network readiness in the global economy. This is an encouraging move; however, external assistance may be required to help the less economically endowed countries on the continent that are unable to marshal resource for such investment. This would ensure that no country is left far behind in the new order. It is worth noting that the selected factors and variables used in this study are not claimed to be the only influences that could impact a nation’s ability to harness ICT for development. More insights on others influences are expected.

As we conclude, it is important to highlight some of the limitations in this work. Some of these relate to the selection of the countries. We are hard-pressed to say that the selected countries unequivocally reflect patterns and trends in the other countries in Africa. Moreover, our choice of ten, though varied and comprehensive, might be limiting. A larger sample of countries might permit a deeper insight. Lastly, there is a fundamental flaw in Hofstede’s work wherein “culture” in a nation-state is assumed to be monolithic (e.g., Myers and Tan, 2002; Walsham, 2002). It is known that even in one single nation there are different cultures. Walsham (2002) in critiquing Hofstede’s cultural typology suggests that other frameworks and approaches may be more applicable to developing societies. This research did not take such approaches into account. Further, the network readiness index proposed by the WEF (2007) has its limitations, and this might have impacted this study’s analyses. Future studies could address some of the limitations discussed herein. Other research methods and frameworks could be used. Similar efforts to this one in comparable regions of the world could be undertaken to facilitate comparative insights. Lastly, the impact of other relevant factors such as human capital not considered here could be examined.

7. REFERENCES


INVESTIGATING PERCEPTION OF THE ROLE OF ICT TOWARDS THE QUALITY OF LIFE OF PEOPLE IN RURAL COMMUNITIES IN UGANDA

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Abstract: The role of Information and Communication Technology (ICT) in enabling various development goals and ultimately human development is no longer disputed. As such, efforts are evolving from just increasing availability and access, to addressing aspects of sustainability and impact of ICT with the aim of optimizing ICT benefits on the Quality of Life (QoL) of people in developing countries. This paper reports a study that applied Sen’s Capability Approach to investigate people’s perception of the opportunities ICT can offer towards their QoL vis-à-vis the actual achievements. It establishes that while people value a range of mostly social aspects that ICT enables, only a few are exploited. This predominant ICT uses for social interaction and pleasure suggest that people lack awareness of the full potential of ICT towards their QoL. It is therefore the obligation of the state and policy makers to adopt a pluralistic approach to ICT provision, one that does not only focus on availability and affordability, but also considers expanding people’s awareness and agency for development benefit.

Keywords: quality of life, Sen’s Capability Approach, Information and Communication Technology for development (ICT4D), rural communities, Uganda, ICT contribution
1. INTRODUCTION

Development as the ultimate goal for Information and Communication Technology for development (ICT4D) undertakings has been variously conceptualized: from economic growth to modernization and, most recently, from a people-centered or human development perspective (Forestier et al. 2002; Prakash and De’ 2007). The human development approach is increasingly taking precedence over the other approaches owing to its multidimensional nature and concern for the “who” and “how” in the development process. For example, while economic growth at both macro and micro level is an influential and significant proxy for human development; it only provides a one-dimensional, money-metric perspective of quality of life (QoL). Additionally economic growth comes forth as only an essential means rather than a goal to human development (Gasper 2002). Also, while modernization posits that development is the life experienced by individuals in developed countries and what developing countries should emulate (Peet and Hartwick 1999), human development considers the influence of contextual factors such as social, political as well as cultural conditions and values in the achievement of a good life.

One of the influential approaches to conceptualizing human development is Amartya Sen’s Capability Approach (SCA) which insists on constructing “development as freedom”. Development in this case is when people have more freedom (opportunities) to live the lives they value and a good life is one of freedom from such things as poverty, political oppressions and inequalities (Sen 1985). From this perspective, freedom is central to the investigation of development both as an ultimate end and a principal means with intrinsic and instrumental value respectively (Sen 2000). As an end, development is not only the rise in income or technology advancement for example the possession of a mobile phone but what the phone enables one to do, the opportunities it provides for the owner to meet personal goals and values. Development as an end refers to the substantive freedoms or the intrinsic, individual capabilities/opportunities that people value, which the resource makes available for people to exploit. It includes aspects such as self-esteem, obtaining an education, being healthy etc¹. This development aspect also emphasizes “agency” which refers to the “freedom to set and pursue one’s own goals and interests” (Zheng 2007 pp 4). Accordingly freedom-oriented development highlights the need for development recipients to participate as agents rather than passive recipients in the development process. In addition freedom as a means has instrumental value that contributes to the realization of the substantive freedoms (Sen 2000). These instrumental freedoms are external to people’s substantive freedoms and are the different kinds of rights, opportunities and entitlements; which according to Sen (2000) these include: social opportunities, economic facilities, political freedoms, transparency guarantees and protective security. In addition to their contribution to people’s substantive freedoms the strength in the instrumental freedoms lies in their complementary nature towards the attainment of a good life. Therefore any definition of a good life – life’s opportunities comprises both the means and ends to development in terms of substantive and instrumental freedoms respectively. The attainment of such a life (achieved functionings) is further

¹ In accordance with SCA once achieved, these capabilities are referred to as ‘achieved functionings’.
influenced by human diversity in terms of personal, social and environmental conversion factors. Evidently a capability (or freedom) oriented perspective motivates a people-centered approach to development in terms of quality of life (QoL), explicitly and implicitly considering issues of empowerment, sustainability and impact which are major concerns in the current ICT4D practice and research (Heeks 2008).

In practice, the focus on opportunities is especially vital for policy as it emphasizes a range of possibilities, revealing the gap between what is perceived as important and what is actually achieved. As Alampay (2006) points out in relation to ICT, opportunities comprising both achieved and unrealized functionings are evidence for ICT services required in the rural communities with the potential to influence policy on service provision in these communities. Gasper (2002) further reiterates that prioritizing freedom in terms of capabilities is a ‘policy principle’. Moreover, Robeyns and van der Veen (2007) point out that policymakers are mandated to provide real options for quality of life even though they cannot decide how people live their lives. Furthermore despite the fact that quite a number of QoL investigations have been made from an economic and materialistic perspective, just a few approaches adopt a broad, systematic inquiry into life values as perceived by people in rural communities (Arku et al. 2008), especially in relation to ICT. This is somewhat surprising since people in the developing country context have similar social, emotional and psychological needs as people in the developed countries. Needless to say, even from a materialistic perspective, these general values are of very high importance and vital inputs in development plans.

A growing body of ICT4D research is applying a capability perspective to aspects such as social exclusion or the digital divide (Zheng and Walsham 2008), and evaluating the developmental impact of specific ICT applications e.g. e-government (Madon 2004; Alexander and Phahlamohlaka 2006; De’ 2006). The application of SCA to the existing research is of various forms: for example defining capabilities as the capacity or ability to use ICT (Garnham 1997; Alampay 2006), surveying the contention between ICT4D projects as either welfare or agency-based approaches to development (Ratan and Bailur 2007), investigating exclusion as capability rather than resource deprivation (Zheng and Walsham 2008). Zheng’s (2007) and Johnstone’s (2007) applications of SCA are more generic providing illustrations for its most appropriate use in e-development and computer ethics respectively. It is noteworthy that majority of these studies were carried out in Asia (India, China and the Philippines), while the application of SCA in research in Sub Saharan Africa is still emergent.

Against this background, this paper reports a study that adapted SCA as an analytical framework in developing an understanding of how individuals in rural communities in Uganda perceived the importance of ICT towards their QoL; and how this perception influences ICT adoption. The overarching argument is that ICT benefits for the QoL of the rural poor are embedded within a complex ICT-QoL relationship. Presumably this complexity accounts for the limited uptake or failure of ICT initiatives in this context, which are in most cases limited to the acquisition of technology. It is therefore posited here that a QoL perception from a capability perspective, relating personal needs as well as values and aspirations to ICT resources facilitates the understanding of this complex relationship. This in turn influences the adoption and use of ICT within a given context. The study defines quality of life in terms of SCA’s capabilities construct as the opportunities (freedoms) that facilitate people to live a life they value within a specific context. It is however important to point out that this paper is limited to what the rural poor perceive as the importance of ICT towards
their QoL (i.e. the opportunities and achievements they can derive) and does not extensively consider how this perception vis-à-vis the contextual factors influences adoption.

Section two adapts features of SCA and QoL principles to develop the theoretical definition of the dimensions and indicators adopted for the study. Sections three and four discuss the methodology employed and the subsequent findings respectively, while section five provides a detailed discussion of these findings, limitations to the study and suggestions for future works. Section six concludes this paper by presenting the contributions of this work and their implication to ICT4D practice aiming to ensure that ICT optimally benefits individuals in rural communities in developing countries.

2. QUALITY OF LIFE DIMENSIONS AND INDICATORS

The QoL definition proposed in this study is one that focuses on opportunities as comprising both substantive and instrumental freedoms. While Sen points out the distinctive nature of these two freedoms, he also recognizes that for an inclusive understanding of the connection between development and freedom, there is need to consider both aspects. From Sen’s viewpoint, “[t]he intrinsic importance of human freedom, in general, as the preeminent objective of development is strongly supplemented by the instrumental effectiveness of freedoms of particular kinds to promote freedoms of other kinds (Sen 2000 pp xii).” Furthermore some freedoms are of both intrinsic and instrumental value. For example while healthcare and education are social opportunities that require policy action, they are also constitutive of one’s personal freedom. The rational is that the major goal for any development initiative is to increase people’s freedoms. In effect the initiative should be assessed on its ability to increase people’s internal capacities such as self-esteem, and the external opportunities which contribute and guarantee people’s substantive freedoms. In support of this approach Alkire (2008) further points out that in choosing dimensions based on the capability approach, it is important that considerations of both instrumental effectiveness and resultant outcomes are considered. This way focus is not only limited to the outcomes, but also the process of development which is the channel through which policy action influence the outcomes. For instance Alkire (2005) illustrates that a small scale development initiative targeting people living with AIDS in South Africa increased individual freedoms such as earning an income, friendship and group support. This initiative also indirectly expanded these abilities through influence on instrumental freedoms such as capacity to access high-value markets, ability to keep accounts etc. Furthermore, in identifying QoL indicators Clark (2003) established that participants in South Africa equally valued economic and social resources such as access to an income or healthcare as much as they valued a good family.

Similarly in analyzing the ICT and QoL relationship, SCA enables a direct analysis of the influence of ICT on people’s substantive freedoms; and its indirect influence through the instrumental value of ICT to realizing substantive freedoms. In relation to ICT, Johnstone (2007) points out that ICT can directly enhance such individual capabilities like interaction and expression; or indirectly enhance opportunities such as education delivery (e-learning) and political participation (e-government) which in turn expand people’s capabilities.

In an effort to provide a holistic picture regarding the role of ICT towards the QoL of people in rural communities a developing country context the study adopts three QoL dimensions synthesized from Sen’s propositions of five instrumental freedoms in an earlier study.
(Kivunike et al. 2008); these are social opportunities, economic facilities and political freedoms. According to Sen (1999 pp. 38-39) social opportunities refers to arrangements society makes available to enable an individual to live a better life; economic facilities refer to the opportunities that individuals enjoy to utilize resources for the purpose of consumption, production, or exchange; and political freedoms refer to opportunities people have to exercise their political rights. The motivation for choosing three of the five freedoms was based on their interrelated nature. In effect protective securities and transparency guarantees are inherent within the chosen dimensions and are therefore assimilated as such in this paper. For example, transparency or trust is exhibited when citizens can freely exercise their political freedom, or the existence of non-bureaucratic processes in conducting financial transactions and accessing social services like education and health. Similarly, protective securities infer that a citizen is secure if they can easily contact authorities or relatives in case of disaster, natural or otherwise. Protective security further implies that people have access to economic resources and jobs to sustain their livelihoods. It is argued here therefore, that an individual’s QoL is well represented by both intrinsic and instrumental social, economic and political opportunities that people value.

From a pragmatic perspective, the social, economic and political dimensions are rather generic requiring further breakdown in terms of indicators to facilitate an empirical investigation. In this respect quality of life literature has extensively surveyed and proposed indicators that suggest a good life (cf. Felce and Perry 1995; Hagerty et al. 2001; Clark 2003). Kivunike et al. (2008) proposed a list of indicators derived from two such studies: 1) Narayan et al’s (2000) - an empirical study that established how people in 23 developing countries perceived a good life; and 2) Schalock (2004) – an expert review of QoL studies in various disciplines published between 1976 and 2004. The purpose of the synthesis was to capture both a context-specific and broad perspective of what made life worth living. It is posited that the combination of these two studies addresses this need since it considers a QoL perception from a developing country context as well as a multi-disciplinary perspective. As presented in Table 1, social opportunities dimension comprises QoL aspects of personal development, physical, social and emotional well-being; economic facilities dimension caters for material well-being and political freedoms cater for people’s rights and security.

Effectively the proposed indicators provide a level of granularity relevant for an empirical investigation. However they require adaptation from a CA perspective to reflect the influence of ICT in terms of the opportunities that ICT characteristics of information and communication make possible (See Table 1). For example good health as a QoL indicator - an end with intrinsic value is adapted to the capability of being able to obtain information on good health practices, or ability to contact a doctor when one is ill. It is assumed here that directly relating ICT to a need facilitates the understanding of the ICT-QoL relationship, providing vital input for policy formulation. The list of indicators further incorporates human agency when it considers the aspects of keeping in touch with family and relatives, similar to being able to interact with others as suggested by Gasper (2002) and Anand and van Hees (2006). It is important to underscore here that this list might not be exhaustive but suffices as an indicative list to guide an empirical study since it is grounded in existing empirical and theoretical works. In addition, similar lists or a combination thereof, have acquired practical use as an establishment of individual or community information/communication needs (see for instance e-usage household survey conducted by Research ICT Africa).

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2 http://www.researchictafrica.net/ (accessed August 29 2008)
### Table 1: QoL dimensions and ICT opportunities

<table>
<thead>
<tr>
<th>QoL Dimensions</th>
<th>QoL Domains</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social opportunities</td>
<td>Physical well-being</td>
<td>Information on good health practices e.g. family planning, AIDS</td>
</tr>
<tr>
<td></td>
<td>Social well-being</td>
<td>Information on availability of drugs and their costs</td>
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<tr>
<td></td>
<td>Emotional well-being</td>
<td>Being able to contact a doctor</td>
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<tr>
<td></td>
<td>Personal development</td>
<td>Sensitization on appropriate sanitation practices e.g. building latrines, boiling water</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Keeping in touch with family and friends</td>
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<tr>
<td></td>
<td></td>
<td>Obtain News (local, national, international and sports)</td>
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<tr>
<td></td>
<td></td>
<td>Entertainment e.g. listen to music, watch movies, play games</td>
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<tr>
<td></td>
<td></td>
<td>Conduct cash transfers e.g. remittances to family</td>
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<tr>
<td></td>
<td></td>
<td>Information on community activities, interest groups e.g. youth, women</td>
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<tr>
<td></td>
<td></td>
<td>Information on relevant spiritual and religious observations</td>
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<tr>
<td></td>
<td></td>
<td>Information on Adult education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information on availability of schools e.g. location, school fees</td>
</tr>
<tr>
<td>Economic Facilities</td>
<td>Material well-being</td>
<td>Information on farming/agricultural practices e.g. modern techniques,</td>
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<tr>
<td></td>
<td></td>
<td>Market information e.g. prices and availability of goods</td>
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<tr>
<td></td>
<td></td>
<td>Investment opportunities, plans and practices e.g. in assets like land, livestock</td>
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<tr>
<td></td>
<td></td>
<td>Local micro-finance or banking opportunities</td>
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<tr>
<td></td>
<td></td>
<td>Information on job/employment opportunities</td>
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<tr>
<td></td>
<td></td>
<td>Advisory services on career building or development</td>
</tr>
<tr>
<td>Political Freedoms</td>
<td>Rights and Security</td>
<td>Information on the state or local government e.g. LCs, district administration</td>
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<tr>
<td></td>
<td></td>
<td>Sensitization on civil rights e.g. e.g. domestic violence, gender issues</td>
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<tr>
<td></td>
<td></td>
<td>Information on national/local rules and regulation e.g. paying taxes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Being able to contact people e.g. local leaders in case of an emergency</td>
</tr>
</tbody>
</table>

### 3. METHODOLOGY

#### 3.1. Case Description

The study was conducted in a selection of four (4) rural communities in Uganda between May and July 2008. Uganda similar to several other developing countries has the majority (85%) of its population residing in rural communities according to the 2005/06 national household survey report (UBOS 2006), which also reported only a small rate of rural-urban migration. The major economic activity is subsistence farming (58%), poverty levels are at 85% and literacy levels are slightly above 50%. To facilitate rural development, government, international and private investors are among others implementing and promoting the use of ICT at various levels. Most significant among these is the Universal service/access fund – the Rural Communications Development Fund - which aims at providing access to basic communications services within a reasonable distance to all the people in Uganda; leveraging investment into rural communications development; and promoting ICT usage in Uganda. The fund policy was developed in 2001 and has been in implementation since 2003 in districts all over the country. Some of the implemented services include: Internet points of presence, Internet cafes and training centers, web portals, public pay phones and most recently school and health-care ICT facilities.

It is important to point out that investigating perception of the role of ICT towards the QoL in a mostly poor community presents some challenges. Most significant is the lack of awareness, knowledge or experience of how information and communication can facilitate the attainment of a good life. In consequence this required precautions in the choice of study sites and methods to ensure rigor in the obtained results.

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3 http://www.ucc.co.ug/rcdf/default.php
### 3.2. Study Site Selection

The selection of study sites was accomplished through purposive sampling which according to Creswell and Clark (2007) involves the intentional selection of study sites and participants who can provide the essential information for a study. First was to ensure regional representation through the selection of a district from each of the 4 regions of the country. Secondly, a county in which an operational universal access fund ICT access facility (Internet café or training center) had been in existence for four or more years was chosen per district (with a few exceptions as discussed below). This was anchored in the need for respondents to have some exposure to various forms of ICT including radio, television, mobile phone, internet/computers and the public payphone.

Third, two parishes were chosen per county in proximity to the ICT facility. The aim was to create an element of adopters - possibly those who could easily access and non-adopters - those who are probably limited by distance in accessing the ICT services. This also explains the selection of two rather than one county in Kayunga and Mbale districts. For instance, in Kayunga district the ICT facilities were set up in Ntenjeru County. However Ntenjeru is rather small (534 km$^2$) raising the assumption that all its inhabitants can easily access the facilities. In this case another county, Bbaale was opted for to cater for the distant cluster. A similar explanation holds for the selection of Bungokho County in addition to Mbale Municipality which is approximately 24 km$^2$.

Respondents who comprised of adults above 16 years were then randomly selected from households within each parish. The number of respondents selected per study site was proportional to the regional population distributions of the four chosen districts. Other criteria used in this selection process were the willingness of ICT facility owners to participate in the study and the aspect of respondent fatigue. Respondent fatigue was especially important as a number of both national and private surveys have taken a toll on willingness to participate all-over the country. For instance, Research ICT Africa recently concluded a nation-wide e-access and usage survey which aimed at establishing a general status in the adoption of ICT in a number of countries in Africa (RIA! 2007). As a precautionary measure, the choice of districts in our study eliminated districts that participated in the RIA survey. The final selection of study sites is presented in Table 2.

<table>
<thead>
<tr>
<th>Region</th>
<th>District</th>
<th>County</th>
<th>County Size (Km$^2$)</th>
<th>Parish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>Kayunga</td>
<td>Ntenjeru</td>
<td>534.4</td>
<td>Bubajjwe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bbaale</td>
<td>1189.7</td>
<td>Bbaale</td>
</tr>
<tr>
<td>Eastern</td>
<td>Mbale</td>
<td>Mbale Municipality</td>
<td>24</td>
<td>Malukhu</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bungokho</td>
<td>494.3</td>
<td>Bufukhula</td>
</tr>
<tr>
<td>Western</td>
<td>Masindi</td>
<td>Buruuli</td>
<td>2795.8</td>
<td>-</td>
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<td></td>
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<td></td>
<td>Civic Centre</td>
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<td>Kimengo</td>
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<td></td>
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<td></td>
<td></td>
<td>-</td>
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<tr>
<td>Northern</td>
<td>Apac</td>
<td>Maruzi</td>
<td>1814.7</td>
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<td></td>
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<td></td>
<td>Akokoro</td>
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<td></td>
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<td></td>
<td>Abedi</td>
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</tbody>
</table>

### 3.3. Data Collection

The study adopted a mixed methods approach comprising multiple data collection techniques. A survey questionnaire comprising of closed questions which aimed to validate the theoretically generated indicators was designed. The questionnaire had two questions with four-point likert scales each. The first was in relation to opportunities requiring respondents to specify the importance of the various aspects. The second then established achievement in
terms of how frequently the respondents exploited the various opportunities. This is especially important as it draws attention to what people perceive as important and whether they are actually benefitting or not from the available opportunities given various personal and contextual characteristics like age, gender, level of education etc. The questionnaire also had an open-ended question of factors that influenced the adoption of various forms of ICT. A pilot study was conducted within a community outside the selected study sites by field experts who had undertaken similar surveys in rural communities. A number of revisions in wording and missing indicators were consequently recommended and effected. The study context comprising of individuals with varied levels of literacy demanded that the questionnaire be administered by trained research field assistants so as to minimize incidences of non-response and misinterpretation.

Secondly, focus group interviews were conducted to establish participants’ perception of a good life, how this can be achieved through ICT, as well as the factors that affect the full realization of ICT benefits. The focus group interviews were organized and conducted with people who came to use the ICT facilities on the assumption that they were relatively conversant and possibly had access to the other technologies.

4. FINDINGS

This section presents findings from both studies. To analyze the survey data, SPSS data analysis package was used to perform the following: (1) descriptive statistics were used to analyze perception (opportunities) of the importance of ICT towards their QoL and actual achievements in terms of frequency of exploitation of the various opportunities. (2) An analysis of variance (ANOVA) test was performed to study the possible influence of the various demographic characteristics on the perception of the opportunities individuals could derive from ICT. Similar approaches have been used to assess QoL functionings and capabilities conceptualized through SCA (Kuklys 2004; Anand et al. 2005; Alampay 2006; Anand and van Hees 2006). (3) The focus group interview findings were also collated and presented in terms of the QoL definition and the role of ICT towards this definition.

4.1. Demographics Characteristics

The questionnaire was administered to 454 respondents out of which 445 were usable results. The focus group interviews were conducted with 22 participants in total: 13 from Kayunga and 9 from Mbale districts. Details of the sample demographics are summarized in Table 3.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Survey Sample Frequency</th>
<th>Percentage</th>
<th>Focus Group Sample Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>224</td>
<td>52.7</td>
<td>5</td>
<td>22.7</td>
</tr>
<tr>
<td>Male</td>
<td>201</td>
<td>47.3</td>
<td>17</td>
<td>77.3</td>
</tr>
<tr>
<td>B. Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 to 25</td>
<td>157</td>
<td>35.8</td>
<td>12</td>
<td>54.5</td>
</tr>
<tr>
<td>26 to 35</td>
<td>162</td>
<td>37.0</td>
<td>9</td>
<td>40.9</td>
</tr>
<tr>
<td>36 to 45</td>
<td>83</td>
<td>18.9</td>
<td>1</td>
<td>0.05</td>
</tr>
<tr>
<td>Above 45</td>
<td>36</td>
<td>8.2</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>C. Highest level of education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>146</td>
<td>32.9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Secondary</td>
<td>112</td>
<td>25.2</td>
<td>10</td>
<td>45.5</td>
</tr>
<tr>
<td>Tertiary</td>
<td>66</td>
<td>14.9</td>
<td>11</td>
<td>50.0</td>
</tr>
<tr>
<td>Vocational</td>
<td>33</td>
<td>7.4</td>
<td>1</td>
<td>0.05</td>
</tr>
<tr>
<td>None/other</td>
<td>87</td>
<td>19.6</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
4.2. Survey Findings

a) Perception of ICT Opportunities and Actual Achievements

Table 4 summarizes the means and standard deviations of the perceived importance of various ICT capabilities on individuals’ QoL; and achievements in terms of frequency of use. Four-point likert scales were used for both questions: the opportunities’ scale ranged from 1 - not important to 3 very important; while the achievements’ scale ranged from 1 – rarely (3 or more months) to 3 - always (weekly/daily). Respondents perceived keeping in touch with family and friends, entertainment accessing news and information on improved health practices as the most important opportunities ICT can avail, while being able to conduct cash transfers and having access to information on adult education were perceived as least important. On the whole respondents perceived as important the various information and communication opportunities ICT can offer. In as far as achievements are concerned, obtaining information on community activities or on adult education were thee least achieved. On the other hand use was more in the social aspects of keeping in touch with family and friends, accessing news and various forms of entertainment. Overall respondents registered the limited exploitation of ICT for their QoL needs

<table>
<thead>
<tr>
<th>Opportunities*</th>
<th>Mean</th>
<th>SD</th>
<th>Achievements**</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information on good health practices e.g. family planning, AIDS</td>
<td>2.43</td>
<td>0.645</td>
<td>1.88</td>
<td>0.750</td>
<td></td>
</tr>
<tr>
<td>Information on availability of drugs and their costs</td>
<td>2.13</td>
<td>0.710</td>
<td>1.70</td>
<td>0.727</td>
<td></td>
</tr>
<tr>
<td>Being able to contact a doctor</td>
<td>2.31</td>
<td>0.705</td>
<td>1.65</td>
<td>0.739</td>
<td></td>
</tr>
<tr>
<td>Sensitization on appropriate sanitation practices</td>
<td>2.47</td>
<td>0.663</td>
<td>1.79</td>
<td>0.778</td>
<td></td>
</tr>
<tr>
<td>Keep in touch with family and friends</td>
<td>2.61</td>
<td>0.583</td>
<td>2.41</td>
<td>0.756</td>
<td></td>
</tr>
<tr>
<td>Obtain news (local, national, international and sports)</td>
<td>2.47</td>
<td>0.718</td>
<td>2.45</td>
<td>0.740</td>
<td></td>
</tr>
<tr>
<td>Entertainment e.g. listen to music, watch movies, play games</td>
<td>2.47</td>
<td>0.642</td>
<td>2.48</td>
<td>0.750</td>
<td></td>
</tr>
<tr>
<td>Conduct cash transfers e.g. remittances to family</td>
<td>1.83</td>
<td>0.736</td>
<td>1.63</td>
<td>0.808</td>
<td></td>
</tr>
<tr>
<td>Information on community activities, interest groups e.g. youth, women</td>
<td>1.87</td>
<td>0.628</td>
<td>1.45</td>
<td>0.689</td>
<td></td>
</tr>
<tr>
<td>Information on relevant spiritual and religious observations</td>
<td>1.98</td>
<td>0.719</td>
<td>1.68</td>
<td>0.799</td>
<td></td>
</tr>
<tr>
<td>Information on adult education</td>
<td>1.84</td>
<td>0.750</td>
<td>1.46</td>
<td>0.659</td>
<td></td>
</tr>
<tr>
<td>Information on availability of schools e.g. location, school fees</td>
<td>2.01</td>
<td>0.772</td>
<td>1.67</td>
<td>0.765</td>
<td></td>
</tr>
<tr>
<td>Information on farming/agricultural practices e.g. modern techniques</td>
<td>2.02</td>
<td>0.742</td>
<td>1.57</td>
<td>0.689</td>
<td></td>
</tr>
<tr>
<td>Market information e.g. prices and availability of goods</td>
<td>1.98</td>
<td>0.674</td>
<td>1.92</td>
<td>0.742</td>
<td></td>
</tr>
<tr>
<td>Investment opportunities, plans and practices e.g. in assets like land, livestock</td>
<td>1.95</td>
<td>0.734</td>
<td>1.70</td>
<td>0.725</td>
<td></td>
</tr>
<tr>
<td>Local micro-finance or banking opportunities</td>
<td>1.90</td>
<td>0.706</td>
<td>1.78</td>
<td>0.734</td>
<td></td>
</tr>
<tr>
<td>Information on job/employment opportunities</td>
<td>2.25</td>
<td>0.746</td>
<td>1.84</td>
<td>0.821</td>
<td></td>
</tr>
<tr>
<td>Advisory services on career building or development</td>
<td>1.85</td>
<td>0.813</td>
<td>1.62</td>
<td>0.735</td>
<td></td>
</tr>
<tr>
<td>Information on the state or local government e.g. LCs, district administration</td>
<td>1.86</td>
<td>0.685</td>
<td>1.64</td>
<td>0.763</td>
<td></td>
</tr>
<tr>
<td>Sensitization on civil rights e.g. e.g. domestic violence, gender issues</td>
<td>1.97</td>
<td>0.702</td>
<td>1.60</td>
<td>0.751</td>
<td></td>
</tr>
<tr>
<td>Information on national/local rules and regulation e.g. paying taxes</td>
<td>1.92</td>
<td>0.687</td>
<td>1.57</td>
<td>0.694</td>
<td></td>
</tr>
<tr>
<td>Being able to contact people e.g. local leaders in case of an emergency</td>
<td>2.28</td>
<td>0.724</td>
<td>1.92</td>
<td>0.865</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Descriptive Analysis: Opportunities and Achievements

*Used 4-point likert scale: 1 = not important, 2 = important, 3 = very important

**Used 4-point likert scale: 1 = rarely (3 or more months), 2 = occasionally (once a month), 3 = always (weekly/daily)

Even the most reported use averaged at 2, which is occasional use – at least once a month
b) Effects of Demographics on perception of ICT Opportunities

ANOVA test provides results in measures of F-test (F) and statistical significance (Sig.). If sig. is below the significance level (5%), then the statistical evidence implies that a difference exists; or in other words the independent variable has some effect on the dependent variable. The ANOVA results shown in Table 5 indicate that the demographic variables of gender and age do not significantly affect the perception of what opportunities individuals can derive from ICT. Gender only significantly affected the perception on the importance of information on national/local rules and regulation e.g. paying taxes; while age affected perception of the important six factors including information on job/employment opportunities, services on career building or development, social aspects of accessing news and entertainment, being able to contact leaders in case of an emergency and information on availability of schools. On the other hand the highest level of education attained and main activities undertaken within the last six months had substantial effects on individuals’ perceptions on the number of opportunities they can derive from ICT.

<table>
<thead>
<tr>
<th>ICT-QoL Indicators</th>
<th>Gender</th>
<th>Age</th>
<th>Education</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Sig.</td>
<td>F</td>
<td>Sig.</td>
<td>F</td>
</tr>
<tr>
<td>Information on good health practices e.g. family planning, AIDS</td>
<td>0.294</td>
<td>0.588</td>
<td>0.719</td>
<td>5.41</td>
</tr>
<tr>
<td>Information on availability of drugs and their costs</td>
<td>0.120</td>
<td>0.729</td>
<td>0.896</td>
<td>4.43</td>
</tr>
<tr>
<td>Being able to contact a doctor</td>
<td>0.525</td>
<td>0.469</td>
<td>1.957</td>
<td>1.120</td>
</tr>
<tr>
<td>Sensitization on appropriate sanitation practices</td>
<td>0.143</td>
<td>0.706</td>
<td>1.197</td>
<td>0.311</td>
</tr>
<tr>
<td>Keep in touch with family and friends</td>
<td>1.101</td>
<td>0.295</td>
<td>0.733</td>
<td>0.533</td>
</tr>
<tr>
<td>Obtain News (local, national, international and sports)</td>
<td>1.999</td>
<td>0.158</td>
<td>3.412</td>
<td>0.018</td>
</tr>
<tr>
<td>Entertainment e.g. listen to music, watch movies, play games</td>
<td>0.270</td>
<td>0.604</td>
<td>3.463</td>
<td>0.016</td>
</tr>
<tr>
<td>Perform cash transfers e.g. remittances to family</td>
<td>2.487</td>
<td>0.116</td>
<td>0.733</td>
<td>0.533</td>
</tr>
<tr>
<td>Information on community activities, interest groups e.g. youth, women</td>
<td>0.224</td>
<td>0.636</td>
<td>0.552</td>
<td>0.647</td>
</tr>
<tr>
<td>Information on relevant spiritual and religious observations</td>
<td>2.645</td>
<td>0.105</td>
<td>2.548</td>
<td>0.055</td>
</tr>
<tr>
<td>Information on adult education</td>
<td>0.764</td>
<td>0.383</td>
<td>0.338</td>
<td>0.798</td>
</tr>
<tr>
<td>Information on availability of schools e.g. location, school fees</td>
<td>0.802</td>
<td>0.371</td>
<td>6.493</td>
<td>0.000</td>
</tr>
<tr>
<td>Information on farming/agricultural practices e.g. modern techniques</td>
<td>0.273</td>
<td>0.602</td>
<td>1.304</td>
<td>0.273</td>
</tr>
<tr>
<td>Market information e.g. prices and availability of goods</td>
<td>0.419</td>
<td>0.518</td>
<td>1.833</td>
<td>0.140</td>
</tr>
<tr>
<td>Investment opportunities, plans and practices e.g. in assets like land, livestock</td>
<td>0.101</td>
<td>0.751</td>
<td>2.194</td>
<td>0.088</td>
</tr>
<tr>
<td>Local micro-finance or banking opportunities</td>
<td>1.258</td>
<td>0.263</td>
<td>2.537</td>
<td>0.056</td>
</tr>
<tr>
<td>Information on job/employment opportunities</td>
<td>0.324</td>
<td>0.569</td>
<td>11.503</td>
<td>0.000</td>
</tr>
<tr>
<td>Advisory services on career building or development</td>
<td>0.201</td>
<td>0.654</td>
<td>7.651</td>
<td>0.000</td>
</tr>
<tr>
<td>Information on the state or local government e.g. LCs, district administration</td>
<td>0.655</td>
<td>0.419</td>
<td>2.142</td>
<td>0.094</td>
</tr>
<tr>
<td>Sensitization on civil rights e.g. e.g. domestic violence, gender issues</td>
<td>0.962</td>
<td>0.327</td>
<td>0.840</td>
<td>0.472</td>
</tr>
<tr>
<td>Information on national/local rules and regulation e.g. paying taxes</td>
<td>4.462</td>
<td>0.035</td>
<td>2.191</td>
<td>0.088</td>
</tr>
<tr>
<td>Being able to contact people e.g. local leaders in case of an emergency</td>
<td>0.768</td>
<td>0.381</td>
<td>6.093</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 5: ANOVA Analysis: Effects of Demographics on Opportunities
4.3. Focus Group Interview Findings

a) Defining a good life

Table 6 provides a summary of what participants in the focus group interviews in Kayunga and Mbale identified as a good life. Furthermore participants identified quite a number of factors in the social and economic dimensions and only personal security and safety from theft or crime, fires or community unrest were identified as vital under the political freedoms dimension.

<table>
<thead>
<tr>
<th>QoL Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Opportunities</td>
</tr>
<tr>
<td>- Possession of assets like a house, car, farming land, computers/internet, good clothing</td>
</tr>
<tr>
<td>- Having a good job</td>
</tr>
<tr>
<td>- Being self employed, being able to earn a living</td>
</tr>
<tr>
<td>- Having extra/surplus income</td>
</tr>
<tr>
<td>- Ability to support (financially and physically) one’s self</td>
</tr>
<tr>
<td>- Quality feeding</td>
</tr>
<tr>
<td>Social Facilities</td>
</tr>
<tr>
<td>- High level of education, possession of computer skills</td>
</tr>
<tr>
<td>- Access to better health facilities and services</td>
</tr>
<tr>
<td>- Entertainment, leisure</td>
</tr>
<tr>
<td>- Self esteem</td>
</tr>
<tr>
<td>- Being respected in the community</td>
</tr>
<tr>
<td>- Being able to help others, hospitality</td>
</tr>
<tr>
<td>- Being a part of and loved by family</td>
</tr>
<tr>
<td>- Being in a happy (humorous) environment.</td>
</tr>
<tr>
<td>- Access to information</td>
</tr>
<tr>
<td>- Having a peace of mind</td>
</tr>
<tr>
<td>- Easy access to services like transport and communication networks</td>
</tr>
<tr>
<td>- Being God fearing</td>
</tr>
<tr>
<td>Political Freedoms</td>
</tr>
<tr>
<td>- Personal security from community instabilities, theft etc</td>
</tr>
</tbody>
</table>

Table 6: Indicators of a Good Life

b) Perception of the Role of ICT towards QoL

A summary of what the discussion participants perceived they could do or be or what they had actually achieved (doings or beings) with ICT is provided in Table 7. Similar to the QoL definition, participants had a limited perception of the importance of ICT towards their political freedoms. Participants were not aware of what more they could do with ICT in exercising the political freedom, aspects like being able to exercise their political rights in choosing national or local leaders were unknown to the participants. It is only after pressing for feedback that some participants pointed out that they participated in some political radio talk shows. In addition the aspect of doing cash transactions through the mobile phone was only brought up later in the discussion and had been performed by a minority of the group participants.

<table>
<thead>
<tr>
<th>ICT facilitated QoL Opportunities and Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Opportunities</td>
</tr>
<tr>
<td>- Conducting business transactions like ordering drugs, sending news items to media houses, contact business associates etc</td>
</tr>
<tr>
<td>- Searching for job opportunities</td>
</tr>
<tr>
<td>- Create job opportunities for those working in the ICT industry/sector e.g. airtime sellers, payphone attendants</td>
</tr>
<tr>
<td>Social Facilities</td>
</tr>
<tr>
<td>- personal/private communication with relatives and friends through email and making phone calls</td>
</tr>
<tr>
<td>- Sharing health related information e.g. sensitization on impending diseases</td>
</tr>
</tbody>
</table>
b) External Factors that influence ICT use

Table 8 summarizes the factors both questionnaire respondents and focus group participants generally pointed out as affecting their use of the various forms of ICT. It was established that the mode of availability and ownership affected use. Respondents specifically pointed out that having to borrow or lend especially the mobile phone and communal/shared use specifically of the radio forced people to listen to programmes they were not interested in. Financial constraints on use were identified as: initial purchase costs of ICT, maintenance costs (i.e. phone top-up, high battery cost), and internet/computer training costs. In relation to the general lack of awareness of the possible ICT opportunities, respondents also pointed out the lack of skilled personnel to train individuals in the use of Internet/computer. Technical issues like electricity and quality of services (i.e. poor network signals and inadequate bandwidth) were also identified as hindrances in the use of ICT. During the focus group discussions it was further established that unsolicited text messages and emails also constrained use and that pornographic pop-ups were a deterrent to use internet/computers in public access points. Respondents also mentioned that they did not use the mobile phone because they had no one to call or business to conduct; while some did not have the time or thought they were too old to use internet and computers. This alludes to an issue of compatibility of one’s values and needs with the use of ICT.

<table>
<thead>
<tr>
<th>Factors influencing ICT use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Availability and Ownership</strong></td>
</tr>
<tr>
<td>Borrowing from or lending ICT to family, friends and neighbors</td>
</tr>
<tr>
<td>Shared use, e.g. listening to programmes one is not interested in</td>
</tr>
<tr>
<td><strong>Financial Constraints</strong></td>
</tr>
<tr>
<td>Initial purchase costs,</td>
</tr>
<tr>
<td>Maintenance i.e. high tariffs-call charges, batteries</td>
</tr>
<tr>
<td>Training costs</td>
</tr>
<tr>
<td><strong>Knowledge, skill to use</strong></td>
</tr>
<tr>
<td>Easy to use or handle for radio or mobile phone</td>
</tr>
<tr>
<td>Lack of awareness of inherent value in ICT</td>
</tr>
<tr>
<td>Complicated functionality or features e.g. text messaging</td>
</tr>
<tr>
<td>Lack of skilled training personnel</td>
</tr>
<tr>
<td><strong>Technical Issues</strong></td>
</tr>
<tr>
<td>Quality of service</td>
</tr>
<tr>
<td>Electricity availability and costs</td>
</tr>
<tr>
<td><strong>Compatibility - Purpose of use</strong></td>
</tr>
<tr>
<td>No one to call or business to conduct</td>
</tr>
<tr>
<td>Not interested e.g. old and illiterate,</td>
</tr>
<tr>
<td>Lack of privacy e.g. payphone</td>
</tr>
<tr>
<td>Distance and accessibility of payphone in the night</td>
</tr>
<tr>
<td>Time to access due to other pressing needs</td>
</tr>
<tr>
<td><strong>Community and Cultural influences</strong></td>
</tr>
<tr>
<td>Lack of trust between spouses, parents and children</td>
</tr>
<tr>
<td>Restrictions of use by parents to children</td>
</tr>
<tr>
<td><strong>Peer Pressure</strong></td>
</tr>
<tr>
<td>from family and friends</td>
</tr>
<tr>
<td>the need to catch-up with the rest of the world</td>
</tr>
</tbody>
</table>

Table 8: External Factors influencing ICT use
5. DISCUSSION

5.1. Quality of Life Definition

The QoL constructs used in the survey were theoretically motivated through a literature review and adapted to reflect the capabilities definition of what individuals can be or do. It is evident from the list of freedoms identified that development comprises both means and an ends. For instance (Table 6), while respondents identified substantive freedoms such as having self-esteem and a peace of mind, they equally regarded being employed and easy access to social services which are of instrumental value also as part of their definition of a good life. In addition, a comparison of the theoretically generated indicators with the definition obtained from participants in the focus group interviews (Table 6) reveals some similarities especially in the economic facilities dimension which alludes to the material aspects of life like the possession of a house, food, a car, a job or earning an income. Worth noting is the qualification which indicates a form of improvement on some of the attributes for instance quality feeding, extra or surplus income or even attaining a higher level of education. Similar to an earlier study conducted in South Africa (Clark 2003), this implies that people’s definition of a good life was not entirely affected by their living conditions. This could be attributed to the fact that despite their living conditions, people in the rural communities in Uganda have been exposed to the general perception of what is considered a good life and therefore have an idea of what a better life than what they are currently living is. On the other hand majority of the focus group discussants were fairly literate (Table 3) and could easily distinguish between the basic and improved opportunities for a good life.

As established in previous studies (Tiliouine et al. 2006; Arku et al. 2008), the study also affirms the assertion that development even for the rural poor is normally misleadingly presented in terms of meeting economic needs and accumulation of wealth. It is established here, for instance similar to the developed countries like Australia (Cummins et al. 2003), that despite the limited economic resources, the rural poor also value the social aspects of interaction with family and friends. Notably though, participants had very little to define their QoL in relation to political freedoms. This could be attributed to the status of Uganda’s democracy and political participation which similar to several developing countries presents citizens with only a few such opportunities. For instance democratic elections at national and local council levels only take place every five years; and this is one of the main channels through which citizens regularly exercise this freedom. Other opportunities such as multiparty politics and public decision-making are still in their infancy and have not been extensively exploited. Furthermore political freedoms are opportunities the state provides or enables its citizens to perform and unless the necessary mechanisms are in place, this can not be fully exercised. These have resulted in citizens placing less emphasis and value on such freedoms which in certain instances they might not even be aware of.

5.2. Opportunities and Achievements: Perception of the role of ICT in individuals’ QoL

Both the survey and group discussions suggested that people approved of the opportunities they could obtain from ICT, with the highest rank of importance awarded to the social interaction aspects in comparison with the economic and political opportunities (Tables 4 and 7). This confirms anecdotal evidence that ICT especially for the rural poor is a source of pleasure and facilitates social networking with family and friends. Furthermore focus group discussion revealed that the few who accessed the Internet mostly used it in making friends
Considering external influences on ICT adoption and use, it is argued here that the nature of institutional support particularly the approaches to ICT service provision for the rural poor in Uganda have a key role to play. Uganda’s strategies and approach to universal access/service have over the years purposed to make services accessible to and affordable by the target beneficiaries (UCC 2001). According to these strategies and unlike a capability-driven perspective, the major factor inhibiting the use of ICT in the rural communities is poverty; translated as the lack of a disposable income. To some extent this has addressed by national efforts such as the liberalization of the telecommunications sector, encouraging competition, widespread service provision and reduction in service costs among service providers. However while services are now available albeit with limited access, people also point out having limited awareness of the extent to which these services can be exploited to meet especially their economic and political needs. This has therefore resulted in available, but under-utilized services, since for instance though people value information on good health practices; they do not know how to obtain this through the Internet, and there are further challenged by the limited availability of skilled personnel. Furthermore, while the current universal access strategy adopts a human development stance, this is limited to supporting sector specific human development goals (UCC 2005). Therefore unless a sector such as health, education or tax administration rolls out a service and empowers people to exploit it for their own good, people will remain adamant in exploiting such opportunities. As discussed earlier considering that state provision and citizen exercise of political freedoms are still in their infancy in Uganda, the use of ICT to support such opportunities has also not been greatly appreciated. While several government organs have websites and the national fiber backbone has been completed, citizens still have limited value of the political freedoms ICT can enable. This is attributed to people’s limited perception and lack of awareness of their role in the political development of the country.

In view of the effect of personal characteristics on perception, the insignificant influence of gender on people’s perceptions of the ICT opportunities corresponds to observations made during the group discussions in which both female and male participants easily voiced their opinions. This can be accounted for by the fact that a substantial number of the survey respondents were literate (Table 3), with levels of education fairly distributed between genders (i.e. primary: female =56% and male = 44%; secondary: female=57% and male=43%; tertiary: female 48% and male=52%). In addition, age which has been established as having a significant influence on the use of various forms of ICT (cf. Alampay 2006) was only significant in a few perceptions of ICT opportunities. Again comparing age to level of education which significantly influenced people’s perceptions, the majority of survey respondents were in the 16 to 25 (35%) and 26 to 35 (36%) age brackets; and the highest level of education attained by a considerable number of these participants was either primary or secondary. This could explain why age only significantly affected aspects of employment, career development, news, entertainment and availability of schools, as these age brackets are in search for employment opportunities and further education. The significant influence of education on individual perceptions in the economic, health related and personal development was expected on the pretext that with some level of education one is in position to seek information on various life aspects. However an unexpected finding was the effect of people’s activities on their perceptions of ICT opportunities. What could account for this
result is that the bulk of the people in this survey sample were unpaid family or domestic workers, had own businesses or were private employees (Table 3). In this respect the significant influence especially on the perception of opportunities in the economic dimension is the conviction that ICT could be a means through which people create own jobs or improve their existing businesses in pursuit for a good life.

Comparing perception of opportunities to the actual achievements alludes to a contributory relationship between the two. The stance that various forms of social interaction were perceived as most important, and were the most frequent uses of ICT advances the notion that what people had actually achieved determined their perception of importance or vice-versa. This is confirmed by information systems technology acceptance theories which posit that perception of how useful technology is affects the eventual use for the achievement of a good life (cf. Venkatesh et al. 2003). In addition the achieved aspects (social outcomes and pleasure) are of intrinsic value; which come easily and are within the control of the individuals themselves. This is an indication of early adoption of ICT which reveals that people generally appreciate ICT for what it is and not necessarily what it can do. This is especially true given that participants in the discussions pointed out the need to be connected (not connected for what); the need to catch up with the rest of the world as one of the reasons for using ICT.

5.3. Study Limitations and Future Work

A major limitation of this study is that since data collection was a one time-snapshot and self-reporting exercise, it cannot be guaranteed that the findings obtained were the true respondent preferences. As Clark (2003) points out, respondents may conceal some preferences or even want to impress the interviewer, therefore responding incorrectly to the questions. Findings can be re-enforced through a longitudinal study involving other methods like observations that delve deeper into the day-to-day lives of people.

QoL is broad and while the findings from the survey provide a general overview, and suggest a limited perception of ICT importance and actual use in both economic and political aspects, it did not exhaust all indicators. This was attributed to the need to develop a questionnaire for which constructive feedback could be obtained, and at the same time ensure that the multidimensional characteristic of QoL is well considered.

A further limitation is that this paper focuses on how the capability approach can facilitate the definition of QoL indicators and does not extensively investigate the influence of contextual factors (such as cost, relevant skills, availability of ICT, language etc) on people’s perception of the possible opportunities ICT provides. In addition, this study does not explicitly focus on the ICT through which the perceived information and communication needs are obtained. Moreover these have been suggested as important influences on the adoption and use of ICT for various life goals, an aspect that will be considered in subsequent research. This will extend the current work to develop an understanding of how both the perceptions developed here and the various contextual factors influence adoption and use of ICT by people in rural communities in Uganda.
6. CONCLUDING REMARKS: THEORETICAL CONTRIBUTION AND PRACTICAL IMPLICATIONS

This study confirms that the capability approach is a valuable framework that can facilitate the investigation of the potential impact of ICT on the QoL of people in terms of what they can do. Specifically the application of the capability set construct to conceptualize a range of opportunities that ICT can provide and those that people value is a contribution to both SCA and ICT4D research and practice for which empirical research is still in its emergent stages. In this respect, it is proposed that QoL capability indicators can be developed basing on aspects of what people can do in the various life dimensions and assessed in relation to people’s perceptions. The study has also established that the level of education and what people do in relation to work are key influences on their perceptions of what they can actually achieve from ICT.

Unlike QoL concepts that focus on satisfaction with life, what SCA provides is an objective list of life’s aspects that can be influenced by policy. As such an analysis on the potential and actual ICT contribution towards people’s QoL establishes gaps which are vital for the state and policy makers. The perceived importance and actual use of ICT in meeting mostly people’s social needs suggests that ICT adoption by the rural poor is still in its emergent stages and the limited awareness of the ICT potential towards people’s QoL. In addition to providing infrastructure, this requires policymakers to intensify efforts aimed at creating awareness which should contribute to people’s improving people’s agency. Once achieved, this would probably meet the demands of empowering citizens to live the lives they value.

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Comparing Strategies to Integrate Health Information Systems
Following a Data Warehouse Approach in Four Countries

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Abstract: This paper presents four country cases of standardizing and integrating health data which are all following what is here termed a data warehouse approach; data from across different health programs are organized in one database framework – or data warehouse. In all countries, fragmentation of health information in different partly overlapping sub-systems run by different vertical health programs represented a major problem, which was addressed by what here is labelled a district data warehouse approach. The district forms the basic managerial level which needs are addressed by the data warehouse. Data captured and managed at the district are then replicated up the hierarchy of the health services and at the national level. While South Africa developed a new integrated system in addition to the existing fragmented sub-systems, Zanzibar, Sierra Leone and Botswana all followed slightly different approaches; more or less incremental in the approach to standardizing health data, and more or less strict in whether to include “all” data, and whether to solve all inconsistencies between the various data sets included early on. The four cases demonstrate that integration is as much, and maybe more, about aligning organisational-political actors as it is about technical solutions. The technical solutions are however important in aligning these actors and in enabling integration. We argue that “attractors”, technical solutions or standards that achieve a certain level of success and enable the building of momentum, are important in aligning the various political actors.

Keywords: Integration, standardization, health information systems, data warehouse
Comparing Strategies To Integrate Health Information Systems Following A Data Warehouse Approach In Four Countries

1. INTRODUCTION

Effective Health Information Systems (HIS) are seen as key instruments for countries to achieve the health related Millennium Development Goals. There is relative consensus among researchers and global agencies such as the Health Metrics Network (HMN) that key problems with the current HIS in many, if not most, developing countries are related to 1) fragmentation among a multitude of donor and disease specific health program driven vertical systems (HIV/AIDS, Immunisation, Mother & Child Health, Tuberculosis, etc), (Chilundo and Aanestad, 2004), leading to 2) lack of shared standards (overlaps, gaps and inconsistent definitions of data in the various data reporting formats) (Kossi et al, 2008), 3) poor human capacity, and poor technical infrastructure in terms of e.g. power and Internet. These problems are leading to poor data quality, no overview of data and information across sub-sectors, and negligible use of data by decision makers and health care providers.

A central part of the HMN technical strategy to overcome the problems of fragmentation and lack of data standards is the establishing of data warehouses, or data repositories, for the storage of essential data and indicators from multiple data sources. This data repository will then provide shared access to shared information across the various health programs and user groups (http://www.who.int/healthmetrics/). In this article we describe and discuss different varieties of such a “data warehouse approach” as they are applied in four countries. Botswana, Zanzibar and Sierra Leone represent relatively recent developments (since 2005/07), whereas in South Africa the process has been ongoing since 1998. While in Botswana, Zanzibar and Sierra Leone, they have followed various strategies to include all data routinely collected from the health services by different health programs in one data warehouse system, in South Africa they started out with a minimum essential data set strategy (i.e. only a sub-set of data reported), which has gradually evolved to include more data through a longitudinal standardisation process.

We use a very loose definition of data warehouse: “A data warehouse is a repository storing integrated information for efficient querying and analysis. Information is extracted from heterogeneous sources as it is generated … This makes it much easier and more efficient to run queries over data that originally came from different sources” (Stanford University 1998).

The 2nd edition of the HMN technical framework uses the term “data repository”, whereas they used “data warehouse” in earlier versions. This is done because they want to omit confusion in a developing country setting, because, in many cases, the term data warehouse is understood as something more sophisticated than what is seen as naturally fitting into a poorly developed infrastructural setting. A description of a data warehouse in a “Western” setting, will for example typically include methods to automatically “extract, transform and load” (ETL) essential data from a computer based “transaction system” to the data warehouse. What then, when the transaction system, as is the case in most developing country contexts, are paper based? Our rationale for still using the term data warehouse is that we would like to translate it to a developing country context. If, for example, the transaction systems are paper based, as is the case with most patient record handling systems in Africa,
the data in the data warehouse will be captured from paper forms. When transaction systems are gradually computerized, then the loading of the data to the data warehouse will be increasingly automated. For the foreseeable future, therefore, the transaction systems from which the data warehouse in developing countries gets the data will be both paper-based and computerized.

Integration as demonstrated in the four cases, however, is not primarily a technical process, but rather a political one. In all cases the overarching problem of fragmentation was caused by different organizational actors working independently. Providing a technical solution to integrate two different systems is relatively easy, but the politics of negotiating this among the actors involved is key to attain any use, and hence sustainability.

This article will proceed as follows. First we present the methods applied. Then we present relevant literature on the issues of integration and standardization in developing countries, before presenting the four cases, the discussion and finally the conclusion.

2. METHODOLOGY

This article draws on case material from direct involvement and experiences in the development and assessment of health information systems in South Africa, Zanzibar, Sierra Leone and Botswana. The authors are all involved in the one or more of the four countries, as well in the broader network of the Health Information Systems Programme (HISP) (Braa et al. 2004; see also www.hisp.info). HISP started in South Africa in the 90’s as a conscious effort to adapt and apply central features of the Scandinavian action research tradition in IS development, such as user participation, evolutionary approaches and prototyping, to the context of Africa (Braa, Hedberg, 2002). Action research aims at generating new knowledge through taking part in the full cycle of design, development, implementation, use, and evaluation and analysis together with all involved parties before the interventions are adjusted accordingly, and the cycle starts all over again (Susman, Evered, 1978). In each of the four countries the authors have been engaged in repeated prototyping cycles of the DHIS software including revision of data sets (i.e. what data to collect and process) and exploration of ways to access, present and analyse the information in the system.

The research and lessons in South Africa, where HISP was initiated in 1994, forms the basis for the research and interventions in the three other countries. The overall HIS development approach first developed in South Africa, including the focus on the local district level, data standardisation based on essential information needs, and local use of own data, has been tried adapted to the other country contexts. As the context differs considerably between the countries, a major research challenge has been to ensure a framework for cross country comparative and collaborative learning and intervention. The methodological approach to address this cross country challenge is based on a “network of action” strategy (Braa et al. 2004), where, first, a mutual beneficial “win-win” collaboration is sought between action projects, which then is fostered through the circulation of people, best practices and lessons, and software and other (needed) materials. The PhD program at the University of Oslo includes 15-20 African students and facilitates comparative action research within and between countries and thus enables the needed “circulation of people” and sharing of experience. Four of the authors of this article are part of this program and are each involved in one or two of the four countries. Shared development and application of the DHIS software, which is used in all four countries, make up an important generator of “win-win” collaboration between the countries, while at the same time providing a concrete means of
distributed learning, sharing of best practices and the circulation of software and training materials.

Following the increased focus on HIS globally, increasingly international donors and agencies play a role in the circulation of best practices, also in the countries included in this study; WHO and Health Metrics Network initiated the project in Sierra Leone and DANIDA (the Danish aid agency) in Zanzibar.

3. CONCEPTUAL FRAMEWORK

National HIS in developing countries are often plagued by fragmentation, where vertical, disease-specific programs run their own information-gathering systems (Stansfield et al. 2008). A typical situation in a developing country is that: 1) there is a national HIS run by the Ministry of Health aiming at covering data from across the various health services and disease specific health programs (e.g. HIV/AIDS, Tuberculosis, Maternal & Child Health, Disease Surveillance, Vaccination Programme (called EPI)); 2) the health services generally and the national HIS are relatively weak with insufficient resources; 3) while the vertical programmes are comparatively rich as they are funded from international sources (e.g. HIV/AIDS), they need to provide their funders with quality information on their activities and achievement in order to maintain their funding. As a consequence, 4) not being satisfied with the data from the national HIS, the vertical programs develop their own sub-HIS with international funding, funding which is difficult to achieve for national HIS, and further fragmentation is generated (Braa et al, 2007). The involvement of multiple funders and organisational actors make integration highly political. HIS integration is thus a non-trivial process, involving more than just integration at a technical level. Sahay, Monteiro and Aanestad bring the attention to the political aspects of integration, and claim that, with a few notable exceptions, literature on the topic seems to be too positive and too technology-oriented (Sahay, Monteiro, & Aanestad, 2008). For instance, integration would also include aligning the efforts of several ministries (Sæbø, Braa, & Chandna, 2007), a challenge of institutional nature.

Standardisation literature argues that standards are evolving through use rather than being established through consensus (see for example David 1986). Building on complexity science, Eoyang argues that “attractors”, e.g. successful pieces of software, play a key role in adapting the various actors to common practices within a complex system by creating momentum through shared practices (Eoyang, 1996). Building on this concept again, Braa et al 2007, argues that attractors are crucial in the evolution of new standards generally, and in the complex health system context particularly. An important part of HIS integration at country level is to get the various actors to agree on shared standards. Attractors, such as successful examples of software or data standards, may be important in convincing, or align through practice, the various actors in health care (ibid.).

Having worked extensively with national HIS in South Africa, Braa and Hedberg argues that inscribing flexible standards in the software used for an HIS could allow a “hierarchy of standards” (Braa & Hedberg, 2002). For health management, there are different information needs depending on the hierarchical distance to the patient. Doctors would need detailed information on patients, districts would need community information to supplement their core health indicators, while national levels would only need a few health indicators to prepare a budget and take strategic decisions. Typically, the amount of information required would diminish as one went higher in the hierarchy, that is, closer to the national level. Scaling of
national standards to lower levels had to be complemented with the ability of lower levels to define their own, additional, information standards.

In addition to technical solutions to facilitate integration, some solutions may promote it. Drawing on the concepts of inscriptions (Hanseth & Monteiro, 1997), we can see that certain solutions prescribe certain behaviour, and that inscribing software with incentives to integrate can be a fruitful approach. If attractors; successful standards or artefacts that offer a gravitational field among seemingly disparate actors (Braa et al. 2007) embedding such inscriptions can be created, a powerful tool for integration has been created.

4. CASE STUDIES

4.1. The DHIS software - flexible design to enable integration

Very often a computerised HIS is a direct computerisation of the various forms and reporting structures that exists in the paper-based HIS. A result of such an approach is often lack of flexibility to modify the systems when the paper-based equivalent changes or to incorporate new needs like integrating additional programmes or additional indicators arise. Such approaches, which strengthen the existing structures of fragmentation, are typically found in the various health programmes where focus is often on reporting huge amounts of detailed data upwards in the hierarchy to the national level and to donor agencies.

To integrate information at the district level and to provide flexibility to meet the rapidly changing requirements of the health care domain, the DHIS design strategy is based on a more flexible model that goes beyond the typical “computerise the forms”-approach. Instead of computerising the form, the DHIS is computerising every data item or data element in the form independently. By breaking up the form into more fine-grained building blocks of data the software also breaks up the fragmentation the forms represent and provides the possibility of manipulating and presenting data across health programs and forms, a prerequisite for integrated data analysis. This design enables the user to define custom reports, tables and graphs for analysis that are completely independent of the collection forms and can instead be understood as user-defined assemblies or reconstructions of the data (elements) that was captured using the forms.

4.2. Sierra Leone

Sierra Leone, a relatively small country in West Africa, is one of the poorest countries in the world and was ravaged by civil war that had lasted for ten year before it was officially declared over in January 2002. The public health system, which suffered from a huge loss of both personnel and infrastructure during the war, is slowly rebuilding the capacity to improve the service provision across the country. This effort is led by the government and supported by many international agencies, and aims at achieving the health millennium development goals. The rapid growth of various health initiatives has created a situation of fragmented information systems, common also in other developing countries (Braa et al, 2007, Sæbø et al, 2007). Figure 1 depicts the fragmented situation characterized by overlapping data collection tools and data elements. The overlapping rate between two different forms can vary from 0 to 50%. In 2008, each facility reports about 17 forms.

From the fragmented HIS described above, the main issue was to provide meaningful and relevant information for decision making and to diminish the workload of staff who are collecting and reporting the data. The suggested way forward was to use DHIS to integrate the various data flows and data sources and thereby to provide an integrated framework for
M&E and data management. To achieve this, attention was devoted to the data warehouse as a starting point. All data elements were identified and sorted out in order to identify and avoid a) duplication from overlapping data forms b) overlapping data elements – in term of their definition. As a result a coherent integrated data warehouse was built, where one data element in the database can be related to a field in several data collection forms. Figure 2 shows how multiple, duplicate data elements from the existing paper system were integrated “behind the scenes” in the data warehouse.

In January 2008, this integration approach was implemented in 4 of the 13 districts in Sierra Leone, and 6 months later in 3 more districts. Intensive training was carried out, each district captured their data in the DHIS and exported the data to the national DHIS by the use of memory sticks. An extensive process to capture and import from the various electronic storages old data from all districts was put in place and a rather extensive national data set was available for analysis during the last half of 2008. All stakeholders were made part of the process which convincingly documented the problems with the current system such as overlapping data collection forms, inconsistent data definitions, poor data quality in terms of both correctness and completeness. At the same time, through actually doing it, it was also documented that shared common data sets in a national repository was possible to achieve. Given this learning process, in January 2009, all stakeholders agreed on new harmonised shared data collection forms to be implemented from March/April 2009, and to implement the DHIS in all districts immediately in order not to lose momentum and data.

Figure 1 SUM, ICS(MMRCS), Excel, CRIS are existing software used to collect and analyze health data
4.3. Botswana

The HIS in Botswana is extremely fragmented, with several ministries involved in the collection, compilation, and use of health data. A centralized initiative to integrate the health information systems was established through the Health Statistics Unit (HSU), which was to collect one form containing the essential data from a range of health programs. However, the main reason for collecting this data was for the compilation of an annual book on health statistics, not for supporting local health information use. At the national level, the compilation of the health statistics book was two years delayed (Sæbø, Braa, & Chandna, 2007). As a response, various health programs still relied on their own systems, which were designed and run by each individual health program. At the district level, however, most of these information systems were handled by one or two persons in one office, representing a form of human data warehouse. Some of the richer health programs, most notably the Prevention of Mother To Child Transmission (PMTCT), set up their own infrastructures to collect timely data by hiring their own people and equipping them with computers and software solutions.

The approach in Botswana was to make a direct mapping of the paper-based system into the DHIS version 1.4, meaning that each cell in the paper forms represented a unique definition in the software. Even if the paper forms had overlaps and duplications, the duplications were transferred to DHIS, without standardization of, in essence, equal data definitions. This approach would not reduce the amount of data to be entered, it would not solve the duplications (which turned out to sometimes contain different figures in different forms), but it did allow for a fast implementation by avoiding “political” obstacles in the set-up of the database. As long as no paper form was changed as it was copied to an electronic format, a database could easily be agreed upon by the various stakeholders. This strategy opted for a quick solution in an environment where the capacity to negotiate an integrated solution was not present at the time. The semi-integrated data collection tool, the DHIS, was then to be used as a platform for further integration. The nature of the project organization posed severe limitations in this direction;

As part of an EU funded research project (BEANISH1), the Ministry of Science, Technology, and Communication oversaw the initiation of the data warehouse implementation. Assigning the administration of the implementation to their IT-unit seconded to the Ministry of Health, the project was distanced from the health domain from the start. While the IT-unit physically worked at the Ministry of Health building, its main activities here consisted of setting up the network, assigning e-mail addresses, procuring hardware, and the like. The placement of the project implementation with the IT-unit meant that the project came to be seen as a “computer project” by the various health-affiliated stakeholders. This division between health and IT became stronger over time, and the project failed to enlist “champions” in the health programs. To complicate further, public health services at the district and facility levels were run by yet another actor, the Ministry of Local Government. Unable to tie the necessary links with the Ministry of Health-run national health programs and the Ministry of Local Government, the IT-unit, formally under the Ministry of Science, Technology, and Communication, became increasingly focused on just the computer-technical side of the implementation.

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1 Building Europe Africa collaborative Network for applying IST in Health care sector, see http://208.76.222.114/confluence/display/BEANISH/Home
A spin-off of the data warehouse project in 2007 is worth mentioning. Looking for a software to ease data collection for their CRIS analytic software, UNAIDS adopted DHIS. Driven by local champions both at national and district level, UNAIDS rolled-out this new software bundle nationwide over the following year. Representing so far a new, independent, vertical reporting structure, the network UNAIDS has established of national and local actors might also manage to integrate the other health information systems in place, from which UNAIDS retrieves their HIV/AIDS specific data.

4.4. Zanzibar

In November 2004 a joint survey to study the HIS status was conducted by the Danish International Development Agency (DANIDA), World Health Organization (WHO), Ministry of Health and Social Welfare (MOHSW) and University of Oslo. The survey revealed poor HIS characterised by fragmented data collection and reporting due to many subsystems in healthcare service provision, and little use of information. As a result of this, in 2005 HISP started working with the newly established Health Management Information System Unit (HMIS Unit) at the Ministry, to implement a computerised HIS. Key objectives of the project were to 1) strengthen information use at the district level, and 2) set up an integrated data warehouse at the national level to facilitate access to information by all health programmes and stakeholders. Ministry stakeholders, health programme managers and district medical officers, and HISP consultants conducted a series of meetings to agree on a set of standardized data collection forms (datasets) that would form the basis of the integrated data warehouse.

To implement the same integrated data repository approach throughout the country, an important requirement of a national HIS, a combined paper and computer strategy was implemented. The glue between all levels were the standardised essential datasets including essential data from all health programs taking part in the integrated approach (Reproductive and Child Health, Immunisation, HIV/AIDS, and Disease Surveillance). These standard datasets were both made available on paper forms to be used for data reporting between the health facilities and the district level, and electronic forms as part of the DHIS software used to register, validate, analyse and report data at district and national levels. In 2005 the customisation and implementation of DHIS started by using the new version 1.4, which was actually under development. This caused some technical problems during the first 1-2 years, as Zanzibar acted as a test site and bugs documenter for the new DHIS version being developed in South Africa. Every year since the first version of the unified data collection forms there has been a revision process (a 3-5 days workshop) whereby the data sets are revised and updated based on negotiations among key stakeholders, and as a result the paper and electronic forms are updated on an annual basis to adapt to these revisions.

4.5. South Africa

South Africa has followed a different trajectory from the three other countries. Here the process started in the 90’s after the abolishment of apartheid and was part of the ANC Reconstruction and Development Plan (ANC 1994a, Braa & Hedberg 2002). During apartheid the health services were extremely fragmented and inequitable and health services and geographical areas were separated according to race and the system of “homelands”. Until May 1994 there were 14 departments of health at the central level; the general National one, separate “white”, Coloured” and “Asians” administrations, and 10 “black” homeland administrations. As a result, there were no health data standards and a multitude of forms for
reporting data were in use. The new national health plan (ANC 1994b) made it very clear that the health system needed to be reconstructed based on equity in health services provision to ensure the inclusion of those who had suffered during apartheid. In order to monitor to what extent this goal was properly addressed and to pinpoint communities in particular need, access to good quality essential health data, integrated across services and geographical areas, was seen as an absolute requirement.

HISP started in 3 pilot districts in Western Cape Province in 1995 with the aim of developing a district based integrated information system. It turned out to be difficult to get all the actors to agree on common standards for reporting. After an “endless” array of workshops, the breakthrough came with the development of the DHIS in the conjunction with the testing of a first version of a minimum integrated data set in the pilot districts in 1997/98. The Province agreed to test it further and the success was rather instant; for the first time health managers had data available at their own desktop computer without having to wait for annual reports or enquire for data at various head offices. Having seen the success in Western Cape, the neighbouring Eastern Cape province also wanted to go for the DHIS software. In Eastern Cape, a project funded by USAID had developed and implemented a minimum data set in all the health facilities in the province, but had serious problems with the software they were using. They contracted HISP and implemented the DHIS successfully at the end of 1998 and could provide full coverage data for the province early 1999. Seeing the success in two provinces, other provinces also wanted to join the process and by 2001 the DHIS and data set approaches were endorsed by the National Health Information Systems committee of South Africa (NHISSA) as a national standard. Since 2001 South Africa has established national standard essential data and indicator sets which all provinces are required to report. In addition to this, and given the federal institution of South Africa, each province is free to collect and manage the data and indicators they want. The principle of hierarchy of standards, enabled by the DHIS, was important in creating agreement among the provinces and other actors. According to this principle, each organisational unit in the health hierarchy is free to collect the data they want and thereby pursue their own interests, as long as they adhere to the standards of the level above. Each province could then continue to collect their own data as long as they reported the required standards to the national level. There are large differences between the data sets collected by the different provinces, but they all include the core national standards. The national core standards have gradually been expanded to more use areas since 2001.

This standard reporting format was in the beginning an addition and “on top” of all other reporting forms. Through its relatively instant success in terms of data quality and easy and immediate access, more provinces joined, but also, as the momentum grew, gradually vertical programs included their basic data requirements within the national minimum data set, which later changed name to “essential data sets”. The immunization program, for example, realized that the quality of their data that were included in the minimum report was higher than in their own data reporting system, and subsequently “gave in” and included their vaccine reporting in the now national essential data set.

There are several electronic record systems in South Africa, or computerized transaction systems as seen related to the data warehouse debate. For the Tuberculosis electronic register and from some Anti retroviral Treatment electronic registries for AIDS patient, “extract, transform and load” functionality is established with the DHIS, the standard more technically advanced “Western” data warehouse model is gradually being adopted.
### 4.6. Summarising the cases

**Table 1: Summarising the cases**

<table>
<thead>
<tr>
<th>Data warehouse standardisation approach</th>
<th>Botswana</th>
<th>Zanzibar</th>
<th>Sierra Leone</th>
<th>South Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incl. all existing report forms – little revision of overlap and inconsistencies between forms and data elements</strong></td>
<td>Including all existing report forms – little revision of overlap and inconsistencies between forms and data elements</td>
<td>Full revision of all report forms – no overlap between forms and data elements. Annual revision process</td>
<td>all existing report forms – no revision of forms, overlaps solved in database, inconsistencies identified and addressed</td>
<td>Essential data sets. Specific paper reporting forms collected uniformly across country, eventually in addition to other forms</td>
</tr>
<tr>
<td><strong>Why this approach was selected</strong></td>
<td>Capacity to lead integration not available. Data warehouse to highlight to stakeholders the need for integration.</td>
<td>All stakeholders agreed to revise and coordinate their reporting forms and solve problems of overlaps</td>
<td>Previous efforts failed because not all programs were included. Now include all data reporting and stakeholders. Show overlaps and inconsistencies.</td>
<td>Extreme fragmentation caused effort to establish new unified reporting forms in addition to all other reporting routines</td>
</tr>
<tr>
<td><strong>Main challenges with the approach</strong></td>
<td>To direct the early momentum gained into real integration. Avoid entrenchment of fragmented system by computerizing it.</td>
<td>Annual revision process tends to add data standards haphazardly program by program making consistency over time difficult</td>
<td>Align all actors in the integration process. Local capacity building. Supporting infrastructure. Harmonization of collection tools and indicators</td>
<td>Keep pace with new developments and technologies and remain in the forefront; e.g. on top of HIV/AIDS reporting development</td>
</tr>
<tr>
<td><strong>Main benefits of this approach</strong></td>
<td>Quick computerization, fast results in populating the data warehouse</td>
<td>Systematic approach, combine management of data from all programs</td>
<td>Reduce amount of manual data entering, highlight overlaps, all data available in database. Shows early the benefits.</td>
<td>The smaller and simpler data sets gives better quality and availability of needed data from across programs</td>
</tr>
<tr>
<td><strong>Status</strong></td>
<td>Slow to gain momentum within MoH, but full local responsibility assumed by 2008. UNAIDS-fork in nationwide use.</td>
<td>National standard. Use of data and data quality is increasing through regular district data use workshops</td>
<td>Stakeholders agreed on shared harmonised data sets to be implemented countrywide.</td>
<td>National standard. High quality data and level of use. Being gradually extended to new data sets and use areas</td>
</tr>
</tbody>
</table>
### 5. DISCUSSION

In this section we discuss and compare the four technically different integration approaches in relation to how they panned out in practice, that is; how the technical approaches related to the political processes. We use the term attractor to bridge or correlate the two dimensions of technical and organisational political development.

While South Africa established a new minimal essential data set in addition to the myriad of existing systems, the three other countries, Botswana, Sierra Leone and Zanzibar, all followed different all-encompassing strategies; 1) Botswana: included all data “as they are”, without solving inconsistencies between them, 2) Zanzibar: started with revising the data collection tools and solving the inconsistencies before setting up the data warehouse, 3) Sierra Leone: accepted that there are different overlapping data collection forms in use, but solved the inconsistencies in the meta data structure of the database.

Ideally, the best approach to standardizing health data and integrating different vertical data reporting systems would be to make all actors agree upon a new set of standards and then implement the new standards. This is to some extent what was achieved in Zanzibar. However, due to the wide variety of vertical donor initiatives, which all tend to have their own separate reporting requirements, and overall changes in information requirements within and between the various vertical health programs, standardization of health data is a complicated process. Standards tend to be evolving through negotiations between actors facilitated through ongoing efforts to develop standards in practice, rather than through early agreements (Braa et al, 2007, Egyedi, 2002, Hanseth, Monteiro & Hatling, 1996). The four country data warehouse approaches described in this paper all address the need for integrating data from the different health programs and services by including the data in one database, but they are using different approaches for the standardization process, from the “loose” approach in Botswana, to the much tighter and structured approach in Zanzibar with
Sierra Leone in between, and with South Africa following a somewhat different approach of establishing an additional system which is gradually encompassing larger parts of the other systems.

Data warehouse development is typically characterised by involving different groups, departments and structures, contrary therefore to a more limited IS project, one “champion” is not enough, as noted by (Wixom et al, 2001). Champions need to be found in several of the involved structures and departments. This is clearly demonstrated by the case of Botswana where the champions where located in a different Ministry from the Health and Local Government. It has therefore been problematic to reach the needed momentum. UNAIDS, with sufficient resources and strong links with all involved actors, managed to bring the stakeholders together to form an integrated collection tool, though only those programs related to mother and child health, ART provision, and HIV counselling, education, and testing.

The strategy in both Botswana and Sierra Leone was to achieve quick implementation and piloting through avoiding much of the negotiation process commonly undertaken in integration efforts. This was done by mapping the existing systems to a database, though with a not-so-hidden agenda. Using the integrated data within the DHIS software as an attractor (Braa et al. 2007), the data warehouse was still set up to enable and promote further integration in the future, through the inscriptions present in the software. By both highlighting the duplications in the data warehouse, and emphasizing the built-in flexibility to change the software, the intention was to increase the incentives for integration.

Even though the political aspect is critical, integration entails technical issues. The technical solution must support or adapt to different logics and political compromises among involved actors. It must be flexible enough to meet current needs and further changes (Braa et al, 2007). According to Latour (Latour, 1987) translation occurs as actors enrol allies in the actor-network and align their interests in a continuous process of re-negotiation. In the four countries, one flexible application – DHIS – is used to support integration through a data warehouse approach. But each of these approaches represents a possible point on the evolution line as shown in figure 2. We have two extreme situations. On the one hand, in Botswana the HIS-revision had adapted too much to the previous disorder since stakeholders did not manage to come out with compromises about ordering the mess. On the other hand, in Zanzibar, the local organisational political context favoured order-making and yielded a harmonized national standard of data elements and indicators flowing in the system. In terms of integration approach, the cases of Zanzibar and Sierra Leone situate themselves between Botswana and South Africa. While in Zanzibar, the aim was to include everything in one system, in South Africa only the essential data from the various areas were focused upon. The approach followed in Sierra Leone may be considered a middle path. Here, the mess was embraced among actors and avoided in the database. The compromise was struck to avoid waiting for an agreement about any harmonization, which has shown to be quite a challenging task. The reporting tools were tinkered where and when it was possible and much effort was put on cleaning and avoiding overlaps in the database, while the paper forms used to collect data would still remain as they were. The development in Sierra Leone after the middle of 2008 has demonstrated that the approach was successful; the various actors have been convinced through the process that a better system is possible if they join forces and they have agreed to unify the various data reporting forms.
In the evolution line (see figure 2) the case of Botswana represents an early stage, but that does not mean any integration process using data warehousing approach must start at that point, nor that the next step will be the case of Sierra Leone.

Regardless of the approach used, an effective integrated HIS must provide a good tool for M&E and easily produce accurate information for action. In addition it must be able to effectively deal with the continuously changing health sector. By reproducing the overlap and inconsistencies in the database, each program in the health framework in Botswana will still have their own data, make their own analysis and get some output from the system. But their approach will hamper any attempt of cross analysis. Moreover it can lead to inconsistency and produce different figures for the same phenomenon. In SA, the national standard approach can allow them to implement changes in one place, without this overlapping or changing the information requirements of other units. If we consider the South African case as the most evolved among the four, both Zanzibar and Sierra Leone can be improved to reach that step without any change in the database. As far as the Botswana case is concerned, a breakdown will be needed at least at the database level to progress towards the South African situation. This is still doable when the network of actors – human, health program, the database, etc – does not reach a critical mass. As we can see, the installed base – existing systems – and the way the actors are aligned and the way the compromise is implemented at any moment shape the possible next step in the evolution of the system.

The four cases demonstrates that the political situation in terms of top-level support, extent of agreement among the various health programs, donors and health programs, commitment, leadership and funding are the important factors in the integration process. The technical approach needs to develop as an attractor within this context in order for the process to succeed.

In South Africa the political situation enabled change and the federal constitution made it possible to explore innovations in one province at the time. This is probably the reason why South Africa managed to follow the most radical approach and establishing a new innovative integrated solution as an attractor.

In Zanzibar, and Sierra Leone also, the political situation formed the approaches followed: In Zanzibar both the political and financial support was solid and it was possible to move directly to a unified and shared set of data standards. Despite technical problems in the beginning, the unified data sets and the software provided a sufficient attractor, given the political context, for increased support and momentum.

In Sierra Leone the top level support was solid, but the various health programs were not totally on board, and it was necessary to demonstrate through an attractor that a better and unified system would be possible to develop. It is important to realise that successful HIS in developing countries are rare and that very little knowledge exists among donors and health programs alike. Furthermore, it is important to realise that there are strong incentives to maintain vertical systems; donors provide funding to health programs and integration and sharing of resources means transparency and are easily translated to “less control of my money” among the health programs. And vice versa, the donors might also feel they lose control if their data and other whereabouts are shared among all actors.

In Botswana there were not enough central leadership and political support, and not enough funds, to continue to the next step of solving the inconsistencies in a participatory process.
involving the various health programs. It is therefore not possible to say that the reason for not succeeding in Botswana was due to the approach followed. What may be said, however, is that the technical solution provided did not become a sufficient attractor, given the political context.

6. CONCLUSION

The four cases demonstrate that while different technical approaches may lead to relatively similar results in terms of integration, the crucial issue is the extent to which the solutions are embraced and adopted within the political dimension. In three of the four cases; South Africa, Sierra Leone and Zanzibar, the achievement was to create an attractor for the further development and integration of the HIS. In Botswana, as a contrast, the creation of an attractor for integration was not achieved. The integrated technical solution that was developed; the collation of all data including all the inconsistencies in one database, did not demonstrate well enough its enabling character. This together with the comparatively weak political base in the Ministry of Health and the insufficient funding through a research project, have made it difficult to develop the process in Botswana further. The technical approach in Sierra Leone was brought further from the one in Botswana, now the data inconsistencies was solved in the meta data structure, and the technical solution was more convincing. Given the strong political base in the Ministry of Health and the HMN, and the initially more lukewarm support in the vertical health programs, the technical approach in Sierra Leone provided an attractor for change. The first year of the process in Zanzibar was plagued by technical problems related to the development of the new DHIS 1.4 version, but given the strong political support, the process was not derailed, the integrated data sets and the DHIS still provided a sufficient attractor, and the system has since the initial phase grown in strength.

South Africa provides a different experience in that here an additional system was developed and became a strong attractor for change. Again, this needs to be understood in relation to the political context; post-apartheid South Africa was open for changes, old structures were to be dismantled and new structures to be built. Successful implementation of new integrated minimum data sets using the DHIS, in first one, then two, then all provinces, turned out to become a strong attractor for change.

Given this summary of the four cases we conclude as follows: The creation of an attractor seems to be crucial when aiming at HIS integration. Furthermore, the less political support, and the less prepared and aware the organisational-political actors are, the more convincing the attractor has to be, and to some extent vice versa; if the political support is solid, more errors are accepted. An attractor can thus only be understood and created within a political context. An attractor is therefore, at least in the case of HIS integration, acting as a boundary object (Star and Griesemer 1989) between the technical and political dimensions of HIS standardisation.

7. REFERENCES


The role of Social Capital in the Integration of Health Information Systems

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Abstract: In recent times, the agenda of strengthening ICTs mediated integration of Health Information Systems (HIS) has been emphasized in research and practice of health reforms in both developed and developing countries. However, its realization remains to be challenging especially in the context of developing countries. The paper presents a case study from Gujarat state of India describing the efforts of a HIS project to implement an integrated computerized system to manage the routine health information. A central argument in this paper is on the role that social capital plays in the process of building such a system, and also the role of ICTs in building such social capital.

Key words: Health information system. HIS integration. Social capital, social networking
The role of Social Capital in the Integration of Health Information Systems

1. Introduction

In recent times, the agenda of integration of health information systems (HIS) has been emphasized both in research and practice of health reforms in both developed and developing countries (Health Metrics Network 2008). As a result, the identification of ‘best’ practices has been observed taking the attention of contemporary HIS researchers. While integration in simple terms refers to the linking of various disparate systems and associated practices, its importance is emphasized by the adverse effects of fragmented HIS with respect to data quality, utilization of resources, and the adoption of a coherent and comprehensive health systems approach to health reforms. Integration may not always be the most efficient approach, as there may be particular problems such as the management of epidemics which may be more suited to a management approach around vertical programs rather than a district based geographical area focused approach as advocated by the primary health care model. This then raises the questions of what should be integrated, how and by whom. However, this paper is not thematized to respond to this question. Rather, we focus on how trust, social relation and networking may contribute for integration efforts.

The dominant approach to the research and the practice of HIS integration remains largely technology focused, concerning how newer and more modern technologies can be applied to address hitherto unaddressed fragmentation challenges. So, we tend to find different types of technologies at different points of time such as Enterprise Resource Planning systems, Service Oriented Architectures, Web-based systems, and in the health domain, Electronic Patient Record systems being tried out as tools for spearheading integration initiatives. The unrealized potential of such technology focused initiatives have led research to also focus on the social and political determinants of integration initiatives (see for example, Chilundo and Aanestad 2003; Aanestad et al. 2005; Smith et al. 2007). As a result, it is increasingly being recognized that integration of information systems in general and HIS in particular, is as much a technical exercise as it is about addressing the institutional, social and political conditions. In continuing with this line of research, this paper analyzes the role of social capital in the integration of HIS in the context of developing countries.

The notion of social capital has its roots in social sciences, and commonly refers to the investments made to build cooperative activities in organizations that have a potential rate of return (Prusak 2001). When we invest in infrastructure, we get infrastructure in return, and in the same vein, when we invest on building social networking, we get more of what makes the infrastructure work in practice and also to enable of the development of the infrastructure itself. Since integration is very much about creating cooperative activities to enable the building of technical and institutional linkages, it is very appropriate to study it within the framework of social capital. We address the following two fold research questions in the context of this paper:

1) How does social capital shape the realization of ICT based HIS efforts in the context of developing countries?

2) What is the role of ICT in building social capital?
Empirically, the paper draws upon the study of ongoing efforts of a NGO called HISP India to design, develop and implement integrated HIS in the state of Gujarat in Western India. Specifically, the focus is on understanding the nature and role that social capital plays in the realization of the integration efforts.

The rest of the paper is structured as follows. In the next section, we discuss key concepts around social capital, and the manner in which it has been appropriated in the domain of information systems research. Next, we outline the research methodology employed, followed by a description of the case study. In the analysis and discussion section that follows, we discuss the nature and role of social capital in shaping and being shaped by the integration efforts. Finally, some brief conclusions are presented.

2. Social capital and its application in IS research

One of the founders of the concept of social capital, Pierre Bourdieu (1986), defines the term as “the aggregate of the actual or potential recourses which are linked to possess of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition” (pp.248). Husman and Wulf (2004) provides a more elaborate definition, saying: “Social capital refers to the network ties of goodwill, mutual support, shared languages, shared norms, social trust, and a sense of mutual obligation that people can derive value from. It is understood as the glue that holds together social aggregates such as networks of personal relationships, communities, regions, or even whole nations” (pp.1). In short they say that: “Social capital is the value derived from being a member of a society or community. By being a member, people have access to resources that are not available for nonmembers” (Husman and Wulf, 2004). Social capital can thus be seen as an important ingredient for knowledge development within and between organizations (Cohen and Prusak 2001), with also potential negative effects if there is a condition of high dependency on the central actor (Uzzi, 1997).

In our research what we found more interesting, and which is not given much emphasis in the social capital discourses, is the value derived from being part of multiple networks. Why we used social capital is because of its central focus on ‘trust’ but not much of authority. However, we argue that this trust gained through being part of multiple networks is the source of power and authority for the institutional entrepreneur who wants to bring change lets say in organization.

Nahapiet and Ghoshal (1998) identified three analytical dimensions of social capital: structural; relational; and the cognitive. The structural dimension refers to the overall pattern of connections between actors, who you reach and how. The presence or absence of network ties among or between actors is a key facet of this dimension. When connection and interaction between members of the network gets stronger, other individuals are more likely to be involved (Chou and Chang, 2008). The relational dimension focuses on the particular relations people have, such as respect and friendship, that influence their behaviour. Trust and trustworthiness are key facets of this dimension. The cognitive dimension refers to those resources providing shared representations, interpretations and systems of meaning among parties. This framework has been applied by various researchers. For example, Martin et al (2005) adopted it to evaluate relational computer based change management initiatives.

The concept of social capital is in recent times also being drawn upon in technology studies and information systems research. For example, Syjamb and Kuutti (2004) in their study of a
technology mediated hunting dog breeding community, described how technology helped them to generate and maintain trust, acceptance and alignment which was necessary for building successful cooperation. The use of information technology was described by the authors to make the actions of the key actors more visible to each other which in turn facilitated the emergence of trust and social capital. In the same vein of understanding the role of social capital in civic engagement, Blanchard (2004) explored how participating in virtual community affects social capital in a face-to-face community. Drawing empirical material from a Multiple Sport News group virtual community, the authors argued how active participation in the group positively affected face-to-face social capital and norms of trust amongst members in both the virtual and face-to-face groups. As a result, members were seen to be less attached and obligated to the virtual community as compared to the face-to-face.

Quan-Haase and Wellman (2004) argue that unlike determinists who suggest that technology is diminishing or transforming social capital, the Internet is enhancing it. They argued that those who use the Internet also would continue to communicate by phone and through face-to-face encounters. Information technology also can play an important role in knowledge sharing by enabling communication amongst proactive individuals regardless of time and geographic location (Hoof, Ridder and Aukeme, 2004). Social capital, it can thus be inferred, is not only developed by group actions or collective norms but is also enabled through individual characteristics such as the eagerness and proclivity to share.

In summary, information systems research which has drawn upon the concept of social capital has largely focused on how technology mediated interactions contributes to the development or not of social capital and its various constituting aspects. However, what has not been given adequate attention is the constituting and constituted relation between technology and social capital. This implies the need to understand how the technology itself is a function of the existing social capital, and how the interaction between the two reconfigures both the technology and the social capital. This analytical relation is explored in the context of a HIS integration initiative in India.

3. Methodology

The study is framed within an ongoing action research initiative involving the design, development and implementation of HIS within a public health setting in India. Data collection took place through a variety of means. Firstly, the whole process of action research engagement for over a period of 2 years in the state provided us with deep insights into the people involved, their interests, the problems they faced with the existing fragmentation of systems, and what was their visions and expectations of an integrated HIS. For example, we periodically met with the head of the health department to understand the challenges he was experiencing due to the fragmented information channels within the reproductive child health programs, and his vision of developing integrated and cross cutting indicators to allow for more effective monitoring.

To develop more specific insights into the social capital and integration relation, qualitative semi-structured interviews were conducted of key stakeholders. Specifically, we tried to understand the nature of socio-technical challenges to integration, and how they were trying to be addressed by the implementors (HISP India) and the users. The key assumption underlying this inquiry was that integration is a complex phenomenon that is deeply embedded in historically existing technical, institutional and social conditions. This assumption guided us to use largely open-ended questions allowing the respondents to give
their views on how they see integration and also the nature of their social networks and interactions around the technology initiative.

Gujarat state, the site for the empirical work, is composed of four hierarchically arranged administrative levels: state, region, district and block. Gujarat has 5 regions, 25 districts, with each having 5-7 blocks. The block is where the computer was placed and where the entire data entry and reporting of all the health facilities in the surrounding catchment area took place. From the block, the aggregated data was sent (either online or manually carried in flash drives) to the district, where further aggregation took place in the online application called District Health Information System (DHIS). The region served as an administrative unit responsible each for 5-6 districts, but where no specific HIS related activities took place. At the region, the person responsible was the “regional program coordinator” (RPC), the “district program coordinator” (DPC) at the district, and the M&E (Monitoring and Evaluation) Assistant or the Block Health Officer (BHO) were responsible at the block.

A series of focussed interviews were carried out with staff from the different levels (see Table below), when we visited each of the regions during the period 4-8, August 2008. During each of these visits, the state level team (including us researchers) the State Director made presentations of the new version of the system, attended to problems the district and block level staff pointed out to, and gave them CDs containing the new system. It was during the breaks of these meetings, interviews were conducted with some of the district and block staff. Listening to the overall interactions between the state and district/block teams also served as very useful sources of data.

<table>
<thead>
<tr>
<th>District/Block</th>
<th>No. Respondent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghandinagar region</td>
<td>1 RPC</td>
</tr>
<tr>
<td>Ghandinagar district</td>
<td>1 DPC</td>
</tr>
<tr>
<td>Ghandinagar block</td>
<td>1 M &amp; E assistant</td>
</tr>
<tr>
<td>Mansa Block</td>
<td>1 BHO and 1 M &amp; E assistant</td>
</tr>
<tr>
<td>Baruch District</td>
<td>1 DPC and 1 M &amp; E assistant</td>
</tr>
<tr>
<td>Jamanagar corporation</td>
<td>1 M &amp; E assistant</td>
</tr>
<tr>
<td>Surat District</td>
<td>1 DPC</td>
</tr>
<tr>
<td>Dagen District</td>
<td>1 DPC</td>
</tr>
<tr>
<td>Navasari District</td>
<td>1 DPC</td>
</tr>
<tr>
<td>Vododra District</td>
<td>1 DPC</td>
</tr>
<tr>
<td>Panchmhal District</td>
<td>1 DPC</td>
</tr>
<tr>
<td>Amerli District</td>
<td>1 DPC</td>
</tr>
<tr>
<td><strong>Total Respondents</strong></td>
<td><strong>14</strong></td>
</tr>
</tbody>
</table>

Table 1: Number of District and Block respondents

There were various other sources of data. For example, emails written from and to the state and district teams helped to understand specific issues being raised. Emails between the HIS staff also helped to understand how they were trying to find solutions to the issues of support being raised. Practical engagement of one of the authors in some of the technical tasks such as cleaning up the problems in report generation and solving software bugs further helped to gain insights to the technical challenges to integration.

The data analysis was shaped largely within an interpretive framework, where different aspects of the nature and implications of social capital and its interaction with the integration
initiative were inductively interpreted. Both the authors of this paper carried out their respective interpretation and then collectively tried to understand the variations in the interpretations. Subsequently, these interpretations were analyzed in the backdrop of the theoretical construct of social capital and integration to understand the specificity of the findings with the research phenomenon studied.

4. Research setting

The case is set in the public health system of the state of Gujarat. There are two key actors involved in this research: HISP India, a NGO that was engaged in the design, development and implementation of an integrated HIS for the state; and, the Health department of the state who were the users of the system and the information being generated by the system. Since HISP India was a node in the larger global R&D network established by the University of Oslo, Norway, around HIS (called Health Information Systems Project – HISP) ongoing in about 15 different countries in Africa and Asia, they drew upon the expertise offered by Oslo research and masters students to address particular technical problems (such as for optimizing server performance). HISP India also tried to draw upon “social capital” nationally, especially the personal networks of the President of the organization, for example, in getting friends in local software companies to look at the software code or in getting their advise on establishing software testing protocols.

Gujarat is a state on the west coast of India with an estimated population of about 50 million (as per census India, 2001). The state is in the forefront of economic and infrastructure (including e-infrastructure) development in the country, reflected in the fact that nearly all district and sub district level health facilities have computers, and there is internet connectivity available down to the sub district (called block) level. With respect to the organization of primary health care delivery, the state is divided in to six sub-national regions, 26 districts, 250 Blocks, 950 Primary Health Centers (PHCs) and 450 Community Health Centers (CHCs). Each PHC has under it about 5-7 Sub Centers (SCs) that are responsible to provide outreach based services to the community.

Generation of health information starts at the SC which is the first contact point between the community and the primary health care system. Field level male and female nurses are expected to visit the villages assigned to them (one nurse typically is responsible for a catchment population of 5000) for providing various public health related services such as related to deliveries and immunizations. Data generated through this service delivery is first noted in the field diaries, then posted to various registers (typically about 15 to 20 in a SC relating to Malaria, TB, Family Planning, Antenatal care, Immunization etc), and finally taken on a monthly basis into the Form 6 which is then sent to the parent PHC for further processing and upward transmission. The health supervisor at the PHC level compiles this Form 6 data together with Form 7, which includes data from the PHC level service delivery, and prepares Form 7A (an aggregate of all SCs and the PHC services) which is then sent to the Block Health Office (BHO). The CHCs in turn compile their service delivery in Form 8 and also send it to the respective BHOs. At the BHOs, Forms 7A and 8 are aggregated to Form 8A and sent to their respective district offices where an aggregated Form 9 is compiled and transmitted to the State office. The schematic below summarizes this rather complex and fragmented information flow.
Figure 1: Fragmented information flow in the RCH program

It must be noted that the above schematic is primarily concerned with the RCH program. In the larger picture there are various other programs such as TB, Malaria and Integrated Disease Surveillance Program with their own respective information systems. This was however, not seen as a problem by some, like a district staff who remarked:

*It is impossible to mix all the programs since they have their own agenda...what is wrong in working separately. they are working fine and it is very easily to monitor a single program than the whole.*

Given this brief contextual background, we now discuss the specific initiative studied.

1.2 Implementation process of the integrated e-HIS

In what can be called as the first phase of the project, in early 2006, HISP India was invited by the State to implement an integrated HIS on a pilot basis at the block level in one district in the state (called Valsad). The notion of integration involved in this phase was taking the data entry forms of the different Reproductive and Child Health (RCH) related activities into one format (Form 6) in order to try and eliminate various redundancies and duplications. The project involved the deployment of the HIS application (called DHIS) at the BHO office computer and training the staff from the different facilities in the block to carry out the basic data entry and reporting activities. Similar processes were also undertaken at the district office. Six months into the process, the project results were evaluated, and happy with the outcome the State Health Commissioner extended the project to four further districts (Rajkot, Surendranagar, Kutch and Baruch). However, in early 2007, for various institutional reasons unknown to HISP, the State terminated the project stating their plan to use another application.

In late 2007, HISP India to Gujarat was recalled by the Health Commissioner as he was unhappy with the application bought in place of the DHIS, especially its weak analysis capabilities such as related to the generation of indicators and their graphical and map-based presentations. In the presentation made when recalled, HISP India emphasized the dashboard facilities of the application, and the value it provided in monitoring both the data quality and health status in the districts. To address the previous unsuccessful implementation of HISP
India in the 5 districts, the Commissioner changed the model from a block level deployment to a server based state level deployment arguing that such a “top down” approach would help to develop ownership of the senior state managers who would then be able to provide the impetus for the lower levels of district and block implementation.

In retrospect, this implementation model has in general worked quite well with the district level implementation stabilizing to a large extent within a period of 2-3 months. This involved a server based deployment which has been the medium for the use of the integrated application. The very fact that all the districts were required to access the same application over the same internet infrastructure required the need to further integrate processes such as related to data entry and technical support. Further, the integrated application placed additional pressure on the performance of the database because of the sheer volume of data that needed to be stored, accessed and processed at one source. The server based application also created the need for developing new kinds of capacities both for the users (who previously had not worked on an internet based HIS), and for HISP India for whom it was their first such experience of implementation. Three challenges to integration related to server, database and capacity are now discussed.

i. Server performance

The DHIS application was deployed on a Windows based server that was rented from a private provider based in North America. The server had a 2 GB RAM, which with time as data started to be entered for a few months became paralyzing slow. The slowness was further magnified by the local Wide Area Network in use in the State which had an extremely limited bandwidth. These technical constraints coupled with the institutional practice of the monthly data being entered by all the users in the last week of the month, meant that the server was significantly overloaded during this period and also with the peak working time in the day (10am to 8pm). For example, we tested that importing a file during this peak period took nearly 10 to 20 minutes, while outside this period (in the night) the same file could be downloaded in less than a minute. In the interviews and email correspondence conducted, the respondents expressed their disappointment regarding server performance, both while entering data and also in using the export-import functionality. The following email extract from a District staff to his state in-charge reflects this problem:

Respected Sir,
This is to bring to your kind notice that most District Blocks have completed of Data Entry in Offline DHIS2.0 for April-May-08 Sir. They export the Data by Data Set Wise as advised by HISP India Sir. But when they try to import the same Data to the online application, they are facing problem Sir… We are getting several calls from the Blocks everyday regarding the above problem Sir. Could you please request HISP India to find a solution to the above problem at the earliest Sir.

A DPC from another district summarized his server related problems in an email:

Subject: Problem in DHIS
Respected Sir,
As per your instruction to finish the DHIS entry, we have completed, 40% of entire, but we are facing a lot of problems.
1. Server is very slow.
2. Data is not getting saved.
3. Software is not accepting zeros.
4. Software is getting closed automatically.
5. It is taking ½ hrs to save one entry and for the cursor to move to next column.

Kindly help us in the above mentioned regards so that we can this the entry as soon as possible.

In addition to the earlier problems of server performance, the 3rd problem related to “not saving zeros” was because HISP India in trying to find a solution of the ever expanding database analyzed the database to identify that nearly 70% of the data included was systematically being reported as “zero” or “blank.” This was pointed to the state HIS in charge, and it was suggested that we don’t store the zero and blank values in the database. While he was not agreeable to this suggestion completely, we were forced to do that to prevent the almost complete paralysis of the server application. Further, it was found that the same user name and password were being shared by multiple users which were magnifying the load on the application. To try and work around the slowness of the internet, some of the users tried to use the internet from a cybercafé with nearly the same results. The following email reflects this attempt and the outcome from the same:

On Mon, Jun 23, 2008 at 11:28 AM
Hello
As discussed on Saturday since there is some problem with the importing process at my end, I tried to do it from cybercafé on Saturday, but it did not happen because the server was too slow. Then I went there yesterday early in the morning and I tried the same procedure again. But the same problem is still there. Now I did it from our computer for two other centers, it is giving the same message like 57% or 100% import process completed. But in the data entry screen, no such data is seen. Please again look in to the matter seriously. May be there is some problem of importing with my username/password.

Since dealing with server related problems was new experience for the HISP India, they tried to draw upon the “social capital” available through the Oslo network of PhD and masters students. Suggestions were made to enhance the server RAM, which was done first from 2 to 4 GB and then to 8 GB. Another suggestion was made to shift the server from a US based provider to one which was local to address the problem of data transfer speed. This was also done to an Indian based provider, whose server was however based in the United Kingdom. While all these measures have greatly helped in enhancing performance, the rapidly expanding database size and number of users continue to prove as challenges to performance. Further measures are being worked on including the optimization of the DHIS application, splitting the database and the application part of the DHIS into separate servers, and further moving the server to Gujarat.

ii. Database Size

With time, as first all districts and then block level users started to use the application, the size of the database started to grow exponentially including data for about 8000 organization units. The HISP India team made a systematic analysis of the database, and wrote the following email to the State in charge:

Date: Thursday, August 28, 2008, 4:44 PM
At the end of every month we have 1,15,30,220 records in the database, of which 78% of data belongs to the Sub Centre (the lowest level of data collection). This 78% of sub-centre data decreases the performance of the application to a great extent. To increase the performance and optimization of the application; we suggest that we maintain 3 to 4 level of data in the online system. But if and when State official want to drill down to PHC or Sub Centre level, data can be made available on request. To do this we need to build a new functionality in the DHIS2 called "Aggregated Export" which aggregates the data to higher level from the field and then exports the data. By keeping the PHC and Sub Centre data at the district or block level, we will be reducing 94% of data load on the server. As and when required by the state official, specific PHC or Sub centre data can be made available for further clarification or scrutiny. This could be achieved by exporting the data in normal (Current) mode. At state office we suggest to maintain one high-end computer (which can act as local server or backup server) where all the data can be stored to easy access and retrieval.

The above email highlights a policy issue of what level of data should be maintained in the online database. While HISP India were of the firm view that data from the lowest levels (Sub Centre and PHC) should not be kept in the online database (but in a local server) which would reduce the load by more than 90%, the state insisted that they wanted an “integrated database” including all available data. Even the suggestion made by HISP India on not saving zero values was not acceptable, as reflected in the following comment by a district staff:

*If we are worried about zeros at this stage in three months, what about the performance of the system in the long run.*

The option of using a commercial database like Oracle was also explored by HISP India instead of the existing free MySql, but the costs and licensing considerations quickly made the state to discard this option. The problem of the database remains still not fully resolved, but temporarily the situation was made under control with the 8 GB RAM server being able to handle the database load. But as the database size continues to grow, the problem is bound to resurface.

At this stage, the main actor, in HISP India NGO joined National Health System Resource Center (NHSRC) as a consultant for the HMIS. This enabled the actor to make a suggestion on how to improve the existing HIS. One of the core suggestions were on setting essential data sets which serves as standard by bridging the fragmented program owned information flows. Specialists from the public health domain were invited by the consultant to get input in the process.

### iii. Capacity limitations

There were capacity issues for both HISP India and the users. For HISP India, both the server and database related issues required a kind of expertise which did not exist in the current team. To solve them, they drew heavily upon the expertise of the Oslo doctoral students. Further, personal contacts of the HISP India in charge involving friends working in the sever business in private firms in both India and Oslo also helped to diagnose the problem and consider alternative solutions.
From the perspective of the users, many of the issues concerning the online system or the import and export of data were also new. A user from a district commented on their lack of experience in working with an integrated HIS:

*In the current situation, we have specialists to manage each program. And I hope they are effective. If we move towards an integrated HIS, then we need to have multi-skilled professionals. That should be the priority focus.*

Contractual arrangements were set so that HISP India was seen to be responsible only for the development while the State was to take care of the capacity building processes. As a result, no HISP India staff was physically based at the state level. The problem with this arrangement was that the state staff who was responsible for capacity building did not themselves have the expertise to further do the job. To address this problem, HISP India suggested to the state to hire three technical staff for the areas of server, database and programming. But however, due to the prolonged procedures inherent in state recruitment, this suggestion could not be implemented.

In the absence of these physical support mechanisms, HISP India has relied extensively on electronic mail communication, telephone support and periodic visits by their members to the state. The positive aspect of this arrangement has been that many of the users have really developed skills to be able to work effectively with the application. For example, detailed emails were written by the HISP technical person in Delhi to the state, district and block level staff providing instructions on how to upload a new war file.

In summary, we have discussed issues of server performance, database size and capacity needs to serve as challenges in the implementation of an integrated HIS, which at the present mode is only including the information systems to support the Reproductive and Child Health program. At the national level, there are ongoing attempts to integrate other vertical programs such as related to TB, Malaria, Blindness Control etc into the HIS. As these reforms are operationalized and transmitted to the state, there will be increasing pressures, technical and institutional, on the integrated HIS.

We now discuss the case material drawing primarily on the notion of social capital.

### 5. Analysis and discussions

The three dimensions of social capital identified by Nahapiet and Ghoshal (1998) – structural, relational, and cognitive – provide an analytical framework responding our examine the role of social capital in the implementation of the integrated e-HIS. This is now discussed.

**Structural:** This refers to the overall pattern of connections between the actors involved and the nature of the network ties that exist.

With respect to the case discussed, two aspects of the structural dimension are relevant. One concerns the top down implementation model adopted by the Commissioner, which first helped to create visibility of the initiative at the state level, and then senior state staff themselves took ownership and cultivated the virtues of an integrated system to the lower levels of the district and block. This kind of local ownership, often lacking in HIS implementation projects, helped to create a network of institutionalized relationships and
understanding of mutual benefits between the different administrative levels of the health department. The state level saw the benefits with respect to the richer analysis capabilities that an integrated HIS provided, but to realize this they needed the district level staff to take up the system in an effective manner. This mutual relationship was enabled through the structural top down model of implementation adopted, where the authority carried by the state level was crucial in initiating the process, and then the ongoing support and handholding provided to the users helped to cement the mutually beneficial network of ties. This provided the basis for the creation of positive social capital that helped the implementation of the integrated e-HIS.

The second aspect of the structural dimension concerns the relation HISP India has with the health organization. This relation is mediated by the focal actor who is part of three significantly influencing organizations: University of Oslo, HISP NGO and National Rural Health Mission-India. From these organizations, the actor extensively draw advices, human and financial resources that help gaining trust from the health sector about initial implementation in Gujirat and the expansion of the system functionally (e.g incorporating more health programs in the system other than RH) and geographically (including others states) which are basic to form integrated national HMIS. In general, this ability of the main actor to participate in different networks helped to create mutual trust between HISP India and the health department, with the latter learning to value the expertise, positive intention and objectivity of HISP India.

Relational: This focuses on the particular relations people have, including feelings of respect and friendship that influence their behaviour. Right at the outset, the Commissioner valued and respected the expertise that HISP India introduced into the initiative. These feelings were enabled by the fact that the President of HISP India was also a university professor with extensive global experience in field level implementation of HIS projects. Similarly, HISP India held the Commissioner in the highest regard, and valued deeply his vision and focus of an integrated HIS to support his and the State analysis needs. Gujarat undoubtedly is on the forefront of HIS use in India, and the personal status and visibility of the Commissioner nationally also helped to also provide HISP India with useful mileage in being accepted also by other states.

Outside the state networks, HISP India had strong personal relationships with friends who were working in technical positions in software firms both in India and Oslo. Whenever faced with a difficult technical problem such as optimizing server performance or using alternative databases, the HISP India President would call on his network of friends for advise, problem diagnosis and suggestions of alternative solutions. This very valuable advise was always made available without cost to HISP India who could then implement cost effective solutions.

Cognitive: This refers to those resources providing shared representations, interpretations and systems of meaning among parties. A key resource in this regard was the use of technology which while serving as the object of shared representations, also served as a medium to circulate these interpretations. Starting with the server based application, the medium of deployment for the integrated HIS, helped to focus the attention of hundreds of users to the same application in the “same physical location.” Frequent discussions on problems related to the server performance had the positive effect of creating a common understanding of the issues influencing the integrated HIS implementation. Common forums (such as of training programs) helped users to discuss similar problems, and also to create user groups who could help each other to find solutions. The use of internet also proved very useful for users to
directly be able to communicate with the HISP India technical team on the problems they were experiencing and be able to receive advise on how to address them. This direct line of communication was empowering for the users who could now subvert the traditionally existing hierarchical and centralized forms of communication.

6. Conclusions

In this paper, we have argued that the key role that social capital has played in the implementation of integrated HIS in the public sector domain of Gujarat state. On one hand, the existing social capital helped the implementation at many levels from enabling the introduction of the initiative to being able to start including other vertical programs. On the other hand, the deployment of the integrated application and the use of the internet helped the creation of additional social capital, such as personal relationships between the district users and the HISP India technical team based on mutual trust and confidence. This helps us to draw two key theoretical inferences. The first concerns the point that social capital is not something given and static, but is a process that grows over time both shaping and being shaped by the processes of implementation. The second concerns the point that ICTs including internet and the e-HIS itself plays a key role in further building social capital that is helpful to integrate the fragmented HIS. The integrated application provided a common focus and site for people to come together and discuss similar problems and jointly seek and identify solutions. Further, the use of the internet helped to take these common resources and circulate it across a larger social group enabling the creation of a broader base of social capital.

7. References


Quan-Haase, A. and Wellman, B. (2004) How does the internet affect social capital?. In social capital and information technology edited by M. Huysman and V. Wulf


Abstract: The knowledge, expectation, assumption, and interests of actors constrain and permit certain sets of communications and functionalities of ISs; specify actors, roles, and expected competencies; and influence the choice of development technologies and specify future trajectories. Besides this knowledge, it is crucial to uncover the process in which ISs acquire these characteristics, and their material and functional forms. This paper shows the processes of embedding actors’ interests, the dynamics of role delegation, and its relationships towards achieving the goal of implementing ISs. The paper reveals that roles can be allocated to actors to preserve a network regardless of the effort required to perform it jeopardizing the aspirations of IS implementation; the same task can be delegated to human and non-human actors at the same time in different contexts; and choice of technologies used to develop ISs can be dictated by the dominant actor, may not also consider the context. The paper shows the strategy adopted to establish and perpetuate a socio-technical network in the courses of developing and implementing an IS in the healthcare sector of a developing country context and shows how to overcome the identified challenges.

Keywords: IS design, translation, developing country, actor-network theory, health information system, antiretroviral therapy system, installed base, actors’ interests, inscription, program of actions.
TRANSLATIONS AS SHAPED BY INSTALLED BASE AND ACTORS’ INTERESTS

INTRODUCTION

The knowledge, expectation and assumptions of individuals about the purpose, context, importance, and role of that technology influence the design and use of technology (Bijker 1995; Hanseth and Monteiro 1997; Markus 1983; Monteiro 2000; Orlikowski 1992; Pinch and Bijker 1984). The material form and function of technologies also embody their sponsors’ and developers’ objectives, values, interests, and knowledge of that technology (Orlikowski and Gash 1994). The choice made by sponsors’ and developers’, for example, determines the process of work, the division of labor, autonomy of employees, and the decentralization or centralization of units and decisions. The technology also influences the path of its development and use (Barley 1986). Technologies are not simply passive and are never value neutral, but always exist in value-laden social and technical relations (Gasser 1986; Williams-Jones and Graham 2003).

Many have focused on the interplay between organization and ISs but lack explanation in where and how the interplay takes place and how one affects the other at a lower level of abstraction (Hanseth and Monteiro 1998). Research also suggests the need for bringing the IT artifact to the forefront (Hanseth et al. 2004; Monteiro and Hanseth 1995; Orlikowski and Iacono 2001) and clearly understand how it mediates change (Volkoff et al. 2007). ISs take material and functional forms during their interaction with the users (Akrich 1992). What is inscribed in ISs and “pre-inscribed” (Latour 1992) in the users, together the “script” (Akrich 1992), defines a framework of action together with the actors and the space in which they are supposed to act, which users may subscribe to or not. ISs explicitly delegate roles with specific competency, morality, and ethics to human and non-human actors (Callon 1991).

How this explicit delegation of roles works? Is it possible to delegate roles to human and non-human actors at the same time and why? This paper explores the dynamics of role allocation and its implications towards fulfilling the goal of implementing ISs in organizations and perpetuating actor-networks. The paper uncovers how actors’ interests are reflected in the material and functional forms of ISs. It also explores the mechanisms used to perpetuate an actor-network. The following empirical questions guided this research: What interests of which group and anticipated program of actions were embodied and why? What was the role of the existed work practice in shaping ISs and future translations? How anticipated patterns of use have affected the adopting organization and vice versa, and the implications thereof?

The empirical material for this research comes from ART (antiretroviral therapy) clinics in Ethiopia. These clinics face challenges in manually collecting and collating data due to the requirement to collect large amount of data per individual patient, the requirement to duplicate them, the fixed format data collection and reporting forms, and the ever increasing volume of patients in a resource constrained setting (Mengesha 2007).

Computer-based IS plays an important role in alleviating these problems (Walsham et al. 2007). To this end, HISP\(^1\) in collaboration with local and international partners, especially the

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\(^1\) HISP, which stands for Health Information System Program, is a network of health institutions and academics that has been operating in developing countries with the coordination of the University of Oslo. For more information on specific programs, see Braa, Monteiro and Sahay (2004), http://hisp.org, http://www.hispindia.org and http://www.aau.edu.et/faculties/dis/site/hisp/index.htm.
ART clinics and the Addis Ababa Health Bureau (AAHB), developed and introduced an open source (Bretthauer 2002; Hope 2004; McDonald et al. 2003; von Hippel and von Krogh 2003) ART system in 2006. Even if four USA based Universities have the mandate to support the ART service other local and international partners were also involved. The interests of these partners to introduce computer-based solution to the data collection and collation challenge turned the environment to a center of competition and politics rather than collaboration. The phenomenon has shaped the design of the IS influencing the choice of development technologies, delegation of roles to human and non-human actors, subsequent translations, and durability of the actor-network. The existed ART practice also dictated the design of the system to follow its path and affected implementation in similar clinics. The nature of the computer system as an efficient data processing tool has influenced the distribution of roles to components of the network. These influences finally resulted in a suboptimal ART information system.

The paper is organized as follows: it discusses the theoretical framework and concepts used to explain the case in the following section. Then, it presents the data from the perspective of actors’ interests, role delegation and scaling, following the presentation of the research methods. The last two sections present the analysis and discussion, and the conclusion, respectively.

THEORETICAL FRAMEWORK

This study draws upon the notions of Actor Network Theory (ANT) specifically it uses concepts such as actor-network, translation and program of action. ANT was born out of the interdisciplinary field of STS (Monteiro 2000) and helps us deal with the world of hybrid entities (Hanseth et al. 2004; Tatnall and Gilding 1999) made up of the social and the technical (Akrich 1992; Latour 1992; Law and Bijker 1992). ANT helps us understand the relationships between organization and technology (Hanseth 2005) by providing a language to describe how, where, and to what extent technology influences human behavior and vice versa at a flexible granularity of analysis (Monteiro 2000); it offers an approach to socio-technical change (Gao 2007; Walsham 1997). ANT adopts a “flat” ontology (Mutch 2002) and it has been the area of criticism which some authors refuse to be an “unfounded claim” (Hanseth et al. 2004).

Technological artifacts are not exclusively the result of pure engineering and design processes but also are products of often conflicting views of the world (Bakardjieva and Feenberg 2002; Feenberg 2000). Technical objects are hybrid by themselves and participate in building heterogeneous networks that bring together actants of all types and sizes (Akrich 1992). Similarly, IS development in organizations involves tensions from different sources and events, circumstances, and unpredictable courses of action shape the trajectory (Cordella 2006). ISs cannot be designed from abstract markets in an asocial manner (Pollock et al. 2007). Designers closely work with users with an understanding that increased knowledge of users and the environment would lead to a better design. The design can also be affected by what exists, the installed base (Hanseth and Monteiro 1998).

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2 The ultimate target of the project was to realize an integrated HIV/AIDS management system that helps to manage a wide range of related services such as the management of voluntary counseling and testing, prevention of mother-to-child transmission, opportunistic infections, sexually transmitted infections, home-based care, ART pharmacy, indicators production, GIS provision, service mapping, referral linkage and TB functions.

3 Four Universities from USA such as the University of Washington (I-TECH), John Hopkins University (JHU), University of California (UC) at Santiago and University of Colombia have the mandate from the Federal government of Ethiopia to support ART related efforts in Ethiopia.
Different actors, both human and non-human, interact and influence one another while accomplishing tasks forming a web of relationships called actor-network (Holmström and Robey 2002). This actor-network links together the human and non-human elements (Callon 1986a; Callon 1986b; Callon 1991; Hanseth et al. 2004; Latour 1991; Monteiro 2000) which can be an actor-network by itself and/or part of another actor-network. The stability of an actor-network is preserved as long as all human and non-human actors remain faithful to the network (Whittle and Spicer 2008). The notions of inscription and translation are important to explain how actors’ heterogeneous interests are aligned, and actor-networks are formed and sustained overtime (Callon 1991; Gao 2005; Holmström and Robey 2002).

Translation is a ‘glue’ (Williams-Jones and Graham 2003) that encourages actors that are independent and capable of resistance or accommodation to be involved in a network (Callon 1986b; Callon 1991; Latour 1991). Translation refers to the mechanism through which actors can transform themselves, displacing their own identity as well as that of others (Bruun and Hukkinen 2003; Callon and Latour 1981). The notion of translation implies definition and it involves a translator, something that is translated, and a medium in which that translation is inscribed (Callon 1991). In the case of ISs, designers translate the requirements of users into a computer-based solution, an inscription. Designers make hypothesis about the entities that make up the world into which the IS is to be inserted and make concrete judgments about anticipations and restrictions of the future patterns of use (Akrich 1992; Monteiro 2000).

Designers (...) define actors with specific tastes, competences, motives, aspirations, political prejudices, and the rest, and they assume that morality, technology, science, and economy will evolve in particular ways. A large part of the work of innovators is that of "inscribing" this vision of (or prediction about) the world in the technical content of the new object. I will call the end product of this work a "script" or a "scenario."

IS design, therefore, is an attempt to predetermine the settings that users are asked to imagine for a particular piece of technology and the “pre-scriptions” (Akrich 1992) that accompany it. Designers transform themselves into sociologists, moralists or political scientists at precisely those moments when they are most caught up in technical questions (Callon 1991). The resulting IS can be treated as a program of action that coordinates a network of roles envisaged by designers, which may be played by users (Akrich 1992; Callon 1991; Latour 1992). The embedded script or scenario of ISs explicitly define and distribute program of actions or roles to humans and non-humans and the space in which they are supposed to act (Akrich 1992; Callon 1991). Designers delegate to non-humans not only force but also values, duties, and ethics that makes humans behave ethically (Latour 1992).

The question is how is this explicit delegation of roles works? Law and Bijker (1992) and Latour (1992) suggest the delegation of roles to be carried out as a function of the effort required to perform tasks. An artifact such as a door can easily handle the task of creating and closing an opening in a wall than a person knocking down and rebuilding the wall each time, hence, to delegate the task of creating and closing an opening to a door than a human. It is useless to delegate tasks to artifacts or people if the effort of making sure that they perform as they should is greater than the original effort (Law and Bijker 1992).

Delegation of roles to components of a network prescribes a set of competency and knowledge and has a direct implication on performance. Delegating tasks to inefficient actors may jeopardize effectiveness and efficiency.
RESEARCH METHODS

This paper is the result of a case study (Yin 2003) conducted under an action research framework (Baskerville and Myers 2004; Braa et al. 2004). It adopted a qualitative research approach (Creswell 2003; Eisenhardt 1989; Klein and Myers 1999; Silverman 1998; Silverman 2005; Yin 2003) with the underlying epistemological and ontological notions of the interpretive philosophy (Orlikowski and Baroudi 2002; Walsham 1993; Walsham 2002).

The fieldwork for this research was carried out from March to August 2006, from February to April 2007 and from November to February 2008. The research employed interview, mostly unstructured, onsite observation, discussion and review of both electronic and print documents. Besides, the author of this paper has been a member of HISP and engaged in the development and implementation of the ART system.

The data collection was centered on understanding the practices of ART such as the management and coordination structure, the flow of patients and information, and the different forms and guidelines that were in use. It was also important to understand the interests of the actors involved and study the ART system development and implementation processes to understand the dynamics of role delegation and the embedded interests. The implementation data comes from clinics in Addis Ababa region where the system is implemented. The researcher has made onsite observations and discussions with ART clinic coordinators, staff of five Hospitals\(^4\) and three regional health bureau\(^5\) officials in charge of ART and reviewed various documentations of the FMOH (Federal Ministry of Health). Altogether, a total of 57 unstructured interviews and discussions were made as stated in the following table:

<table>
<thead>
<tr>
<th>Specialization/Responsibility</th>
<th>Number of Respondents</th>
<th>Number of Interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART Coordinators</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Physicians</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Nurses</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Data Clerks</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Pharmacist/ Druggists</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Laboratory Technologists</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Regional Health Bureau Officials</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Representative/Delegates of USA-Based Universities</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Technologists</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>National HAPCO</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**Table 1: Respondents by Specialization and Frequency**

During the interview and discussion sessions, the researcher took note and summarized the main points afterwards. The analysis centered on iteratively reading data followed by identification of key themes. There was a need for continuously going back and forth

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\(^4\) The Armed Force and Military General Hospital, Tikur Anbesa Teaching Hospital, Zewditu Memorial Hospital, Federal Police Hospital and Federal Prison Health Center.

\(^5\) The study included the Addis Ababa Health Bureau, the Amhara Regional Health Bureau and the Oromiya Regional health Bureau officials in charge of ART.
between the designer and the user, between the build-in user and the real user, between the world inscribed in the object and the world described by its displacement (Akrich 1992).

CASE PRESENTATION

ART clinics in Ethiopia record the data of AIDS patients in Intake and Follow-up forms, and Pre-ART and ART register books. They report to various recipients using Pre-ART, ART, regimen, and cohort reports at different frequencies. Figure 1 depicts the contents and relationships of these data collection and reporting forms. The primary aim of the computer-based ART system developed by HISP was to automate the data collection and reporting forms depicted in the figure. The system accommodates the Ethiopian calendar, which is unique, and complies with (nationwide) standardized data collection and reporting forms and guidelines.

The ART system development and implementation directly and indirectly involved the standard ART practice, HISP, ART clinics, the ART system, AAHB and others. The health bureau was interested in immediately acquiring solution and HISP was interested to get into the market as quickly as possible and perpetuate the established actor-network by developing OSS-based ART system. The following sections present the interests of these actors, the role delegation processes, and the processes of implementation in other clinics respectively.

![Figure 1 Dependencies among Data Collection and Reporting Forms of ART Clinics in Ethiopia](image)

**ACTORS’ INTERESTS**

The USA-based Universities and others had identified a need to introduce similar solutions. Some individual and organization-based attempts were supported by the mandated organizations, people in the national HAPCO, and other organizations working in the area. Table 2 shows the characteristics of these actors and their interests in detail. Not all of these attempts and plans bore any fruit. In the meantime, HISP introduced an ART system into three clinics.

Afterwards, the AAHB invited other similar software for evaluation and the result declared the HISPs’ ART system as winner. The health bureau insisted on expanding the implementation in Addis Ababa despite the discontent of some people in the national HAPCO. The situation clearly indicated the possibility of introducing the system in Addis.
Ababa and the challenge of getting acceptance at a national level. Besides, those who have
the mandate were supporting other initiatives and must accept the HISP’s ART system to
deploy it in any region, since they were operating in all of the regions. One of the health
bureau officials who tested a system developed by others and HISP states:

… we prefer to use your software than the one introduced by [the other actor].
We have seen both; yours has better functionality than the other one.
Nevertheless, [the other actor] has the mandate in our Regional State to support
ART… the agreement is made at the Federal Government level. … However, we
keep on discussing with the concerned people on this matter.

<table>
<thead>
<tr>
<th>Actor</th>
<th>Description</th>
<th>Interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard ART Practice</td>
<td>The FMOH has developed standard forms, guidelines, and procedures for collecting and collating data, and distributed to all ART clinics. Each clinic is supposed to comply with the national standard.</td>
<td>This standard practice needs to be preserved. The FMOH must approve any changes on the standard.</td>
</tr>
<tr>
<td>ART Clinics</td>
<td>This group refers to the local practices of the ART clinics. The pilot ART clinic has changed the data collection procedure and introduced a new data collection form that has the same content with the existing forms with the aim to facilitate the data collection process and minimize the load of data clerks. Some of the patients do not have complete data recorded in all forms and the recorded data were incomplete. In some cases, the unique identifier was missing. Data clerks have been facing difficulties in collecting and collating data.</td>
<td>The initial design of the system was confined to the pilot clinic’s work practice and it dictated the new system to follow its practices. It also has affected the enactment of roles and their distributions to actors in the actor-network. For example, due to incomplete data, the task of data verification in terms of existence, domain, range and format was given to human beings and the computer at different times.</td>
</tr>
<tr>
<td>AAHB &amp; Other Beneficiaries</td>
<td>The (AAHB) Addis Ababa Health Bureau is responsible for allocating resources and monitoring the activities of ART clinics. Besides, it is involved in planning and decision-making processes concerning patients, the service, and ART in general. Other beneficiaries are those who directly or indirectly are involved in supporting ART such as donor agencies, the FMOH, WHO, etc. Getting accurate and timely information is crucial to discharge the responsibilities of this group.</td>
<td>The AAHB and other beneficiaries were in need of a solution. For example, the AAHB was in need of identifying stable patients so that it can transfer them to health stations. Besides, they were not getting accurate information on time to make informed decisions and plans. The health bureau has resource constraints (limited expertise and finance) concerning system development and deployment.</td>
</tr>
<tr>
<td>HISP</td>
<td>HISP is composed of developers, researchers, and students tied together in a network of south-south and north-south collaborations. It has been working</td>
<td>HISP wants to immediately enter into the market and dominate it within a short period. Wasting time is</td>
</tr>
</tbody>
</table>
towards strengthening HIS in developing countries through capacity building, and software development and implementation. HISP develops the ART system and sets the stage for its implementation, and builds the capacity of developers and users at different levels through south-south and north-south collaborations. The Ethiopian chapter of HISP is based at Addis Ababa University, the oldest academic organization in Ethiopia.

The Ethiopian chapter of HISP is based at Addis Ababa University, the oldest academic organization in Ethiopia. The developers are students and they should finish their studies within the expected period. The identified needs of others to develop a similar solution were considered a threat. The base of HISP in Ethiopia gave the prestige and allowed the staff for participation.

Table 2: Actors and Their Interests in the ART System Development and Implementation Network

<table>
<thead>
<tr>
<th>Actor</th>
<th>Description</th>
<th>Interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ART System</td>
<td>The ART system is the one mediating the network serving as obligatory passage point (Callon 1986b). The system is based on open source software license and technologies, runs on both standalone and networked environments and has web based interface. It is meant for supporting the data collection and collation processes.</td>
<td>The ART system was expected to alleviate the problems of data collection and collation. The goal will be realized only if the established actor-network is preserved.</td>
</tr>
<tr>
<td>Mandated Universities</td>
<td>The four universities from USA such as the University of Washington (I-TECH), John Hopkins University (JHU), University of California (UC) at Santiago and University of Colombia are mandated by the Federal government to support ART activities in Ethiopia. The activities of other collaborators are required to be coordinated with theirs.</td>
<td>They need to introduce their own system through either purchase or in-house development. One of the Universities had commissioned in-house developed system that addresses research purposes and it had a plan to develop one for the clinics.</td>
</tr>
<tr>
<td>Others</td>
<td>This category of actors includes organizations supporting other ART system development initiatives. Some of the organizations have influence at a federal government level.</td>
<td>They need to introduce other system than the HISP.</td>
</tr>
</tbody>
</table>

Those who are from HISP state the following:

We have demonstrated our system to different regions at different levels. We have learned that our system satisfies the needs of these users. We have support from the regional health bureau and end users. Nevertheless, those who are responsible for supporting ART service at a national level and those USA Universities do not support us…. They are trying to develop and introduce their own system.

Meanwhile, HISP lost a bid to implement routine health data management IS across the nation despite its experience in implementing similar systems in the country. The environment shadowed by competition and the need for domination has shaped the design of the IS accordingly. For the sake of competition and showing the strength of the local capacity
and importance of the system, the developers introduced new functions that were not readily available in the manual ART system. For example, it included appointment management function and report/analysis generation capabilities that were not possible before such as identifying patients with a certain CD4 level etc. One of the health bureau official states the following concerning this matter:

I am very happy with the feature and functionality of the software. Besides, it does not involve us much cost…. Really it is very interesting to easily identify those patients who are stable using the system which otherwise could be time taking and cumbersome.

The system implemented OSS license and technologies. The developers’ state:

Our system bases the OSS license and state-of-the-art open source technologies. Any ART facility can use it free of charge and we have been offering our services freely. We have a plan to upgrade our system to make it more robust in collaboration with our international partners. ….

The main agenda of HISP has been to strengthen the HIS of developing countries through capacity building and implementation of OSS-based ISs. Hence, the ART system implemented the OSS license and technologies such as MySql, Apache and PHP. The use of OSS license allowed EFOSSNet\(^6\) (Ethiopian FOSS Network) to join the network. The system is web-based and runs on standalone and networked environments. HISP emphasizes the term “state-of-the-art technology” during any dialogue concerning the system as a result.

The ART clinics did not have computer networks. All clinics were running the system on PCs and they did not have an immediate plan for either networking or sharing ART data across physicians or clinics in real time. The PCs in all of these clinics run MS Office package and all of the data entry clerks have knowledge and experience of them. Some Data Entry clerks have developed applications with the help of MS Excel to prepare and maintain reports.

**ROLE DELEGATION**

The system was developed and tested in one of the ART clinics in Addis Ababa. The pilot clinic had several attributes to qualify for selection: it started the service before others; hence, it serves relatively large size of patients; data collection and compilation was difficult; it also had the experience of dealing with a similar but failed attempt; the staff had wider experience; etc. However, due to the age and patient volume, it has introduced unique data collection procedure that cannot be replicated to other similar clinics. For example, it started offering ART before the introduction of Intake-forms, and data has been recorded into Pre-ART and ART register books only from Follow-up forms. The clinic has piles of filled out Pre-ART and ART register books without corresponding Intake data.

Due to the pressure from AAHB for an immediate solution and HISP’s interest to enter into the sector as quickly as possible, development of the ART system was confined to the pilot clinic. Consequently, the developers delegated the role of accepting data from Pre-ART and ART register books, and Intake forms to the system and that of populating the Pre-ART and ART Register books to human-users.

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\(^6\) EFOSSNet stands for Ethiopian Free and Open Source Software network. Its mission is to create an environment that FOSS is utilized to enable better use of ICT for the sustainable development of Ethiopia. URL: http://www.efossnet.org/
Most of the manually filled out forms were incomplete; in some cases, the unique identifier was missing. Computer-based systems are supposed to facilitate accurate data collection by enforcing a variety of automatic checking mechanisms such as data existence, domain, range, and format verifications. Designing the system enforcing such validity checking mechanisms was not possible due to the incomplete data, i.e., those records with missing and wrong values, which are many in number, cannot be entered into the system. If not entered, the system may not be functional as intended and that was against the interests of the AAHB, HISP and the clinic. As a solution, the developers delegated the role of data validation – value existence, domain, range, and format – to data clerks rather than the system. The arrangement led to the establishment of a taskforce that cleans the data. Figure 2 summarizes the context, the dynamics, and the resulting ART system.

**Figure 2: Graphical Representation of the Influences, the Translation, Roles and Their Interrelationships**

The existing manual system had undergone changes on the standard procedure of data collection and introduced new forms. For example, the Data Clerk was supposed to copy details of a patient directly from the Intake and Follow-up forms into either Pre-ART or ART register books. Due to the size of patients, it has become difficult for the Data Clerk to go through all the Intake and Follow-up forms of every patient and copy the data into Pre-ART and ART Register Books. To solve the problem, the clinic has developed an abridged version...
of the Follow-up form. The new arrangement dictates Physicians to fill out both forms with the same data.

Even if the data entry procedure did not have any effect, the introduction of an abridged version of an existing data collection form has affected the design of the IS. The abridged version was more convenient to collect and enter data into the system than the original but not supported by the standard. Therefore, for the sake of developing a system that meets the needs of the standard data collection format, the system was designed according to the national Follow-up form, not the abridged version.

SCALING

When the system was implemented in another two clinics – Federal Police hospital and Federal Prison health center – it was found out that their procedure was different from the pilot clinic. Hence, there was a need for re-designing the system to align with the new context. Those ART clinics that started ART after the introduction of Intake forms no longer needed to enter data into ART and Pre-ART register books from the keyboard. The sources of data for the register books are the Intake and Follow-up forms (Fig. 1), once data from these sources were entered into the system, there was no need for re-entering the same data again. Rather than entering data from the keyboard into the Pre-ART and ART register books, these can be generated as reports. Hence, the system was modified to reflect the new situation and it delegated the role of populating Pre-ART and ART Register books to the system itself rather than to data entry clerks.

This situation demanded changing the original design of the system at the pilot site. For new patients and patients that have Intake data, there was no need for reentering the same data again in the interests of data accuracy and bypassing human limitations.

The ART clinics in the new sites started ART relatively recently and they had less than 100 patients on ART. In these cases, the developers delegated the role of data validation to the computer system because, if there were incomplete or invalid data it was relatively easy to correct them. In new ART sites, it is possible to delegate the role of validating values to computers. Even if this procedure facilitated data entry and improved data accuracy, it did not impact the design of the IS at the pilot clinic.

ANALYSIS AND DISCUSSION

The ART system has brought together human and non-human actors of different size that had profound effect on the choice of development technologies and functions. The system entertained conflicting views and interests of various groups, and was the center point of competition and politics rather than collaboration. This section analyzes and discusses the data from the viewpoints of inscribed interests, the program of actions, and translation, and their relationship towards fulfilling the goal of IS implementation and future trajectories.

INSCRIBED INTERESTS AND FUTURE TRAJECTORIES

The choice of development technologies, the use of OSS as a license and development methodology (Feller et al. 2005), enabling the system to run on both standalone and networked computers, and the web based feature are manifestations of the interests of the dominant actor (Law and Bijker 1992). The dominant actor is the one that is able to insist upon its definition of both problems and appropriate solution.

The idea of OSS development was not mature enough in Ethiopia. Nevertheless, despite the debate concerning relevance and cost implications of OSS to developing countries
(bridges.org 2005a; bridges.org 2005b; Feller et al. 2005; McDonald et al. 2003; Morgan 2002; Weerawarana and Weeratunge 2004; Wheeler 2005), the license helped to build coalition among local and international partners. The capacity development strategy of HISP such as capacity development at different levels, empowering users and networking of actions (Braa et al. 2004) in south-south and north-south manner reinforced the entry into the ART domain and sustain the network.

The use of the political card “state-of-the-art system” gave an opportunity to HISP for selling the product and gaining support despite the reality of beneficiary clinics. The beneficiaries do not have networked computers or an immediate plan for sharing data across physicians or clinics in the real-time. However, the system requires all of these technologies installed on PCs to run smoothly which might have negative implications on the speed and storage spaces considering the developing country context. This phenomenon shows the transformation of actors including developers into political scientists and sociologists (Callon 1991) to assure the viability of the system.

The system can be developed using Microsoft technologies, which were quite familiar to users and were in use in all ART clinics. However, due to the existence of competitors, the whole mission was targeted at excelling others by using “better technologies” and “suitable ideology” and proving the capacity of local developers through feature and function additions and yet demanding no cost both for the system and associated services.

The system inscribed not only the current patterns of use but also specified future directions. Web-based applications are state-of-the-art and the way of the future, and ART services benefit more if physicians have online access to patient data irrespective of location with the support of analysis and visual tools which the system has already inscribed. The selection of any system in the future is locked-in (Hanseth and Monteiro 1998) not only to the technical compatibilities such as network, database, and interface of the system but also to the ideology of OSS.

**PROGRAM OF ACTIONS ENACTMENT AND DISTRIBUTION**

The existed practice of the pilot ART clinic expressed its interest in terms of retaining its routines (path dependency (Hanseth 2004)). The initial design of the system delegated roles according to the context of the pilot clinic. Due to the need to proceed with implementation, the developers delegated tasks that a computer system handles more easily and accurately to humans. Later on however, some of these tasks were delegated back to the computer system. Here the non-humans have influenced the delegation of roles similar to human actors.

The case reveals that role allocation is not a function of the effort required to perform tasks as pointed out by Law and Bijker (1992) and Latour (1992). Computers are superior to humans in consistently and efficiently carrying out tasks such as validating data availability, domain, range, and format (Kling 1980). However, for the sake of perpetuating the socio-technical network, this particular role was delegated to humans despite the difficulty and the problems thereof. Therefore, it is possible to say that roles allocated to components of a network may not be a function of the effort required to perform them.

The developers did not consider some contextual factors such as using the newly introduced form in the pilot clinic in the interest of the national standard that had political significance. The success of any system was tied to its adherence to the national standard as stated previously.
TRANSLATION

The translated version of the ART system (Figure 2) followed the “effort” logic while delegating tasks. The original design was modified so that it automatically generates Pre-ART and ART register books and validate data. From this viewpoint, it is possible to generalize that the same task can be delegated to human and non-human actors at the same time in different contexts. Role delegation involves not only delegation of force but also values, duties, and ethics that implies competency. Human and non-human actors do not have the same level of competency and delegating the same role to them is problematic. However, the resulting sub-optimal system (Gasser 1986) perpetuates the actor-network as shown.

The dynamics of role allocation was crucial to sustaining the network and the implementation process. However, it might have negative implications towards achieving the goals of introducing computer-based systems. For example, making the system to accept Pre-ART and ART register books from the keyboard duplicates data. Besides its impact on storage space, retrieval speed, and related database management challenges, it demands additional resource for verifying and entering data. It is inconvenient to generate reports because it is challenging to choose between the register books, and the Intake and Follow-up forms as sources of reports.

Besides the duplication, the problem of accurate information generation is aggravated due to lack of appropriate data validation mechanisms. Due to data collection errors the two data sources can exhibit differences and may produce different reports. Considering sensitivity of the health environment, delegating tasks to inefficient actors may aggravate the problem rather than solving it. The system might end up being multiplier of wrong data. Therefore, as one of the core aspects of IS, roles are required to be carefully allocated to components of a network otherwise it might fail to serve the purpose. System development, besides negotiating local interests, should pave way for “generification” (Pollock et al. 2007) of translations in cases like the ART system where there are standardized data collection and reporting forms, and procedures across the nation.

CONCLUSION

This paper demonstrates how an IS acquires its material and functional forms by attaining to the various influences overtime. The paper shows how interests of actors in the socio-technical network were translated and appropriated over time, and the roles of the installed base and the interests of actors’ in enacting program of actions and their distributions among components of an actor-network. The paper also reveals that certain program of actions can be delegated to inefficient actors despite their implications on the performance of the IS. It also shows the strategy used in order to establish and perpetuate the socio-technical network such as the use of OSS license and development methodology, the promotion of the south-south and south-north network of actions, the flexibility of delegation of roles to components of the network, the capacity building strategy, and the ability and capability of function and feature additions.

The paper also indicates how the ART system was not just a tool that minimized the problems of data collection and analysis. It showed the ART system as a tool that embodied and indicated the future behavior and structure of ART clinics, that dictated the nature and type of technologies, tools, and ideologies to be followed, and became the central point of competition and politics. The system has already specified the type of environment it will be running in the future and the functions it can provide to current and future users.
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A FEDERATIVE VIEW FOR INFORMATION INFRASTRUCTURES IN DEVELOPING CONTEXTS

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Abstract: Large IT projects, usually managed by international organizations, often fail to get rooted in the variety of contexts they address. On the other hand, a frequent problem of local initiatives run by public administrations and NGOs is the fragmentation and lack of coordination. This paper aims at identifying a mid-range empirical area and a meso-level theoretical perspective in order to propose an infrastructural approach to IT-based efforts. Relying on studies of information infrastructure evolution, and experiences in fostering collaboration across a variety of IT-based development efforts, we propose to conceptualize existing systems as potential hubs of a possibly emerging information infrastructure, and suggestions to manage them accordingly. The proposed new step in that direction is the constitutions of ‘federation’ of socio-technical systems as a crystallization of ‘networks of action’. Selectively integrating running systems and coordinating existing organizations is a way to scale up while keeping the design locus as close as possible to where practical local knowledge is situated.

Keywords: Networks of action, information infrastructure, integration, socio-technical innovation, development, federation
A FEDERATIVE VIEW FOR INFORMATION INFRASTRUCTURES IN DEVELOPING CONTEXTS

1. INTRODUCTION

For several years now, the idea of the “network society” has highlighted how the logic of networks has shaped contemporary world, with a specific emphasis on the role of IT. Large IT systems here referred to as ‘information infrastructures’, are unevenly distributed and evolving. Organizational contexts have a central role in such unevenness. Such unbalanced situations are mostly evident in developing contexts - it is widely known that many approaches to implementing IT in developing contexts have been tried, some succeeded, and many failed to be sustainable. This paper proposes a view over ongoing successful projects as possible hubs of a broader infrastructure to be constituted by federating them, rather than as best practices to be replicated, as commonly suggested. Fragmentation of IT projects can be tackled, we suggest, by supporting coordination through the establishment of ‘federations’, in which technology has to be considered as a relevant actor.

We picked the term ‘federation’ from political science because it well expresses our proposal for agreements and shared power without constituting a unitary or organization (as a state). Federalism combines autonomy for sub-central units with a central authority, whose power is constitutionally defined. This understanding of federalism resonates with the view we present about information infrastructures as federations of existing information systems. Federations of socio-technical systems, we argue, can help in reducing the design/reality gap by linking locally rooted information systems with globally distributed information infrastructures, which do not depend on single transnational authorities. Integration of information systems, a crucial issue in information systems research, is conceived as part of federative efforts. Indeed, the purpose of this paper is to propose a view over ongoing successful IT projects as possible hubs of an information infrastructure. A central theme in the Information Infrastructure literature is how information technologies emerge and grow in use, in order to propose specific approaches for how appropriate applications can be adopted, scaled up, cultivated, sustained, and institutionalized over time. We aim at contributing in this sense by considering the constitution of infrastructures as outcomes of federations of information systems, comprising both technical components (such as technologies and standards) and social and organizational elements (such as work practices, human resource issues, politics, as well as other institutional conditions).

The paper is organized as follows: first we problematize the issue of the ‘network society’ in developing contexts by bringing information infrastructures into the picture. Then, the design/reality gap is tackled both empirically (disconnection between plans and actual results) and theoretically (information infrastructures as possibly emergent). At this point, federations are proposed as a way to develop information infrastructures, avoiding the two opposite risks of grand projects (which fail in meeting local requirements, therefore in being used), and micro interventions (which hardly scale up). The federative approach is discussed in the final section.

NETWORKS AND INFRASTRUCTURES

A decade ago, Castells (1998), engaged by the United Nations Research Institute for Social Development Conference on Information Technologies and Social Development, wrote “The most critical distinction in this [network] organizational logic is to be or not to be — in the network. Be in the network, and you can share and, over time, increase your chances. Be out
of the network, or become switched off, and your chances vanish, since everything that counts is organized around a worldwide web of interacting networks.” The centrality of networks in the contemporary world is widely accepted, with their growth increasingly taking place not only geographically but also cross disciplinarily and across fields of activity (Benkler, 2006). Such networks do not emerge by and sustain themselves autonomously, they are in interplay (shaping and shaped) by information infrastructures, including or organizational practices and institutions. The concept of information infrastructures contrasts with the traditional concept of information systems, which typically concerns independent or stand alone systems. Ils are large scale, complex, and networked technologies such as the Internet. Information infrastructures an improve de pendability, quality of service, coherence, a nd affordability of services provided to people by supporting such networks.

An information infrastructure has been described as a “shared, evolving, heterogeneous, open and standardized installed base of IT-capabilities” (Hanseth and Lyytinen, 2004). A another widely accepted concept of information infrastructures comes from Bowker and Star (1999), who studied classification systems. The former view can help in pinpointing the heterogeneity of large information systems, and in conceptualizing them as in continuous interplay with other ones, and with their contexts. The latter, by focusing on classifications, intercepts a boundary between information management and interdisciplinary research. Both views on information infrastructures tend to contrast reductionist top-down approaches to integration and standardization by highlighting how infrastructures are not completely-planned outcome of long term evolution and contingencies. Integration efforts need to take this open-endedness into account.

In many developing countries social volatility and instability is accompanied by lack of capacity to make full use of the potential IT presents for development (Weber and Bussell 2005). Often, there is a mismatch between skills implied and required by IT, and those available locally. This reproduces the marginalization and exclusion that Castells warned about. IT projects in developing contexts suffer from both horizontal (local vs. global) and vertical (across initiatives) fragmentation. From a vertical view, IT projects are run by different or organizations like local mini ministries, United Nations, World Health Organization, Organization for Economic Cooperation and Development, donors, national public agencies, non-governmental organizations, and consulting firms. These efforts are often uncoordinated, with the result that local or organizations have to spend inordinate amounts of time and resources in dealing with separate –and sometimes conflictive- initiatives and actors. At the local level, poor focus on the development of expertise and tendencies of neglecting social and organizational issues are cited as major factors contributing to the problem of ineffective implementation of information systems. However, global implementation plans designed in presumably universally valid strategies also often prove problematic, as they easily clash with the large variety of contexts of implementation. From a horizontal view, IT projects are tightly controlled silos, resulting in an overall poor quality and ineffectual sharing of information, therefore lack of coordination.

Fostering cooperation across IT projects, thus cross or ganizations, a lso requires consideration of technological aspects, through inscription of cooperative tools, enabling information sharing and revising lines of accountability. We are aware that it is not a linear process because technology tends to freeze the contexts from which it originates, with the risk of obstructing its transfer. The dialectic between local specificities and global
requirements, flexibility and standardization (Hanseth and Monteiro, 1997; Braa et al., 2007) is central in building information infrastructures. In order to find a balance between local specificity, interoperability, and standardization (Rolland and Monteiro, 2002), open processes of continuous and long term negotiation are required. Engaging in “metadesign” to open up solution spaces, rather than offering complete solutions (Giaccardi and Fischer, 2008) is an interesting approach.

Our proposal has two starting points. The first is our participation, within a broad frame of action research, in a project which we refer to in this paper as Program for Health Information System (PHIS). This participation put us in contact with a wide variety of IT-projects in many developing contexts. The second is our participation in the Committee on Development Information (CODI) of the United Nations Economic Commission for Africa (UNECA) bi-annual meetings, which aim to provide technical and policy assistance to African nations to develop national geo-information infrastructures (NGII).

The PHIS network was initiated in 1994 as a health information project in South Africa, in collaboration with a Scandinavian university. From 2005, the European Commission funded this initiative by supporting the strengthening of collaboration links between the nodes of the network. These linkages consist in sharing experiences, skills, products, and processes between similar contexts. Indeed, the PHIS network comprises of international training programs and open source software development teams which have now expanded from South Africa to Ethiopia, India, Vietnam and other countries. Specifically, our involvement took place at all levels of PHIS activities, from global software development to local implementations in different countries, including capacity building initiatives.

The CODI conferences for national and supra-national geo-information infrastructures development in Africa was initiated in 1999 and has convened five times in bi-annual pan-African meetings. In contrast to PHIS, CODI conferences have produced documentary output (a series of documents and auxiliary reports) that discursively attempt to move Africa away from uncertain knowledge and contested values in NGII implementation, first by promoting implementation steps and later (when implementation steps failed to bear fruit) partnership with the prestigious national information and communication infrastructure (NICI) initiatives, thereby avoiding the design-reality gap empirically and theoretically.

3. Re-Framing the “Design – Reality Gap”

Much research examining the implementation of IT in developing contexts has reported on a wide range of cases where systems end up as total or partial failures. The gap between the design of information systems and use contexts has been found to be a key factor contributing to IT implementation failures (Heeks, 2006). Addressing these challenges is not merely a quest for increasingly sophisticated technical solutions, but an endeavor to identify and engage with approaches that take into consideration the complexity and heterogeneity of the socio-technical contexts that constitute and support information technologies.

Issues related to information systems integration are two-sided. On the one hand, they are about integration “out there”; about the complex interplay of datasets, protocols, standards, work practices, and institutional settings. The other side is about the “integration of our view” on such phenomena, which is fragmented in different theoretical traditions and disciplines. Our perspective on federating systems highlights the continuous redefinition of socio-
technical arrangements. The “organizing” aspect is usually understudied, although crucial in understanding and managing the entangling of organizations and technology in integration efforts (Orlikowski, 2008). Therefore, we see organization as a possible result of successful integration, not its pre-requisite (Czarniwska, 2004).

A supranational sovereign authority, with the remit to regulate and coordinate IT-based efforts within and across countries, is unlikely to be established or even possible. At most, a supranational authority in Africa, such as the United Nations Economic Commission for Africa (UNECA) can play a role in helping build consensus around key African development challenges and in articulating common perspectives and positions, which then may form the basis for engagement with the international community. For instance, the UNECA has been instrumental in the inception of the African Information Society Initiative (AISI) and the implementation of NICIs with support from other United Nations agencies and bilateral donors. Lack of coordination leads to fragmentation and waste, as well as to unsustainable implementations, too weak to a mass critical long term support. Therefore, the endorsement and development of transnational information infrastructures can only be bottom-up i.e. must find a basis through progressively federated ongoing projects. From such a starting point, our aim is to provide a framework to facilitate sustainability and scalability of a transnational information infrastructure. Concrete possibilities for coordination can be inscribed into the project guidelines and technologies. This paper presents an argument along this line by suggesting “to infrastructure” ongoing IT projects.

Indeed, from a historical perspective, we can note that many infrastructures emerged through the integration of existing systems, with incremental standardization being a key element in their establishment. The scalability of infrastructures is not s imply the out come of interoperability and standards. Without considering organizational and political aspects of the actual contexts of implementation, integration of systems and scaling up of information infrastructures do not happen. This is the reason to call this process "federation", to avoid both technological reductionism and the tight technical coupling implied by "integration". Facilitation of interoperability among existing projects, as well as with new ones is our proposal for a first step in such direction.

Bowker (2000) argues that the integration of large datasets happens at the concrete level of database design as well as at the abstract one of negotiating relationships between disciplines, simultaneously. Therefore, the two faces of integration have been contextualized (or “historicized”) both as a guide for practical activities, and as a transdisciplinary research topic. On the political implications of categories and classifications, Suchman (1994), Star (1991) and Leuenberger (2007) respectively have explored the performative aspect of categorizations, the marginalization created by them, and the political relevance of their indirect enforcement. All these aspects are constitutive of both enacting and studying federations as means of growth of information infrastructures.

4. ‘Infrastructuring’ Needs a Federative Effort

Federating information systems to develop information infrastructure is a way to actively take into account legacy systems that not only represent inertia and obstacles for change, but also a tremendous resource, because they are part of existing activities and procedures. In other words, a globally scalable information infrastructure is necessary "cosmopolitan", i.e. embedded in, and thus familiar with and at ease with a long range of organizational and societal cultures and settings.
Choosing appropriate integration strategies and technologies that balance needs for smooth information flow on the one hand, and stimulate and enable innovation, learning and improvement of organizational performance on the other, is crucial. Therefore, federation, rather than a late add-on option, should be seen as a first concern when considering the need for a new information system, incrementally leveraging existing infrastructural parts, re-arranging both technical and organizational pieces together, negotiating collaborations. Such approach contrasts to a more traditional requirements engineering process of using established software libraries but otherwise more or less starting from scratch. It also runs fundamentally counter to the “not-invented-here syndrome.”

4.1. Networks of Action Crystallized in Federations

Various arguments have been raised by development studies to establish “South-South” collaborative networks. The sharing of resources can help the long-term sustainability of information systems implementations. It has been argued that it is important to develop “networks of action” within which groups and organizations in the South can share experiences and support each other in the effort to develop software that is matching with local requirements, sustainable on the long term, and globally scalable (Braae et al., 2004). Here we propose to consider how to crystallize such “networks of action” for the development of information infrastructures.

We encourage the revision of IT development strategies in order to conceive themselves as potential parts of larger networks, possibly included in or converging into a broader infrastructure. Design and implementations have to be organized accordingly: by thinking about ongoing information systems as dots to be connected for future information infrastructure. The base for our view lies in recognizing the importance of the “installed base”, of what is already in place and being done. Analytically, three layers of infrastructures can be identified, with relative issues – technical, organizational, and political:

Technical
At the basic level, this includes technical artifacts involved, such as datasets, data warehouses, information flow schemes and protocols. Furthermore, it extends to technical processes and conceptualizations, i.e. software development and debugging procedures, architectural considerations, deployment platforms, programming tools.

Organizational
This includes both public sector institutions and private companies, facilities, procedures, responsibilities, as well as heterogeneity in the provision and access to information (often related conflicts of interest), and also the various levels of integration: syntactic, semantic, related responsibilities (Carlile, 2004). It also entails unintended side-effects such as increased complexity through coupling of previously separate elements.

Political
This pertains to local administrations, ministries, international organizations like UN, and importantly the range of powerful donors (USAID, Gates Foundation, World Bank etc). Political aspects include the re-ordering of relationships (re-distribution of burdens and benefits), and balancing (central) control versus (distributed) autonomy.
Furthermore, though useful to separate these issues analytically, they are closely intertwined from a practitioner point of view. For example, research on databases, human resource management, and IT governance refer to different disciplines, but these topics are hardly distinguishable in what people do on a daily basis, and in how technology changes and can be changed. Similarly, federations do not necessarily respect such an ordered analytical view. More likely, they cut across different levels. In order to account for this, research about federations needs to not only be interdisciplinary, but also reconsider assumptions about what is empirically relevant, and how to approach the study. For instance, federating information systems for health monitoring and transnational health policy making requires the gradual dissolution of the current disjunction of disciplines (health informatics is also policy-making as a way of acting in the world, to paraphrase Bowker [2000]). So, services and applications impacting public health care (as other domains) need to be tied together to cross-fertilize each other; this is the reason for interoperability at the technical level (which includes the negotiation of definitions of standard protocols, tools, datasets etc.) and the establishment of coalitions at organizational and political levels.

Thus, instead of being seen as a monolithic system which regulates individual action, federative order comes to be seen as a network of concrete, communicative interaction, creating a broad meshwork to circulate and multiply innovations and dilute negative side effects. The establishment of an information infrastructure operates simultaneously at the concrete level of participatory design and implementation (e.g. fields in a database, capacity building, integration of datasets and organizational practice) and at a theoretical one (dealing with the relationships between information science, organization, and global software development, among others).

4.2. Co-evolution of Theory and Practice

Understanding which infrastructural elements can be translated into the heterogeneous public and private sector contexts in the South is a matter of development strategies. As it is a matter of federating existing and working IT projects, the possible nodes of an emerging infrastructure cannot be described ‘a priori’. For instance, a teleradiology system can match well with an aggregated health data reporting system. Two databases about HIV and tuberculosis are difficult to integrate because they are based on different technologies and/or their administrators’ responsibility lines diverge. This is why we claim that the federative attitude needs to be constitutive of IT efforts, rather than a later add-on: once self accountable systems are in place, it is difficult to change them in order to make them to contribute to new and broader functionalities, later. Indeed, creating, implementing, re-using information standards is difficult, expensive and often in partial conflict with the vested interests of some stakeholders.

As socio-technical federations can be used to affect -if not to manage- the installed base, we need to find a balance between the need to enable virtuous circles and avoiding the propagation of negative side effects across a growing network. Existing problems in particular systems should not propagate from the local to the infrastructural level, because risks will escalate as a consequence (Hanseth and Ciborra, 2007). Being more specific about the strategies for federating systems, we recommend a selective integration which identifies specific elements to integrate across systems and places. These strategies can be supported by focusing on the following incremental steps:
Established initiatives should be documented to enable smooth handover
Collaboratively and dynamically mapping and cataloging existing initiatives in developing countries
The negotiation and provision of guidelines for those who are starting new initiatives, and want to avoid being locked out after some time in their activity development
Actively fostering coordination of organizational and technical matters
Facilitating the federation of complementary technologies and initiatives
Establishing mixed public-private transnational consortia
Aiming at an independent and authoritative forum for socio-technical negotiations

Such steps do not promise results in the short term, but constitute the base for long-term efforts to be effective. In practical terms, this means that the initial hubs of emergent information infrastructures are likely to be found among ongoing initiatives on the ground: established projects - if connected as dots of an infrastructure - have already gone through the critical bootstrapping phase (Aanestad and Hanseth, 2003). Thus, ongoing IT efforts are the privileged loci of design, but interoperability needs to become a priority. Therefore we recommend building on top of what is already there, as this strategy re-orders and orients existing and other resources, does not clash with the local “installed bases”, is more likely to meet local needs, and allows the coordination of fragmented initiatives, improving results and saving resources.

4.3. Federations between Markets and Bureaucracies

Unlike the “one size fits all” innovation approach, the federating approach is flexible because it facilitates modular alliances. So, a federating approach helps scalability and requires active management of growth, balancing the tension between standardization and flexibility through gateways (Hanseth, 2001) and flexible standardizations (Braa et al., 2007). Thus, it implies a mid-long term view and support which goes beyond current fragmentation. Scaling up needs to address both “the what” and “the how” (Sahay and Walsham, 2006; Braa et al., 2006). The complexity which emerges from the interplay within and between the previously introduced levels of federation suggests to position federations between the two ideal-typical poles of organized relations: market and bureaucracy, which can never be found in their pure forms.

<table>
<thead>
<tr>
<th>Achilles Heel</th>
<th>Bureaucracy</th>
<th>Market</th>
<th>Federalism</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>misplaced trust in authority and expertise, coupled with high mobilization capacity</td>
<td>tendency to put self interest before collective interest</td>
<td>multiple accountabilities (what is right the procedure or the customers requirements?)</td>
</tr>
<tr>
<td>Is vulnerable to</td>
<td>dramatic collapse of ambitious think tank projects</td>
<td>failures stemming from lack of cooperation or individual corruption</td>
<td>propagation of side-effects</td>
</tr>
<tr>
<td>Stresses</td>
<td>expertise, forecasting, and management</td>
<td>individuals as self-interested rational choosers</td>
<td>negotiations and consensus building</td>
</tr>
</tbody>
</table>
In the table above, the first two columns come from Christopher Hood (1998), who adapted them from Douglas and Wildavsky (1982), the third has been added by the authors. It presents the characteristics of federations in contrast to other organizational principles. Below we propose a list of federations which are classified along three infrastructural characteristics: accreditation (granting access), coalition (managing gateways), and standards. These three dimensions help in explaining the tension between flexibility and stability in federations.

<table>
<thead>
<tr>
<th>Infrastructural Level</th>
<th>Ideal – Type</th>
<th>Characteristics</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Top-down and bottom-up)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulatory body/Authorities</td>
<td>Centralized, independent body</td>
<td>EU – 7th Framework Programme Value Management Model</td>
<td></td>
</tr>
</tbody>
</table>
| Peer production       | Community, distributed acceptance (like gift economy, or ‘potluck’, where status and legitimation are crucial)  
1 | Wikipedia, FOSS, Geoserver, Mondrian |                               |
| Coalition (gateways)  | Joint ventures                    | Merging of organizational sub-parts for a negotiated task | WHO OpenHealth               |
|                       | Networks of Action                | Scaling of dispersed collaboration                    | PHIS                         |
| Standard              | Franchising                       | Autonomy within the frame of controlling organization | Linux Standard Base, HMN, NHRM |
|                       | Sector Association                | Body for negotiation and representation of interests | WITFOR, WSIS, IFIP 9.4, W3C, ICANN |

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1 Also refer to Ghosh (1998)
5. CONCLUSION
Relying on studies of information infrastructure evolution, and experiences in fostering collaboration across a variety of IT based development efforts, we propose to practitioners and researchers to conceptualize existing systems as potential hubs of an emerging information infrastructure, and to manage them accordingly: selectively federating running systems and existing organizational patterns is a way to move the design locus closer to where practical local knowledge is situated, and build on that basis. That is why we find a federative approach relevant to understand, design and implement information systems in developing contexts (and beyond).

To deliver sustainable benefits over their lifetime, infrastructures need to enable processes of experimentation, discovery and invention through trial and error. In coherence with our theoretical framework, technical and organizational aspects have to be considered at the same time for the establishment and maintenance of new networked and collaborative courses of activities. Moreover, the interplay between technology, work practices and organizational contexts within which such processes are expected to take place, makes these phenomena complex to understand, and to manage. So, analytical dimensions like layers (technical, or ganizational, political) and market-bureaucracy tension (in terms of accreditation, coalition, standardization) are proposed to conceptualize federations in a way which is accountable both to local needs, and scaling up requirements.

In her critical review of the contemporary literature about information systems in developing contexts, Avgerou (2007) identifies three discourses: 1) transfer and diffusion, 2) social embeddedness and 3) transformative. The third is rooted in the second, and both differ from the first, because they conceive target contexts not as passive recipients of IT, but as parties in the evolution of innovations. In Avgerou's view, the main difference between the last two discourses is that for "social embeddedness", information systems are locally constructed, whereas the "transformative discourse is explicitly concerned with the way IT is implicated in the dynamic of their change [of social, economic, and political relations in a developing country or the world at large]." (idem p.8). Avgerou states that the social embeddedness discourse is sensitive to local dynamics and situated meanings and actions. The transformative discourse introduces new elements beyond organizations and interorganizational links: institutional models implying power relations beyond specific or ganizational settings. The interplay between technology and discourse intercepts an empirical arena situated at the meso-level, between global initiatives and discourses, and emphasis on specific implementations. At this level, we see a possible development of the "Networks of Action" strategy (Braa et al., 2004), to conceptualize and conduct each intervention as but one element in a larger network of action. The crystallization of that "infrastructuring" is seen metaphorically as ‘snowflakes’ by Staring and Titlestad (2008).

This strategy also requires substantial investment. Still, many of the building blocks of such an infrastructure can be taken from the frameworks underlying ongoing successful projects. In this way, rather than each project remaining isolated and autarchic, and thus fragile, federations of projects can become more sustainable, though they require the ceding of some control in the process of federating. By delegating common functionalities to an open or federative managed infrastructure, each project gains the benefit of resources created by others, and at the same time is freed from shouldering the full cost of maintaining its own technological and informational platform (Nielsen and Anestad 2005). Therefore, by
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COOPWORKS – A CASE STUDY ON AN INFORMATION SYSTEM MEANT TO ENHANCE THE CAPACITIES OF AGRICULTURAL CO-OPERATIVES

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Abstract: In this paper we will present a case of a publicly-funded open source project aiming for capacity building in Kenya and other developing countries, in order to study the rationale of using open source in capacity development. The Food and Agriculture Organisation of the United Nation (FAO) with the financial support of the Government of Finland has undertaken an inter-regional project titled "Development of a Management and Member Information System (MMIS)". The objective of the project was to enhance the capacities of agricultural co-operatives and producer organizations in developing countries to improve their business efficiency and competitiveness in national, regional and global markets through the development and dissemination of a low-cost and marketable prototype computerized management and member information system. The development of this open source licensed prototype software builds on an existing system recently developed within a FAO Technical Cooperation Programme project in one pilot dairy co-operative in Kenya. The MMIS has been given the name CoopWorks – Business Management Information System for Producer Organizations. The case study provides us with first-hand experiences on how open source may be used in capacity building, as well as experiences on the challenges such venture may face.

Keywords: open source software, capacity development, ICT
COOPWORKS – A CASE STUDY ON AN INFORMATION SYSTEM MEANT TO ENHANCE THE CAPACITIES OF AGRICULTURAL CO-OPERATIVES

INTRODUCTION

In this paper we will present a case of a publicly-funded open source software (OSS) project aiming for capacity building in Kenya and other developing countries. The case study provides us with first-hand experiences on how open source software may be used in capacity building, as well as experiences on the challenges such a venture may face. The paper has three goals, namely first to illustrate both the importance of open source and the challenges of adopting open source software in this context. Secondly, the paper illustrates via short literature review the current state of capacity development and its goals and how ICT can potentially help in capacity development. Thirdly, we seek to pinpoint the key challenges in capacity development in the context of the presented case and illustrate the successes and failures of the case project.

There has been a multitude of research on information system adaptation and investment successes, less on failures and recovery (see for example Montealegre and Keil 2001). OSS in developing countries context has also been widely researched. However, there are few articles concentrating on OSS software projects in developing country context that focus on capacity development and reflect on project successes and failures in this context. Thus the nature of the paper is to offer normative insights to any academic or practitioner meeting similar situation.

1.1 BACKGROUND

Free (libre) software and open source software (FLOSS) is a tempting choice for many software projects in developing countries. The lack of expensive licenses for software and independence from major software producers attract projects with limited resources and even countries, who wish for political or economical reasons base their ICT-strategies on “free” software (see for example Weerawarana and Weeratunge 2003, Noronha 2002, Wright 2006). Likewise as naturally the costs of software project do not revolve only around software licenses, nor is the cost the only issue in the growing popularity of OSS in developing countries. “I don’t think the cost (alone) is an issue...But more than price, what matters is the application development. The idea of the openness should be kept there. Openness and sharing...these are great values in themselves”, Pierre Dandjinou, ICT-D Policy advisor for Africa (quoted by Noronha 2002).

Open source software is traditionally developed “to scratch an itch” of the developers themselves (Raymond 2001). This means that software is developed, mostly by voluntary individuals, to solve a problem the developers have themselves. Increasingly, open source software projects are founded also based on commercial motivations, where an entrepreneur or enterprise strives for profit by providing services or complementary products together with open source software. However, there are many cases where another party is scratching the itch of another, but where also economic sustainable development of the project and high impact of the software are key issues to be taken care of. Unlike voluntary or commercial
OSS projects mentioned before, these kinds of projects are usually interorganizational; i.e. there are many developers from different organizations involved, and a complex stakeholder network.

The seeds of this research project lie in the late 80’s research project, in which the researchers of the Turku School of Economics, Finland, surveyed Kenyan agricultural coffee and dairy sector co-operatives. The project was funded by Food and Agriculture Organisation of the United Nation (FAO). The general aim of the project was to give normative advice how Kenyan farmer owned co-operatives could enhance their capital formation and management efficiency. There is a long tradition in Scandinavian research on third world co-operatives. For example the Scandinavian Institutes of African Studies published a book as early as 1972 focusing solely on co-operatives and efficiency (Widstrand 1972). The final report of the project suggested computerization as one of the key elements in accomplishing this aim (Jämsén et al. 1999). A decade later this recommendation was put into action.

1.2 RESEARCH METHOD

Our team of researchers was invited to participate and share our knowledge on the key issues of the project, and later contracted to provide research based support for project decision making. At the same time, the team gathered qualitative empirical data of different aspects of the project. The data was gathered mainly with interviews and observation during field missions at the planning phase, the early execution phase, and at the end of the project. In addition, the team had close communication with the project management during the whole project. We use this data as a descriptive case and make an analysis of FLOSS in capacity development.

The main research strategy of this study was case study (Yin 1994; Gummesson 2000). As strong researcher involvement in the research process was required, the type of approach in this study was action research (Gummesson 2000; Gill 1986; Greenwood & Levin 1998).

Although action research is hard to define in a generic way, some accepted guidelines exist. One of the most used definitions is by Rapoport (1970), who describes action research as contributing:

"...both to the practical concerns of people in an immediate problematic situation and to goals of social science by joint collaboration within a mutually ethical framework."

CAPACITY DEVELOPMENT WITH ICT

1.3 ACHIEVING THE GOALS OF DEVELOPMENT THROUGH BUILDING CAPACITIES

Developing countries face many problems: poverty, hunger, diseases, environmental disasters and other problems, such as inequality, corruption, prohibition of association or self-expression, and a lack of educational infrastructure. The discourse about the goals of development refers to efforts of addressing these problems. The Millennium Development Goals are a good example of the goals of an international development program. There are eight Millennium Development Goals that all 191 United Nations member states have agreed to try to achieve by the year 2015 (http://www.un.org/millenniumgoals/).
In addition to people’s basic needs, such as nutrition and healthcare, Millennium Development Goals emphasize strategic needs, such as education, income improvement, equity, and global partnership. Answering to basic needs equals to surviving and coping with day-to-day life. Answering to the strategic needs, on the other hand, is synonymous to capacity development: finding solutions to strategic needs means building capacities to achieve the future needs, too. According to UNDP, capacity development is the process through which individuals, organizations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time (http://www.undp.org/mdg/basics.shtml).

It is significant to understand that capacity development requires more than individual skills development. First, individual capacity development covers also such areas as social capital and motivation, which create capacities for an individual to use the acquired skills. Secondly, in addition to skills people need the kinds of opportunities that enable them to use and expand their skills and capacities to the fullest. Without the opportunities, people will find that their skills rapidly erode. Hence, in addition to individual level, capacity development needs to be addressed at organizational and societal levels. (Fukuda-Parr et al. 2002, 9-10) The aim of the societal capacity building is to strengthen the capacities of a society so that the society provides more choices and possibilities for people. The objectives of the societal capacity development can be, for example, facilitation of economic development or providing more equal opportunities for all.

As understood in the composition of the Millennium Development Goals, equity is one of the significant aspects and goals of development. First, equity can be seen as a societal capacity: equity creates more opportunities for individuals. Equity benefits also the process of development. For example, a broad sharing of economic and political opportunities is instrumental for economic growth and development (World Development Report 2006). Equity is also a basic right and a goal of development itself.

To summarize, the aim of capacity development is that individuals, organizations and societies strengthen their capacities to achieve their development objectives. Development objectives referred by capacity development can include such areas as education, income improvement, equity and global partnership. The emphasis of capacity building is both in individuals and in organizational and societal structures.

1.4 CHALLENGES IN CAPACITY DEVELOPMENT

Capacity development takes place through multiple processes in the public sector, civil society and the private sector. Because capacity development is fundamental in the process of development, the importance of building local capacities should be recognized especially in development cooperation projects. However, development cooperation projects are often criticized for not supporting the development of local capacities. For example, Kingsbury, Remenyi, McKay and Hunt (2004, 8) argue that what has been learned about development over the past half century is that much of the development process to date has been inadequate: development fads have changed while the lives of many poor people remain much the same. They affirm that investment in new industries to modernize the economy during the 50's has been inappropriate or inadequate; that investment in education alone during the 60's has in most cases not been sustained to reveal the benefits it could have delivered; that investment in basic needs during the 70's has not been enough or sufficiently applied; that investment in 'getting policies right' to facilitate technology transfer during the
80's has been misguided, mishandled or was simply unsustainable; and that investment in alliances that were intended to achieve sectoral reforms, especially in finance and export-led development, during the 90's has not achieved the sort of gains in development that have led to a sustainable reduction of poverty on a global scale. (Kingsbury et al. 2004, 8-9)

Even though the mistakes made in the past have been recognized, development cooperation projects still suffer from the same problems. For example, many of the recommendations made in the OECD’s Development Assistance Committee’s (DAC) Principles and Rethinking Technical Cooperation in 1991 have not been implemented in technical development cooperation projects. Instead, technical cooperation projects are still frequently criticized for undermining local capacity, distorting priorities, choosing high-profile activities, fragmenting management, using expensive methods, ignoring local wishes, and fixating on targets (Fukuda-Parr et al. 2002, 8).

Because of the problems faced in the development cooperation projects, there are also strong critiques against the traditional forms of development cooperation. Traditionally, development cooperation is cooperation between the personnel of different development agencies – such as experts, consultants and volunteers – and local stakeholders, such as local government, private sector and individuals. These donor and recipient roles in development cooperation create an asymmetric relationship. Thereby the development industry often creates objects out of development initiatives rather than partners. However, the old model of development cooperation ignores the fact that an asymmetric relationship can be an obstacle to building partnerships. (Fukuda-Parr et al. 2002, 9-10) The aim to address the problem of asymmetric relationships in development cooperation has also changed the jargon: first the term development aid changed to development cooperation and now the emphasis is on local capacity development and ownership. Fostering local ownership requires the consideration of the role of the development industry and the time-span for development interventions. In addition, it has to be discussed which approaches actually are national and indigenous. (Fukuda-Parr et al. 2002, 14)

1.5 HOW DOES THE USAGE OF ICTs SUPPORT THE PROCESS OF DEVELOPMENT?

Access to information and possibilities to communicate, innovate and learn are significant issues in capacity development. Today ICTs play a significant role in communicating and in using, storing and distributing knowledge. Hence, ICTs have become essential not only for big multinational corporations, but also for individuals and small and medium sized companies. ICTs provide also many possibilities for organizations and companies in developing countries.

The relation between ICTs diffusion and economic development has also been studied and generally proved to be positive (e.g. Indjikian & Siegel 2005). Many institutions claim that science and ICTs could play a key role in alleviation of the problems in developing countries, too. For example, the World Summit on the Information Society (WSIS) member states have committed to investing in ICTs for enhancing socioeconomic development in developing countries, and institutions such as United Nations, World Bank and International Telecommunications Union (ITU) promote ICTs for governments of developing countries.
Though ICTs alone are not an answer for problems developing countries are facing, ICTs can be used as tools for addressing the development goals. The eight Millennium Development Goals can be addressed by ICTs for example in following ways: ICTs can help in eradicating poverty by increasing farmers and traders access to market information, and by increasing efficiency and competitiveness of firms owned by people living in developing countries. Primary education can be supported by increasing supply of trained teachers through virtual training, teacher networks, and by providing educational material through ICTs. Gender equality can be supported by delivering specifically targeted educational programs. Healthcare can also be improved through ICTs by increasing an access to health information. For example, information about HIV/AIDS can be provided through locally appropriate content in local languages. (World Telecommunication Development Report 2003)

Mark Warschauer (2001) argues that the use of the Internet extends also people’s social capital. The Internet provides expanded opportunities for communication and association with broad numbers of people. Some studies show also that those with the Internet access maintain and develop more extensive social networks of contact and support both within and outside the local community. Internet provides a possibility to participate in virtual communities and a new tool for organizing social alliances. For example, many non-profit organizations have Internet sites. Communication through the Internet can also improve communication in civil society, which consists of networks, groups, organizations, and forms of association that exist between the private sphere and the state (Warschauer 2001). ICTs are also one area of innovations. ICT related innovations can be technical, social or organizational.

Overall, it can be summarized that the main role of ICTs in development is in providing information and communication channels to increase awareness, transparency, competitiveness and social capital. New business opportunities can also be created through the information systems, which enhance information processing.

THE CASE: Coopworks

1.6 PROJECT BACKGROUND

The Food and Agriculture Organisation (FAO) of the United Nation headquarters in Rome with the financial support of the Government of Finland has undertaken an inter-regional project titled "Development of Prototype Computerized Cooperative Management and Member Information System (MMIS)". The objective of the project was to enhance the capacities of agricultural cooperatives and producer organizations in developing countries to improve their business efficiency and competitiveness in national, regional and global markets. This was to be achieved through the development and dissemination of a low-cost and marketable prototype computerized management and member information system (MMIS). The development of this FLOSS licensed prototype software was built on an existing system recently developed within a FAO Technical Cooperation Programme project “Computerization of Agricultural Cooperatives and Emerging Producer’s Associations in Kenya” where the first version of the MMIS software was developed and piloted in a Kenyan dairy cooperative. Later the MMIS has been given the name CoopWorks – Business Management Information System for Producer Organizations (see www.coopworks.org).

The computerization initiative was build on findings from an earlier study on capital formation processes in Kenyan agricultural cooperatives (see Jämsén et al. 1999). The study
revealed that the cooperative management lacked up-to-date operational information and that the cooperative members did not receive proper information of how their funds had been managed. Low level of computerization was seen as a major obstacle in efficient member capitalization and in improving cooperative business performance. There was need for transparency and competitiveness that information systems would bring. However, in addition to the problems with the affordability of computer systems and the lack of electrical infrastructure in rural parts of Kenya, there was no affordable and suitable software for managing cooperatives. The first computerization project therefore developed a pilot version of such a software product. In the aftermath of the pilot project, the various stakeholders were brought together, and the plan for the follow-up project was jointly negotiated by various stakeholders. The follow-up project was set up in order to further develop the software, and to introduce the software Kenyan agricultural producers and to other countries. The idea was to build the critical mass of users and developers, to develop more modules, and to gather experiences widely – however, due to lack of resources and incompleteness of the software, it was decided later not to introduce the software in any other countries, but to concentrate on Kenya.

1.7 THE SOFTWARE – CoopWorks

The pilot version of the software was developed by a subcontracted Kenyan small software company in collaboration with the management of the pilot cooperative. This first version was already licensed with a FLOSS license. However, only the MMIS software itself was FLOSS, but it was built on a proprietary technology platform. The project had acknowledged that FLOSS licensing would lower acquisition costs, and possibly also maintenance and updating costs. In addition, FLOSS licencing would facilitate local customization, independently from the project or the main developer. One of the key issues recognized already in the early planning phase of the follow-up project was the sustainability of the action in the long run. The project management was worried that once the two-to-three year funding from the Government of Finland would end, the software would not be further developed, supported or marketed. The FLOSS licensing of the software was envisioned to enhance dissemination and adoption of the software by users, developers and also local companies, and thus create a critical mass and a business ecosystem that would independently develop, support and market the software – providing the support framework that the use of CoopWorks would require, but also rousing the local economy. The fact the software stack on which CoopWorks was build was not FLOSS was seen as a problem, because it would increase the adoption costs and impede the planned collaborative development aspects. It was hence decided that a new version of the software would be created, and it would not only provide better usability, security, modularity, and functionality compared to the pilot software, but also be build on nearly all-FLOSS platform, namely WAMP (Windows, Apache, MySQL, PHP). The platform choice was a compromise between the advantages deriving from the FLOSS nature and the availability of existing user and developer skills and commercial support, which did not favor other FLOSS products.

1.8 PROJECT EXECUTION

The main governing body of the project was the joint coordination committee (JCC), which consisted of the project coordinator and representatives of the main stakeholders, namely FAO Kenyan office, a Kenyan ministry responsible of cooperatives, an agricultural producers’ apex (or “umbrella”) organization, an ICT companies’ apex organization, and a foreign NGO which financed related actions. The JCC was responsible for coordinating the
actions related to the project mission, which involved all the stakeholders and not just the FAO. One of the key activities was to disseminate information about the software. This was done mainly by organizing seminars for all potential stakeholders (coops, ICT-sector companies and governmental and producer union officials).

Inside the JCC there was opposing visions on how to manage the software and who to involve in the activities. It was in the interests of some parties to try to keep the management of the joined activities and the software development in the hands of just a few players, where as others thought this would lead to dominance of those players, their limited views and to high service fees supported by monopoly positions. The interviews at the end of the project revealed that there had been power struggle between the project players, and the there had been a risk of seizure of power, but that the FLOSS nature of the software project made this kind of ambitions difficult, since the software itself could not be appropriated.

During the project, the JCC organized the development of the second version, which according to all parties was regarded as success. The new software was introduced in two more pilot cooperatives, which with the guidance and training provided by the project were able to successfully adopt the system into their daily use. Members of the JCC also organized many events for various target groups, such as local representatives of the ministry and cooperative management, with the purpose to inform them about the new opportunity CoopWorks now provided. CoopWorks was also introduced to software entrepreneurs, and a handful of them also claim readiness to provide support services if demand exists.

1.9 RESULTS OF THE PROJECT

At the end of the project, most of the JCC members stated that the greatest challenge in front of the wide-scale adoption of CoopWorks in the cooperatives is the quality of staff, namely their skills in managing the investment and recognizing the potential advantages of using a computerized system. It was also the comment from the previous project coordinator that in retrospect the dairy cooperative sector was probably not ready to adopt the system, and that the project should have had invested even more on training initiatives. For the farmers, the fact that the software was FLOSS was hardly an issue. As such, the project seemed to have too much emphasis on the technology. One reason for this could be the way the project goals were agreed between FAO and the sponsor, and influenced by the various stakeholders such as consultants. Farmers or cooperative staff had little influence on the project goals, and were in fact represented in the JCC only indirectly. However, the project was not designed to be a standard technical cooperation project aiming for the capacity building of the Kenyan farmers, but a project aiming to develop usable software for global usage and therefore having a much larger client group.

Overall, if we consider what kind of cooperative can even be considered a potential client of the CoopWorks system, it is probably a fairly successful and relatively rich cooperative with business-minded management, close to the capital or some other big city. Poor or very small cooperatives can hardly afford the related investments, and those far from the big cities might not have reliable source of electricity or support services available. There is therefore the risk that computerization will widen the chasm between the winners and the losers. However, the pilot cooperatives were the only dairy cooperatives in their region, and therefore their advancement did not worsen the situation of their competitors. In addition, usually farmers are fairly free to join any cooperative they see fit, therefore also the poorest individuals can benefit from the achievements of the successful cooperatives.
Another challenge is that even at the end of the project the cooperatives are very dependant on the staff who know how to use CoopWorks and on the support service providers. This situation does not seem to be changing in the near future – the computer skills of people are generally low and the users and the developers have not reached the critical mass when the support services would be both lucrative and commonly available. However, in theory anybody has the opportunity to study the software, and work in the cooperatives or start providing commercial services for CoopWorks, so this might improve with time.

The original idea of the project was the cooperatives could independently make investment decisions, adopt the information system, and buy services required from local service providers on a commercial basis. In reality, however, the cooperative management is often not able to make investment (note: investment here is for total cost of ownership, not only hardware and software) calculations, or properly understand the potential of ICT; the cooperatives are poor; there are deficiencies in the infrastructure; loans for investments are insufficient or expensive. In addition, interviewed software entrepreneurs didn’t consider CoopWorks to be very attractive business for software companies, a fact which limits the availability of services and increases service prices. The cooperatives are therefore not able to make positive investment decisions, but need both knowledge and financial support for adopting the information system. The situation may change in the future, when marketing and training efforts bring results and the critical mass behind the software increase. It is also possible that the software will be used and developed further by players outside Kenya – it is after all a globally available FLOSS product. However, it is dubious that this would happen by itself. More likely the software will form a basis for other development projects.

When concluding the results of the case project, both the members of the JCC and the research team thought that the project succeeded in many things, but also failed in some. As described above, the cooperatives were not at the end of the project yet able to adopt the software on a large scale, due to problems with investing, skills and affordable services. On the other hand, during the project the software was developed from poor pilot software to a quality MMIS product of global potential, and the participants gained experience from collaboration that will benefit all in the future.

1.10 DISCUSSION

This paper had three goals: namely first to illustrate both the importance of open source and the challenges of adopting open source software in this context. Secondly, the paper aimed to illustrate the current state of capacity development and its goals and how ICT can potentially help in capacity development. Thirdly, we sought to pinpoint the key challenges in capacity development in the context of the presented case and illustrate the successes and failures of the case project.

FLOSS licensing was chosen for the software due to lower the costs of acquisition, maintenance and updating; and to support local customization. In fact, FAO headquarters actively encourages OSS development for the following reasons: a) It is cheaper, b) FAO works with partners in different organizations and member countries, and FLOSS allows everyone to participate in the development or the customization for the specific country. In the beginning of the project however, only the MMIS software itself was FLOSS while other required components were proprietary software. In order to further lower the costs, to promote the adoption, and especially to open up the technology to support the creation of the
business ecosystem, the project increased the amount of FLOSS component in the second version of the software. In practice, removing the costly proprietary components did lower the acquisition costs of the information system, but on the other hand, due to relatively low availability of service providers the service costs were high.

The interviewed software entrepreneurs were very excited about FLOSS in general, praising the low costs and freedom it offered. However, at the moment CoopWorks was not considered a very attractive business, mainly because the demand for services was low, and the cooperatives were not able to pay high service fees. The demand from the cooperatives’ side was low partly because of the low availability of services and their high price. It can be said that in this case it was not enough that the information system was almost all FLOSS and therefore affordable, since the other related investments and services proved to be difficult to acquire. It was expected that the situation with service availability and affordability would improve with the increase of user organizations and support providers, but this would demand further effort and financial support from the project until the business ecosystem would reach the critical mass.

The case project had a dualistic nature when it comes to ownership and independence issues. On the other hand, the software was developed in collaboration with a Kenyan cooperative, and the project did heavy collaboration with many local players. It was also the goal of the project that users, developers and entrepreneurs of the developing countries could in the future develop and support the software themselves, taking the responsibility in collaborative ownership. The FLOSS nature of the project did support these aims especially because FLOSS licensing permits free adoption and development of the software, supporting the uptake by cooperatives, learning by staff members, and business development by software entrepreneurs.

There was no doubt that the pilot dairy co-operative and its members felt the system was a success. ICT-generated benefits included lessened transaction costs, improved transparency, better possibilities for management to plan operations and so forth. These are generally seen as classical ICT-benefits and there are very little differences in developing country context.

However, it was also clear that in terms of capacity development, the project was largely a failure. Some individual and organizational development occurred, mainly in pilot dairies. When considering the project resources, this achievement is relatively modest. There is a real danger that the project will stall, and be an example of classical waterfall-project where too much emphasis was paid in technology and project management and too little to actual user needs. It is likely that our case would have benefited from a more iterative approach. Our case does not offer enough evidence to suggest that hierarchical, top down-approach is always wrong, but in this case the rather rigid project planning and management approach is in our minds the biggest explanation why capacity development did not occur, at least at the hoped for levels. When commercial organizations are largely moving toward more iterative, fluid project planning and management, perhaps there is a lesson to be learned here.

Finally, to give the project a final assessment, it is perhaps best classified as a good example what can be achieved with ICT (and FLOSS) in small scale capacity development. Thus, as a pilot project it can be seen as a success.
CONCLUSION

ICT could aid in capacity building, for example by improving business efficiency and competitiveness of farmers’ organizations – improving the quality of information created trust and aided in capital formation and increased business performance.

Global development organizations such as FAO are using ICT as part of their technical cooperation, and even participating in software development where suitable and affordable software is not present on the market. They also actively promote OSS, although only in cases where it is viable in terms of available support and skills. However, as the case suggests, there can be lack of proper understanding of OSS, and the full potential of the OSS approach can be forfeit.

The case study suggests OSS is used in capacity building to lower costs of acquisition, maintenance and updating, and to facilitate local independent customization. The role of OSS was deemed important for the sustainability of the action, since projects involving ICT are also prone to discontinuity of capacity building actions as is other development cooperation. In the presented case the project aimed to create a critical mass of users and developers and a business ecosystem to support the software development, support and marketing. This proved to be challenging, since low level of demand causes low level of supply, and vice versa. Our conclusion here is that the low costs and high adoptability of OSS is not enough to create a critical mass and network effects if other related costs are too high. In the case project, the relative poorness of the client organizations also diminished the attractiveness of the business.

The independent nature of OSS creates not only a chance for the actors in the developing countries to carry out their own development and customization work, but also a sort of insurance against power issues. Since OSS cannot be fully controlled by any single party, it may exhort different actors to cooperate with others.

In terms of capacity development, the case project reminded us about the dangers of technology fetish – too strong emphasis on technological issues is inclined to lessen the attention to softer issues, such as education.

We also suggest that in similar computerization actions it is important to evaluate if digital divide between the winners and losers within the developing country is widened with the action, and make an effort to avoid such a situation.

We also point out that rigid project planning and management that has strong focus in producing something tangible in the end, in this case software, may not be an optimal approach.

As a general conclusion we can say that even though computerization in general seems to provide considerable benefits for certain organizations in the developing countries, the circumstances may render it difficult to invest on information systems.
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Abstract: This paper provides an analysis of the relationship between ICT artifacts and institutions in the context of the millennium development goals (MDG) for sustainable development. Based on Fligstein’s (1990) idea of ‘conceptions of control’ (broad managerial paradigms) and on primary and secondary empirical data pertaining to the history of the governance of the Brazilian Amazon region and the role of the Brazilian Amazon monitoring systems, this paper argues that: (1) the process of institutional change (shifting of conceptions of control) is conflictual, emergent and contested; (2) the design and use of ICT artifacts tend to reflect the local dominant conceptions of control; (3) that ICT artifacts that emerge within a specific conception of control can be reconfigured to serve the interests of other conceptions of control over time. The paper concludes that it is essential to attain the spatial and temporal dimensions of ICT in order to understand how the local institutional forces shape the development and use of ICT in relation to the MDG. In this way, it might be possible to understand not only whether an ICT contributes to the MDG or not, but also why it is the case, and which social dimensions could help or hinder the future use of ICT for those aims.

Keywords: neoinstitutional theory, conceptions of control, millennium development goals, geographic information systems, environmentalism, Amazon rainforest
CONTEXUALIZING ICT FOR SUSTAINABLE DEVELOPMENT: AN INSTITUTIONAL ACCOUNT OF THE AMAZON RAINFOREST MONITORING SYSTEM

1 INTRODUCTION

In September 2000, the 189 member states of the United Nations signed the United Nations Millennium Declaration. One of the most important parts of the declaration was the Millennium Development Goals (MDG), an eight-goal action-plan that the international community agreed to carry out in order to improve the life of humankind. These goals included the reduction of extreme poverty, combating aids and ensuring environmental sustainability. Different studies point out that information and communication technologies (ICT) could play an important role in helping countries develop and by doing so, contribute to the achievement of the MDG (e.g. Batchelor et al., 2003; Madon, 2005). Nevertheless, the overwhelming cases of failure of ICT projects in developing countries suggests that the challenges ahead are as daunting as the potential benefits (Baark & Heeks, 1999; Walsham & Sahay, 1999).

One of the main results emerging from the literature that reports on the possibilities of ICTs in developing countries has been the centrality of social and cultural dimensions in the success and failure of ICT projects (Avgerou & Walsham, 2001; Barrett, Sahay, & Walsham, 2001). Walsham and Sahay (1999), for example, showed that geographic information systems contain a series of “western” values embedded in them (e.g. use of maps to represent the territory), which may contrast with those values held across different developing countries. Studies such as this suggest that in order to increase the chances of success of ICT projects in developing countries, stakeholders ‘must improve their capacity to address specific contextual characteristics of the organisation, sector, country or region within which their work is located’ (Avgerou & Walsham, 2001: 2). Thus this literature has pointed to the importance of understanding the spatial dimension of development.

However, far fewer studies have also sufficiently attended to temporal dimension of ICT in developing countries (for exceptions see Madon & Sahay, 2001; Sahay, 1997; Walsham & Sahay, 1999). This study seeks to contribute to this limited literature by drawing upon neoinstitutional theory to inform our analysis of the case of the introduction and development of the Amazon monitoring system\(^1\) over the last four decades. Our case will reveal that the differing uses of this ICT application can be explained by considering the ways in which the differing institutional values become dominant over time. In this context, we will argue that evaluating the Amazon monitoring system solely in relation to the goals of sustainable development as understood today in the developed countries would be a mistake, since this

\(^1\) Today the family of governmental monitoring systems of the Amazon rainforest are developed and maintained by INPE (Brazilian Institute for Space Research), the OEMAs (state-level organs for environment, such as SEMA from Mato Grosso), IBAMA (federal environmental protection agency) and SIPAM (system for the protection of the Amazon). Despite the number of actors and individual systems, it reasonable to refer to this set of ICT applications as a single “Amazon monitoring system” given the fact that all systems are related in different regards to INPE’s PRODES (which maintains the leadership in the area) and draw upon the same raw data (Landsat, CBERS and MODIS satellite images).
view implies an ahistorical or even a naïve understanding of ICT in developing countries. Furthermore, our paper will argue that the relationship between ICT and institutions should be conceptualized as conflictual, emergent and dialectical (Hayes, 2008), and further, that literature on institutional literature needs to better attend to the emergent and conflictual practices that shape and are shaped by information technology.

This paper is organized as follows. The next part provides the theoretical base of this paper and briefly reviews the information systems literature in this area. The third section outlines our methodological stance. The forth section presents the empirical base of this article. This is followed by a discussion and conclusion where we discuss the case with regard to the relationship between ICT artifacts, their institutional context and the millennium development goals.

2 INSTITUTIONAL THEORY

Neoinstitutional theory in organizations emerged in the late 1970’s and 1980’s in response to a growing disenchantment with the explanatory power of traditional economic and rational administration theories underlying many articles in literature at the time (Barley & Tolbert, 1997). Generally speaking, new institutionalism defines institutions as widely shared norms, rules and interpretive structures ‘that constitute the nature of reality and the frames through which meaning is made’ (Scott, 1995: 40).

Neil Fligstein (1990) offers a strong institutional analysis that presents clearly both a focus on the cognitive dimension of institutions and its identification as a phenomenon present at a broader social level that characterizes much of the neoinstitutionalism in organizations. His analysis, like DiMaggio and Powell’s (1983), challenges the mainstream evolutionary economic theory that believes that the U.S. naturally created technological efficient firms by managing them according to an universal extemporal rationality. Fligstein shows through a longitudinal study of North American corporate history that USA’s biggest companies have taken their current shape mainly due to a succession of dominant conceptions of control. Conceptions of control are institutionalized widespread “totalizing world views that cause actors to interpret every situation from a given perspective” (1990: 10). They ‘operate both as cultural templates for structuring new actions (i.e., what behavior make sense) and a set of structures limiting the possibilities of action (i.e., what others are doing, thereby structuring what reactions are possible)’ (Fligstein & Brantley, 1992: 287). Conceptions of control can be understood as a sort of institutional logic since they provide ‘sets of “material” practices and symbolic constructions’ to individuals so as to make sense of their environment (Friedland & Alford, 1991: 248). However, while institutional logics provide the ‘cognitive maps’ to activities that range from bureaucracy to religion, conceptions of control are mostly related to managerial practices since they emerge from the need of individuals and organizations to control their environments. Examples of conceptions of control include the manufacturing conception that sees the organization as an engine that must transform raw materials into finished products in the most efficient way, to the more recent financial conception, that sees organizations as a portfolio of assets that must obtain the highest return on investment.

The growing information systems literature that draws on ideas from neoinstitutional theory suggests that institutions interact with ICT artifacts mainly in two ways: (1) local institutional arrangements influence success/failure of ICT projects (2) the institutional field shapes the design and use of ICT in organizations.
First, different authors point out that the broader institutional context plays a key role in the establishment (or institutionalization) of ICT innovations. King et al. (1994) initially suggested that institutions, understood mainly in terms of early institutional theory (e.g., influential organizations such as government, professional associations and universities) can influence the success or failure of IT innovations. Later Swanson and Ramiller (1997), drawing on the neoinstitutional theory, propose that specific organizing visions (community-wide idea for the use of specific of ICT applications) are the main enabler of successful innovations. Building on this concept Currie (2004) analyzed the case of Application Services Provisioning (ASP), a business and technological model that delivers software over wide networks and argued that it was not established as originally conceived largely due to the incapacity of its supporters to generate a coherent community-wide organizing vision. Closer to the focus of this study, Humes and Reinhard (2007) emphasizes the role of coercive power in the institutionalization process of a public financial system in Brazil.

The second line of studies argue that the impact of ICT in organizations is not deterministic, but depends on specific institutional arrangements present at the organization prior to the introduction of new technologies such as values, roles and patterns of interaction (Avgerou, 2000; Barley & Tolbert, 1997; Currie & Guah, 2007; Fountain, 2001; Noir & Walsham, 2007; Orlikowski & Robey, 1991).

Even though neoinstitutional theory has been gaining an increasing number of supporters in the last few years, different authors point out to important limitations to the theory for the study of ICT in organizations (for a review see Yang, 2003). Lawson (2003) complains about the disappearance of the individual behaviour effect from the institutionalist framework, while Blackler and Regan (2006) argues that neoinstitutional theory downplays the role of conflicts, emergence and false starts in the process of institutional change. Hasselbladh and Kallinikos (2000) are even more acute in their critique, and affirm that the current mainstream version of the theory is ‘too idealistic and broad to direct empirical research’, and as such it ‘needs to abandon the bird’s eye view of the field, and come closer to the social and cognitive means and procedures underlying rationalized beliefs and schemes of action’ (700).

Given the broad and longitudinal nature of this research it was not possible to abandon the view from above and to give due attention to the role of individual agency in the process of institutional change. Nevertheless, this study has drawn heavily in Blackler and Regan’s (2006) concerns and has privileged theoretically the role of concurrent and conflict conceptions of control. At the same time, by following Hasselbladh and Kallinikos (2000) this study has paid close attention to the ideals (e.g. broad intentions), discourses (e.g. norms and laws) and techniques of control (e.g. official statistics) concerning the development and use of the Amazon monitoring system during the data collection phase of this research.

3 RESEARCH METHODOLOGY

The case study that forms the empirical base of this article concerns the history of the Amazon monitoring system, a family of satellite-based remote sensing systems used by the Brazilian government to estimate deforestation rates in the Amazon rainforest. The primary data consists of sixteen interviews held between June and August 2007, in three different Brazilian states. The informants were thirteen government officers, two members from non-governmental organizations (NGOs) and one entrepreneur with business activities in the Amazon region. The government officers interviewed are individuals directly involved in the development and use of the Amazon monitoring system and the creation of the country’s
environmental policy, including two ex Ministers of the Environment, three congressmen, an influential scientist member of the IPCC (Intergovernmental Panel on Climate Change) and directors of different environmental and research bodies. Nine interviews were tape recorded and then transcribed and translated in English. In the other seven interviews the author judged more appropriate to take extensive notes and then, just after the encounter, reconstruct as accurately as possible the full conversation while translating it in English.

Secondary data sources have also played a key role for allowing the historical reconstruction of the case study and to offer initial topics to be discussed in detail during the interviews. These data sources include the Brazilian law, newspaper archives, reports from governmental agencies and NGOs, technical documentation concerning the Amazon monitoring system and academic papers about the economical, political and environmental history of the Amazon. The primary and secondary data was then analyzed using an interpretive stance in order to identify recurrent themes and shared interpretations of the Amazon rainforest and the role of the monitoring system (Walsham, 1993).

4 AN INSTITUTIONAL TALE OF THE JUNGLE

Based on the identification in the primary and secondary data of three main recurrent ways of interpreting the Amazon rainforest and the monitoring system, we argue that in the period under analysis (1964-2007) the Brazilian government has managed the Amazon region from three different conceptions (see Table 1). As we will see below, the trajectory of the Amazon monitoring system has been shaped by these three alternate and sometimes contradictory conceptions of control. The military conception of control represents the worldview usually held by the armed forces, and sees the nation as a territory that must be defended from all kinds of threats to its economical, political and territorial independence (see Page & Redclift, 2002).

<table>
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<tr>
<th>Conception of control</th>
<th>Ideal</th>
<th>Aims</th>
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<tr>
<td>Military</td>
<td>An independent and strong nation-state</td>
<td>Protect the Amazonian region against threats to its economic and political sovereignty</td>
</tr>
<tr>
<td>Economic</td>
<td>A wealthy and prosperous Amazonian region</td>
<td>Develop the Amazonian region by expanding and modernizing its economy</td>
</tr>
<tr>
<td>Ecological</td>
<td>A sustainable and risk-free society</td>
<td>Preserve the Amazonian environment</td>
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Table 1 Ideals and focuses of the military, economic and ecological conceptions of control

The economic conception of control in general terms is concerned with the economic growth of the country, as defined by the achievement of certain numeric indicators (e.g. GDP, per capita income and budget surplus). The economic conception of control is closely related to the notion of developmentalism, namely, a set of ideologies that ‘regard development in the sense of economic growth and institutional modernization as a good in itself” without questioning the fact that those models of modernity are a product of developed nations and that they often collaborate to the perpetuation of post-colonial forms of domination (Berger, Berger, & Kellner, 1974: 183; Escobar, 1988).
Finally, the ecological conception of control is primarily concerned with the long-term sustainability of human life on Earth. While the economic conception of control 'downplay[s] discontinuities and crises, especially in the ecological arena’, the ecological conception recognizes the impact that human activities have on the environment and perceive risks – hazards generated by modernization – as management’s core problem (Shrivastava, 1995a: 119). According to this conception of control, the government should preserve the environment by adopting ‘ecologically sustainable organizational designs and practices’ (ibid: 127).

This section presents the case study from a neoinstitutional perspective, analyzing the evolution the Amazonian policy of the emergence of the Amazon monitoring in terms of these three conceptions of control. The analysis of the implications of the case study for the understanding of ICT and institutions more specifically will be left for the discussion section. For analytical clarity the discussion bellow separates the history of the Amazon in relation to three major events: the military coup d’état in 1964, the creation of the new democratic constitution in 1988, and the year 2001 in which the Amazon monitoring system has showed for the first time some effectiveness in reducing deforestation.

4.1 The birth of the Amazon monitoring system

Most of the Amazon forest is under the sovereignty of Brazil, and the “Legal Amazon” by its turn, covers nearly half of the country’s territory. The region has gigantic proportion: the area is 26 times bigger than England and nearly the size of the European Union. Until the 1960’s the region was barely untouched, but following a military coup d’état in 1964 the region became a major priority for the government. During that period the government became increasingly concerned with the military security of the Amazon. At the time the government feared that American expansionist policy and the world’s demographic growth might have lead to the loss sovereignty over the region (Reis, 1965). In order to fill the region’s “demographic empty” (the main source of vulnerability) the government started a major internal colonization project that provide subsidies for agricultural activities – a set of measures that has initiated a process of large scale deforestation that continues to the present (Fearnside, 2005). This view has echoed clearly in the interview of a congresswoman from one of the Amazonian states:

During the 1970’s the idea was to occupy and develop the region at any cost because of the imminent threat of the U.S to get the area. It was the period of the ‘Mata por Pata’ [trans. replacement of forest by cattle …]

Parallel to the colonization of the Amazon, the government has also started investing in satellite and airborne remote-sensing technology, becoming one of the pioneers in this technology (Biache, 1983). Different interviews that the reason of this expenditure was twofold. First, there was the economic need know more about the country’s continental territory and to verify if the subsidies to convert the forest into ‘productive land’ were giving the expected results, instead of being drained out by illegal schemes. ‘The SUDAM [Agency for the Development of the Amazon] wanted to know if all fiscal incentives were really being

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2 Legal Amazon (Amazônia Legal) is the socio-geographic division established by the Brazilian government to indicate Amazon rainforest and areas of transition. It includes all seven states of the North Region (Acre, Amazonas, Amapá, Pará, Rondônia, Roraima and Tocantins), as well as Mato Grosso state in the Center-West Region and most of Maranhão state in the Northeast Region. The Legal Amazon includes 59% of the Brazilian territory.
used to cut down trees’ explains a senior scientist from INPE, the Brazilian space research institute. Second, the data provided by satellites was seen as crucial in the government’s effort to maintain the sovereignty over the Amazon.

Towards the end of the Cold War the attention of the international community shifted from military to ecologic concerns. And Brazil, that was in a process of transition from the military to the civil regimes suddenly found itself as global environmental villain due to its policy towards the Amazon. At first the Brazilian government resisted the international pressures. For instance, the country refused to participate the International Environmental Conference where the preservation Amazon was one of the topics, on the grounds that the discussion of how Brazil manages its territory represents an attack the country’s sovereignty (McCleary, 1991). However, around 1988 pressures from high-profile members of the international community (including cuts of loans from the World Bank) and national social groups such as the rubber tapers’ movement led by Chico Mends (which was assassinated that year) forced the Brazilian government to review its policy towards the Amazon and adopt stricter environmental regulations (Espach, 2002; Kolk, 1998).

As part of the new environmental policy, the government created PRODES (Program for Calculating Amazon’s deforestation), the first monitoring system to regularly provide data concerning the extent of deforestation in the Amazon region. Indeed, Brazil stills the only country in the tropics to regularly provide reliable statistics about its forest coverage, even though Indonesian government have started developing a similar system (Fuller, 2006; World Bank, 2006). Based on the comparison of the most recent forest coverage as shown in the satellite images, with images from previous years, PRODES calculates through statistical techniques an estimate of the deforestation rate for that year (how much rainforest has been lost in km$^2$) divided by state (see Figure 1).

![Figure 1 Deforestation rates of the Brazilian Amazon rainforest between 1978 and 2006 calculated using the Amazon monitoring system (Sources: Fearnside, 2005; INPE 2008).](image)

Despite the official ‘greening’ of the Brazilian government, accounts from different interviewees and secondary data showing high deforestation rates during the 1990’s (see Figure 1) suggest that the change in the official discourse during the end of the 1980’s did not represent any significant change in the way the Brazilian government has seen and managed...
the Amazon rainforest. Indeed, a closer look at the meaning that some top Brazilian politicians give to the ‘environmental friendly’ actions describe above suggests that the decision to change the environmental law and to create the Amazon monitoring system was mainly an attempt to convince the international community that the Brazilian government had the right attitude towards the Amazon. When asked about the motivations behind the creation of IBAMA (the federal environmental agency) and PRODES, the Amazon’s most important monitoring system, a congressman and ex top member of the executive pointed out in an informal conversation that:

During the 1980’s the international community was concerned with the Amazon. I created the IBAMA by putting together different pre-existing bodies as an answer to this pressure. As a way to prove that we have the competence to manage the Amazon. The use of satellite images to monitor deforestation started under my government. [...] The idea with this move was again to demonstrate to the international community our preoccupation with the environment.

The above suggests that around 1988 emerged a discourse (new environmental laws, and a constitution) and a technological artifact (PRODES) in clearly line with the ecological conception of control. However, despite the superficial alignment of the new laws and this ICT artifact with the ecological conception of control, the meaning attribute to it and the actual organizational outcomes (e.g. high deforestation) suggest that the Amazon monitoring system and the environmental laws were actually resources for the military conception of control aiming at reducing international pressure. Furthermore, judging by the continuation of many agricultural subsidies inherited from the military era and the continuous expansion of agriculture in the region it is possible to conclude that the economic conception of control (characteristic in the first uses of remote sensing in Brazil) was also present at full strength.

4.2 The ‘greening’ of the Brazilian government

After years of false starts and the dominance of the military there is indication of change the Brazilian government towards the ecological conception of control. In other words, the government seems to have started devising its policy towards the Amazon region aiming, amongst other things, at the actual environmental protection of the rainforest and the sustainable development of the region. Evidence of the rise of the ecological conception can be found in different places. For example, in 2007 the government proposed the creation of a new international fund to exchange avoided greenhouse emissions from deforestation for financial help. This action is particularly relevant because it indicates at the same time the strengthening of the ecological conception and the weakening of the military conception of control, since Brazil had so far always refused any mechanism linking international money to the preservation of the Amazon on the basis that this represents a threat to the country’s sovereignty. Most importantly, the notion that the Amazon rainforest should be preserved seemed to be taken-for-granted for all interviewers.

During the same period the arrival of a new generation of monitoring systems suggest that this family of ICT artifacts has been transformed from a resource of the military conception of control to one of the main tools to control deforestation. Different interviewees explained to us that, unlike PRODES that provides only yearly data, this new generation of monitoring system that includes DETER, SLAPR and SisCom is able to detect within 15 days new clearings in the Amazon rainforest and relate this data with the land registry, which allows
the environmental protection bodies to intervene while illegal operations still under way and prosecute environmental crimes (Fearnside, 2003). As a consequence, different officials pointed out that the Amazon monitoring system has played a key role in the drastic drop in deforestation rates between 2004-2007 (see Figure 1). A Brazilian top scientist at a governmental research institute and member of United Nations Intergovernmental Panel on Climate Change (IPCCI) explained to us:

Today we can say that the tools we [INPE] have developed are the main environmental management tools for the [Brazilian] government. Thanks to this constant monitoring of the Amazon that the public organs are able to act, so it has an essential role. Furthermore, a share of the reduction in deforestation is thanks the existence of those [monitoring] systems. It is true that if you don’t have political willingness, you don’t go anywhere. However, also without this monitoring system the illegal activities can go on and nobody will even know about it, or maybe know only afterwards [when it is too late].

Further still, a new use for the Amazon monitoring system closer to the economic conception of control is taking shape. The Amazon Fund, proposed by the government in 2007 and created in 2008 with a donation of $300 million from Norway (with promises of donate up to $1 billion in the following years), was only possible once the Brazilian government committed itself to reducing deforestation. Further current negotiations in the United Nations are seeking to link carbon credits with the avoidance of deforestation or REDD (reduced emissions from deforestation and degradation) in the global carbon credit market. In both cases, the Amazon monitoring system is due to become a tool to calculate carbon credits to Brazil based on the detected deforestation in the Amazon. This suggests the formation of a synergetic relation between the economic and the ecologic conceptions of control.

However, the strengthening of the ecological conception of control within the Brazilian government and the weakening of the military conception is not a smooth process, as it might seem in a first look, but the outcome of a process that involves the steady contestation from the military and the economic conceptions of control. First, the recent clashes between the government and the military over the creation of the indigenous reserve Raposa do Sol, near the country’s borders shows that the institutional supporters of the military conception of control are reluctant to give up. According to environmental NGOs the surge in deforestation rates in the second half of 2007 (after three years of steady decline) was due to the increase in the price of soy beans and other agricultural commodities and the lack of capacity or political will of certain sectors of the government to counterbalance this market force. Furthermore, different officers suggested that the economic aspect of preservation hinders the full deployment of the ecological conception of control. A senior representative of the ministry of the Environment explains the issue:

The problem is that in order to adopt an environmental model the country will suffer an economical loss. Today half of the wealthy produced by the country comes from primary products which have environmental impact. The rich countries on the other hand do not want to answer if they want to pay the bill.

This suggests that even though the ecological conception of control has gained considerable force in the last ten years, it is inextricably interlinked with the economic conception of control and with a diminishing but still present military conception of control.
In summary, the institutional account of the history of the Amazon monitoring can be understood as a competition between different conceptions of control. At each period of the history of the Amazon, the three conceptions - military, developmental and environmental - were able to influence the meaning and use of the monitoring system with different levels of intensity. While the economic conception of control remained at full strength during the entire period under analysis, it was possible to verify the emergence of the ecological and the recession of the military conceptions of control during the 1990’s. Having presented the case from the lenses of institutional case, the next section discusses the implications of this analysis for the study of ICT in relation to the millennium development goals in developing countries.

5 DISCUSSION AND CONCLUSION

This discussion section argues that in order to evaluate ICTs in relation to the millennium development goals it is important to consider the historical trajectory of the broader macro societal context (Barley & Tolbert, 1997). Indeed understanding the relationship between the global and local context has been a concern for many eminent IS scholars for some time (Walsham, 2001). We draw primarily on Fligstein’s (1990, 2001) work to understand the Amazonian monitoring system shifting trajectory of meaning and use, first as a legitimating symbol for militaristic purposes, and later as an environmental monitoring system in line with the MDG for the sustainable development. To do this we consider how broad institutional fields may shape and change the ways in which the Amazonian monitoring system was conceived of and framed, and the characteristics of this process.

Institutional change

In order to understand the history of the Amazon’s monitoring system social context it is also necessary to understand how the different conceptions of control emerge and recede. Our case also highlights how dominant conceptions of control can become destabilized when moments of crisis arise. Fligstein (1990) argues that moments of crisis offer an important opportunity for the rise of new conceptions of control. These are the moments in which ‘major groups are having difficulty reproducing their privilege as the rules that have
governed interaction are no longer working’, the institutional fabric tears up and institutional change can happen (Fligstein, 2001: 118). During the end of the 1980’s and beginning of the 1990’s Brazil has faced two political crisis that are connected to changes in the Amazon monitoring system. First, during the end of the 1980’s the international pressure for the preservation of the Amazon rainforest culminated in cuts of international credit to major development projects located in the Amazon rainforest. This financial crisis forced the government to stop ignoring international preservationists pressures and to change its official environmental policy, a move that even though did not have immediate effects paved the way for further institutional change (a process that could also be understood in as the consequence of a coercive isomorphism from the rich countries (DiMaggio & Powell, 1983). Second, over the same period the military dictatorship went in crisis leading to a political transition from the military rule to a civil government aligned to the military (1985-1990), and finally to a government clearly distanced from the dictatorship (from 1990). At broader level, with the fall of the Berlin Wall and the official end of the Cold War the regional political instability was not as great during the 1990s as it had been previously. The new internal and the external political dynamics meant that the rationale for the monitoring system being in place to defend Brazil’s sovereignty over the Amazon was not strong enough to sustain this particular use.

During that period Brazil was also marked by an institutional transformation that is outside Fligstein’s theory. Different interviewers pointed out that the Brazilian society (and consequently its government) become increasingly aware of the importance of their natural environment, and the risks of its destruction could bring to our health and quality of live. It is possible to identify a endogenous and a exogenous factor behind the strengthening of the ecologic conception of control. First, Brazil’s further urbanization and industrialization, could have led to the emergence of a risk averse society as described by the sociologist Ulrich Beck (1992). Second, it is possible to interpret Brazil’s ‘greening’ a the consequence of a north-south institutional isomorphism (DiMaggio & Powell, 1983), a phenomenon already extensively described in other terms in the development literature (Adams, 2003; Banerjee, 2003; Escobar, 1988). As a consequence of these processes and despite its false starts and obstacles, today the Brazilian government sees the Amazon rainforest mainly as a national treasure that must be preserved, even though governmental practices towards the region are not always coherent with this view. Nevertheless, this conception is quite different to the view prevalent in the 1970s and much of the 1980s when it was conceived of as a green desert, an unproductive land covered with rainforest that must cleared to give way to the country’s development.

**Institutionalization as a longitudinal process**

Similar to Fligstein’s (1990) account of USA corporate history in the last century, the Brazilian government has also been dominated by a succession of different conceptions of control in the last four decades. In this context, the notion of conception of control has allowed us to understand why organizations such as the Brazilian government or a major US corporation have adopted certain practices that might seem absurd by today’s standard, such as subsidizing large scale deforestation of the ‘world’s lungs’ and adopting predatory pricing to push competitors out of the market, respectively.

The case study of the Amazon monitoring system also contains empirical findings that extend Fligstein’s (1990) notion of conception of control. While Fligstein (1990) suggests that a certain institutional field is usually dominated by a single major conception of control, our case has shown that two conceptions of control can coexist in symbiosis or conflict for significant periods of time. This was evident in the synergy between the pressures for military sovereign control and economic development that framed the colonization of the region.
during the 1970’s, as well in the current conflict between the military and the ecologic conceptions of control over the indigenous reserve Raposa Serra do Sol. Currently such contestation is most evident with regard to the competition for dominance between the ecological and the economic conceptions of control. While the idea that the Amazon should be preserved is taken-for-granted, the actual governmental practices towards the Amazon are still an arena of contestation between the economic and the ecological conceptions of control. This is in constant negotiation and as such the trajectory of conceptions of control are best viewed as being emergent political outcomes (Blackler & Regan, 2006).

**Aligning artifacts and institutions**

Conceptions of control not only offer a way to conceptualize the relationship between specific organizational practices (e.g. subsidies for destruction) and broader social phenomena (e.g. the cold war) but also provide a theoretical lens to understand the process whereby the institutional context shapes the design and use of ICT artifacts. The case shows the presence of a degree of alignment between dominant conceptions of control (and institutional values) and ICT artifacts, confirming similar studies carried out in developed (Currie & Guah, 2007; Hayes, 2008) and developing countries (Humes & Reinhard, 2007). The novelty of this study is the finding that the relation between ICT artifacts and conceptions of control is neither static nor predicable. Indeed, the case study suggests that ICT artifacts can emerge in accordance with a certain conception of control (e.g. military) and later be reconfigured to reflect a succeeding conception of control (e.g. ecological). The recognition of this phenomenon has two implications for the understanding of ICT in institutions.

First, this suggests that it is wrong to analyze the history of ICT artifacts as simply an evolution from a ‘worse’ to a ‘better’ system. Since the evaluation of what is better is usually framed according to the contemporary dominant conception of control, this kind of analysis can easily lead to presentisms or cultural imperialism, namely, judgments based on values different from the time period or place of the ICT artifact (Noir & Walsham, 2007). So, for instance, it would be wrong to evaluate historically the Amazon monitoring system simply in terms of their efficacy in attaining the sustainable development advocated by the MDGs by reducing deforestation rates since it is a notion that is clearly linked to the ecological conception of control that only emerged in the developing countries in recent years.

Second, the analysis of the trajectory of ICT artifacts in relation to conceptions of control can help us to understand what might appear to be an arbitrary drift. Ciborra (2000) points out that ICT artifacts, such as information infrastructures, tend to drift, namely, ‘they deviate from their planned purposes for a variety of reasons often outside anyone’s influence’ (4). He explains that technology intrinsically tends to drift due to some force from inside that manifests itself when its put to use, ‘[t]hus, the idea emerges of technology with a certain degree of autonomy and inner dynamics; of technology both as a drifting system and as a organism to be cultivated’ (ibid: 32). In this context, the case above suggests that the Amazon monitoring system’s transformation from a militaristic symbol of competence to an ICT that helps to attain the sustainable development MDG was actually not a random drift outside the government’s influence due to the ICT’s inner force, but instead it was an realignment of the technology with the aims coming from a new emergent ecological conception of control.

In this context, the assessment of the linkage between ICT and the millennium development goals shouldn’t stop at the evaluation of the current outcomes of these applications. Instead, researchers should better conceptualise and investigate the spatial and temporal dimensions in
order to understand the local institutional forces that over time shape the development and use of ICT. In this way, it might be possible to understand not only whether an ICT contributes to the MDG or not, but also why it is the case, and which social dimensions could help or hinder the future use of ICT for those aims. Hopefully, armed with this understanding, research on ICTs in developing countries can continue expanding its concern from the ICT *per se* to the social aspects that enable productive uses of technology for the sustainability of the world’s resources.

6 REFERENCES


THE DATA TO INDICATOR (MIS)MATCH: EXPERIENCES FROM TRYING TO STRENGTHEN THIS LINK IN THE HEALTH INFORMATION SYSTEM IN TAJIKISTAN

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Abstract: In the context of health systems generally, and public health in particular, indicators are a specific tool for programme management, including for the analysis and diagnosis of problems and to guide the formulation of relevant corrective action. A key challenge facing the process of generation and use of indicators in developing countries is that there tends to be a significant indicator-data mismatch implying that either indicators are not or can’t be calculated with the data (not) being routinely collected or the poor quality of the underlying data which makes the generated indicators unreliable. Drawing on case material from Tajikistan’s existing HIS we applied framework of three dimension of (1) completeness, (2) fittingness, and (3) actionability to define ways to improve indicator-data match. The key argument being made in this paper is that if nations are to meet the promised MDGs, then they need to improve this indicator-data match. With this in mind, the aim of this paper is thus twofold: 1. To understand the nature of this indicator-data mismatch; and, 2. To develop practical approaches on how this mismatch can be improved.

Keywords: Indicator, MDG, Health Information System, Framework, Actor Network Theory
THE DATA TO INDICATOR (MIS)MATCH: EXPERIENCES FROM TRYING TO STRENGTHEN THIS LINK IN THE HEALTH INFORMATION SYSTEM IN TAJIKISTAN

1. INTRODUCTION

On September 6th, 2000, at the Millennium Summit a large gathering of world leaders adopted the UN Millennium Declaration, committing their nations to a new global partnership to reduce extreme poverty and setting out a series of time-bound targets, with a deadline of 2015 that have become known as the Millennium Development Goals (MDGs). Three of the 8 MDGs identified were directly related to health care: reduce child mortality (MDG4); improve maternal health (MDG5); and, combat HIV/AIDS, Malaria, and other diseases (MDG6). Each of these goals are measured through specific indicators, which have to be accurately measured and monitored in order to evaluate how respective nations are achieving their MDGs. However, in order to do this, the specific numerators and denominators that go into the formula for the calculation of the indicators need to be accurately captured, aggregated and computed using the formula. The generated indicators then need to be interpreted and analyzed by the concerned health programme managers to take appropriate interventions in order to make timely corrections. The data which make up the numerator and denominator are usually provided by the national routine Health Information System (HIS) of a country. A key challenge facing the process of generation and use of indicators in developing countries is that there tends to be a significant indicator-data mismatch implying that either the indicators cannot be calculated with the data being routinely collected or the poor quality of the underlying data means that the indicators generated are not reliable. A key argument made in this paper is that if nations are to meet the promised MDGs, then they need to improve this indicator-data match.

With this in mind, the aim of this paper is twofold: 1. To understand the nature of this indicator-data mismatch; and, 2. To develop practical approaches on how this mismatch can be improved. The empirical setting within which these issues are explored is the Tajikistan health system, which is also a signatory to the MDG declaration. Specifically, an analysis has been conducted of their national HIS to understand its capability in being able to provide the necessary numerators and denominators required for the generation their key indicators. This analysis is carried out at two levels. Firstly, a broader analysis of the national HIS to study the existing structure and flows of the information within the health system. Secondly, and more concretely the database comprising of the national HIS is carried out to understand specifically the nature of the indicator-data mismatch. This analysis then provides the basis to develop practical strategies on how to address these gaps to strengthen the systems such that more accurate and actionable indicators are made available to health managers responsible for strengthening health services delivery.

2. THE NATURE OF THE INDICATOR-DATA LINKAGE

In the context of health systems generally, and public health in particular, indicators are a specific tool for programme management, including the analysis and diagnosis of problems and also for taking corrective action. Indicators are abstracted knowledge from broader information sets and composed of comparison on different relevant factors, or sometimes single units of information to support decision making processes or for measuring levels of achievements. For example, the indicator of full immunization coverage is broadly a measure
of the effectiveness of the immunization program indicating what percentage of live births taking place in a particular catchment area have got all their vaccination shots (BCG, TT, DPT etc) in a pre-specified time period (less than 12 months). The national level for example can take the immunization coverage of a state and compare it with other states and also over time as a measure of performance and use this analysis to take decisions like which state needs what kind of vaccine stocks and when. These figures have to be also reported by the national level to international agencies like GAVI and WHO that monitor a nation’s progress with respect to the MDGs. Similar analysis can be conducted at the state and sub-state levels, where the immunization coverage indicator may also be supplemented with some other specific monitoring indicators such as BCG-TT drop out rate which reflects what percentage of the children who took their BCG shot did not take their TT shot. Such detailed monitoring indicators like drop out rates are required to better manage service delivery while immunization coverage is used more as an “impact” indicator to study how the overall program is doing with implications for health policy.

The above examples illustrate at least two points. Firstly, with different levels of the health administration (from sub district to district, state, national and international), the types of indicators used vary, and also to the kind of use they are put to. Secondly, each indicator has a specific numerator and denominator. In the first example, the numerator used in “total number of children fully immunized” while in the second the numerator is “Total number of children who received TT shots MINUS Total number of children who received BCG shots.” Similarly, the denominators also vary with the first example using “Total number of live births” and the latter “Total number of children given BCG shots.” In both cases the factor used in %. Given this, it is imperative that the numerator value is being provided by the HIS, implying that the data element “Total number of children fully immunized” is included in the forms being filled in every month by the health workers, and the data being filled against this data element is of good quality. If that is the case, we can say one dimension of the indicator-data match, let us call it “completeness,” is adequate.

Another dimension of this match can be identified when we take the health systems perspective whereby we look at all the health programs say that a particular district has to administer. Suppose, there are ten such programs and each of them have 2 indicators, then at least 20 numerator and 20 denominator values would need to be provided by the HIS. And if we further assume that each numerator and each denominator is made up of one data element, the HIS should periodically provide data on 80 data elements on a timely basis to the health program managers. If the HIS is providing data on exactly these 80 elements, then it can be seen to be a precise and actionable HIS. However, if it provides data on say 200 data elements (including the above 80) then the HIS can be described as a “redundant” system. And if some or all these 80 data elements are not included (in the 200) in the HIS, it can be described as both a “redundant and inefficient” system. Let us call this dimension of the indicator-data match as “fittingness.”

While the dimensions of completeness and fittingness give us a sense of the data supply end, another key facet concerns how the indicators are understood and used by the health program managers for supporting their everyday action. Let us call this dimension “actionability” of the indicator-data match. While the generation of indicators can be seen as a necessary condition for their use, they are not sufficient. To provide it with the property of sufficiency, the indicators should be easy to understand, well presented, and the decision makers should have the capacity and the will to understand and use the indicators. This may be the hardest aspect of the indicator-data match, as building it requires large and sustained investment in
building capacity of the information users on the use of information. This involves a cultural shift from using data just for the generation of tables of aggregate numbers for upward reporting to the generation and use of indicators for local action (Braa et al 2004).

The three identified criteria of completeness, fittingness, and actionability, taken together provide us with the basis of an analytical framework to examine the indicator-data match. Further, these three criteria are interconnected, because for example if fittingness is poor, so will be its actionability because if the indicator cannot be generated in the first place, it inherently cannot be used and be actionable. This analytical framework is applied to the empirical data on the indicator-data match drawn from the Tajikistan study.

3. RESEARCH METHODS

The research methods adopted were aimed at firstly gaining an understanding of the broader situation of the HIS in Tajikistan, and then, secondly, to concretely analyze the indicator data linkage.

3.1 Situation analysis

With regards the situation analysis, the empirical setting was defined by an existing initiative by the Asian Development Bank (ADB) that was supporting the Tajikistan Ministry of Health through the creation of an institutional structure called Health Sector Reform Project (HSRP). The HSRP became the focal point through which technical assistance was being channeled to the Ministry on various areas, including HIS which is the focus of this paper. One of the authors of the paper was invited by the ADB to support this process of HIS reform which had been ongoing over the last couple of years. The various previous efforts, such as studies by consultants or project reports of HSRP were studied in depth to get a sense of the status of the existing efforts. The national HIS consultant at HSRP was a crucial link in this process that could provide continuity to the events and narrate the past and help to focus on the current needs. Numerous discussions, formal and informal, between the first author and this consultant helped to gain a sense of coherence to the various pieces of the story. For example, she described how a Pakistani consulting group had been hired by HSRP to develop the strategic conceptual framework for the national HIS reform. The mandate now was to take this framework as the point of departure, and try to move towards actually developing and implementing a computer based HIS. Reading the report of the Pakistani group proved invaluable in getting an understanding of the framework. Similarly, reports of the HSRP efforts, such as around the rationalization of the indicators which involved a reduction from 1300 to 833 indicators provided concrete information on which indicators were relevant to the national ministry. Some of the other reports referred to were: “Health for all to 2005” national strategy (1997), National programme of health care reform (1998), AIDS prevention (1993), and the Law on Health Protection of the population (1997).

After gaining an overview of the background, personal interviews were conducted with various program level managers at the national level, plus staff at the Medical Statistics division who were responsible for the operation of the HIS. The program level managers included immunization, maternal health, HIV/AIDS, tropical diseases, epidemiology and TB. In total, about 15 interviews were conducted, each lasting about 90 to 120 minutes, and involving a translator. Each interview was conducted in Russian, and the translator first translated the questions posed by us, and then the answers. The translated answers were noted in a diary that was then subsequently elaborated upon as field notes. It is interesting to point
out that while the native language of the respondents was Tajik, their medical education had been carried out in Russian. So, they were much more comfortable in answering technical questions in Russian rather than in Tajik. Also, contributing to the situation analysis was a detailed study of the existing data recording and reporting formats. There were nearly 37 data recording formats each of them containing multiple sub formats. For example, one of their reporting formats had more than 50 sub formats running to more than 100 pages. The bulk and redundancies of the formats and data were a potent reflection of the existing data-indicator mismatch. At least three sets of presentations were made by us to audiences at the HSRP, the national Ministry of Health, and at a national workshop. The comments received during these presentations and the ensuing discussions helped in the fine tuning of the situation analysis. A final report of more than 150 pages submitted to the HSRP and ADB elaborated in detail on the overall analysis.

### 3.2 Database analysis

A copy of the database was obtained through HSRP which included the data being entered in the HMIS from 6 pilot districts were the HMIS was being implemented. This database was analyzed firstly for identifying duplicate data elements (same data being recorded in different forms) and also redundant data elements (for example, data elements that recorded “Totals” of a particular category and also the various “Totals” of the different sub-categories. To identify the data-indicator (mis)match, we took the 833 indicators and their respective formulas (numerator and denominator) as the starting point. Then working backwards, we tried to identify whether the numerator and denominator required for the calculation of the indicator were included in the database or not. Following from this, we could also identify which of the data elements that were currently included in the database were actually being utilized for the calculation of an indicator. Interestingly, this led to an estimation of a figure of nearly 90% of “un-utilized” data elements, reflecting the gross data-indicator mismatch.

Following this brief description of the research methods employed, the case study is presented.

### 4. CASE STUDY

#### 4.1 Case setting

The empirical setting for this research is Tajikistan, a country located in Central Asia with a territory of 143,100 square kilometers, population of 6.7 million (UN, 2007) that shows an annual growth rate of 3.0%. Nearly half of population is below the age of 15 years. The Republic of Tajikistan is governed by the President and an elected Parliament, and is administratively divided into the capital – Dushanbe city, four regions (called “viloyat”), which in turn are divided into sixty seven districts (called “nohiya”), that have further smaller municipal areas called “jamoat”. After independence from Soviet Union in 1991, Tajikistan faced a grueling civil war in which up to 50,000 people were killed and over one-tenth of the population fled the country. This unrest ended in 1997 with a United Nations-brokered peace agreement. The abrupt breakdown of the centrally managed Soviet system and the consequences of the civil war contributed to a poor economy, damage of the public utility systems of water supply and heating, which magnified the spread of various communicable diseases. A recent WHO report indicated a decrease in life expectancy owing to poor nutrition, polluted water, and increased incidence of malaria, tuberculosis, typhoid, cholera, and cardiovascular diseases (WHO 2008).
Despite the independence from Soviet Union, it can be said the health system has continued thus far with few structural changes, and still comprising of the Ministry of Health, and its regional and district offices. There are specialized hospitals at the national level for more complex care, hospitals at regional and district levels, with health centers and health stations at the municipality level. Some ministries and government agencies have their own specific hospitals. Even with respect to the HIS, we see the legacy of the Soviet system still dominant with a high focus on the collection of statistics and their centralized compilation and reporting as an annual statistical exercise at the national level. While the Soviet legacy lives on in terms of this focus on statistics, the supporting systems of expertise required for statistical analysis is much more limited than what existed pre-1991.

In the existing HIS, the existing information flow started with the primary instruments of recording forms (258 in number) which provided the basis for the generation of 37 reporting forms, which were then sent up various levels to the national statistics and the State Statistical Committee for the calculation of various required statistics. The reporting forms were designed for the historically existing paper based systems underlying the Soviet system logic of centralized management. Redundancies were rampant, for example there were data elements for “Total” of a particular disease under different age categories, while also having different total figures for each of these age categories. This made the Total figure (of all categories) redundant as it should be calculated rather than a manually entered field.

Through the interviews conducted, various common themes were identified with respect to the HIS. A key theme concerned how the existing HMIS was primarily data driven and not action led, implying its primary focus on reporting for meeting the needs of the bureaucracy rather than on the analysis and use of information for action. The focus of the HIS was on the collection of statistics, which at the end of the year was used for the annual compilation of a comprehensive health statistics book. While there were approximately more than 30,000 data elements being collected through the information system, very few indicators were generated. While through the reform process undertaken by HSRP, a total of 833 indicators were identified, these had still as yet not been operationalized into the HMIS.

There was extreme fragmentation of information flows, with multiple parallel and uncoordinated flows inherent with redundancies and duplications. For example, under the TB program some provinces (Oblasts) entered data in EpiInfo and sent it to the national level TB centre. Since the data format in which the national Medical Statistics division wanted was incompatible with EpiInfo, the national TB center manually copied the data from EpiInfo into a paper format, transmitted it manually where it was entered into the MedStat program. Further, there was no hierarchy of information recognized, and all the data collected at the lower level flowed to the Republic level with limited abstraction and analysis. The focus on upward reporting lent itself to almost no feedback aimed at improving action and also increasing the motivation of staff who only saw their task to collect and transmit upwards huge amounts of data. Table 1 shows number of data elements contained in each form. As pointed out earlier there are 37 forms (for data entry and which also server as report formats), and in each form there are multiple categories, or what can be described as “sub-forms.” In the table below, the first column gives the form number (from 1 to 37), and the second column enumerates the number of data elements by all categories.
Table 1. Number of data elements by form for all categories.

As the above table indicates, a vast amount of data was expected to be collected by the field staff. However, on an examination of the data in the Messtat database provided to us (for 2005/6), we found a high percentage of this data being left as blank or filled as zero. The table below gives an example of the high percentage of such blank/zero values.

<table>
<thead>
<tr>
<th>Form Number</th>
<th>Number of Data Elements X Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1298</td>
</tr>
<tr>
<td>2</td>
<td>208</td>
</tr>
<tr>
<td>3</td>
<td>156</td>
</tr>
<tr>
<td>5</td>
<td>134</td>
</tr>
<tr>
<td>7</td>
<td>1157</td>
</tr>
<tr>
<td>7H</td>
<td>156</td>
</tr>
<tr>
<td>8</td>
<td>336</td>
</tr>
<tr>
<td>9</td>
<td>340</td>
</tr>
<tr>
<td>10</td>
<td>220</td>
</tr>
<tr>
<td>10A</td>
<td>76</td>
</tr>
<tr>
<td>11</td>
<td>200</td>
</tr>
<tr>
<td>12</td>
<td>3027</td>
</tr>
<tr>
<td>12A</td>
<td>153</td>
</tr>
<tr>
<td>12O</td>
<td>132</td>
</tr>
<tr>
<td>13</td>
<td>96</td>
</tr>
<tr>
<td>14</td>
<td>1266</td>
</tr>
<tr>
<td>15</td>
<td>68</td>
</tr>
<tr>
<td>16</td>
<td>60</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>31554</strong></td>
</tr>
</tbody>
</table>

Table 2. MedStat database zero/null values

As the above table indicates, the percentage of missing/zero values is approximately 80% with Form 7 and 11 even indicating an average of greater than 90%. This extraordinary high
The formats for reporting were poorly designed, containing numerous tables, sub-forms and sometimes even a thousand data elements. In the same form, no distinction was made between annual and monthly data, or between data required for diseases and those on infrastructure and staff. Such data was hard to be used for formulating actions for correction. Same data was reported in different forms, for example Form 30 and 32 had identical data elements regarding maternal health and child mortality.

The current HMIS software being used at the national level was called MedStat, which was developed using Microsoft Visual FoxPro and deploying .dbf tables for data storage. MedStat was poorly designed and represented just an electronic reflection of the paper based system, with all its existing inefficiencies. The example of “Total” provided above, although originally designed to support the logic of a manual system, was also mirrored in the software. The software had no functionalities for indicator calculations and other visual analysis tools such as graphs and charts. In summary, the software was outdated, poorly supported, and grossly inadequate for the generation of indicators, and their linking to specific organizational units.

For the analysis of the database to understand the data-indicator linkage, we first studied the list of indicators mandated by the Ministry. There were 834 indicators grouped into 6 main categories: demography, healthcare resources, environment, healthcare services, MDG and life style. In general we found that the data available from the 37 report forms could be used to calculate approximately 40% of these indicators. For example, the indicator “Obstetric aid rate with the participation of specially trained health workers,” related to MDG5, required data from different sources: Forms 30 (Report on treatment of prophylactic activity of facility), 32 (Report on medical aid to pregnant, parturient and puerperal women) and 16 (Report on collective farm medical centers). Form 30 contained from both facility and service data, while 32 contained data elements related to maternal and child health. There were duplications of data leaving the situation ambiguous of what data should be used for which indicator calculation. Many indicators in the list were based on surveys (and not routine data) or were the responsibility of other State Agencies, mainly from the Republican Statistical Bureau (RSB). Table 3 below demonstrates percentage of data coverage of indicator needs, to summarize the indicator data mis(match):

<table>
<thead>
<tr>
<th>Indicator Groups</th>
<th>Qty of indicators in group</th>
<th>% of data availability from existing data elements (apr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demography</td>
<td>353</td>
<td>30</td>
</tr>
<tr>
<td>MDG</td>
<td>12</td>
<td>50</td>
</tr>
<tr>
<td>Life Style</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>Environment</td>
<td>89</td>
<td>5</td>
</tr>
<tr>
<td>Health Conditions</td>
<td>224</td>
<td>90</td>
</tr>
<tr>
<td>HC Resources</td>
<td>128</td>
<td>70</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td><strong>44.17</strong></td>
</tr>
</tbody>
</table>

Table 3. Indicator data match by indicator groups
After presenting the results of the situation analysis and the database analysis, we now move to the discussion section where we examine the indicator-data match, using the three dimension framework of completeness, fittingness, and actionability.

5. DISCUSSION

5.1 Completeness

The dimension of completeness refers to the gap between what data is required for the generation of indicators and whether that data is being provided for by the routine HIS. The data presented in Table 3 indicates that only about 45% of these data needs are met. This gap is especially high with respect to indicators on Environment, Lifestyle and Demography. The reason for this could be these indicators are not directly the mandate of the health department who are therefore not capturing the data. Only about 50% of the data required for the generation of the MDGs are currently being collected.

5.2 Fittingness

Our analysis reveals an extremely poor fit with respect to the data-indicator linkage. On an average, the number of data elements used in an indicator calculation is 2. So, for the currently defined 834, we need a total of about 1668 data elements. Further, if we assume that each data element has on an average 8 categories (taken on the higher side), we require a total of 13,344 data element units, which represents 42.3% of the current Tajikistan HIS size (31,544). This implies that 57.7% of the existing data elements have no value for indicator calculations, and are hence redundant. This redundancy reflects a very poor fit between data and indicators. Further, in many cases, the data collected is not relevant with respect to the indicators being generated. For example, the MDG6 indicator calculation (United Nations 2001) requires data on women in age category of 15-24 years, whereas the Tajikistan HIS provides 15-19 years data.

5.3 Actionability

The current HIS is extremely poor on the dimension of actionability on at least two counts. One, no indicators are currently generated from the existing Medstat system. However, from this system, some of the data elements are extracted and fed into another system (called DPS – Data Presentation System), and about 5 indicators are generated which are uploaded on a WHO system. These indicators are not made available to the lower level program managers to support their everyday monitoring and evaluation purposes. These 5 indicators may be using less than 50 out of the 31,544 data elements (less than 1%) reflecting the high degree of non-use of data for action. Two, all the data which is collected by the lower levels are fed to the national level with no degree of abstraction and aggregation. If we go by the basic principle that the lower levels are responsible for monitoring related action, and the national level for evaluation and impact analysis, then they should receive different kinds of data and indicators for their respective action. However, that is not the case in the existing system, implying a high degree of lack of actionability. Furthermore, the number of indicators proposed by MoH (834) covers too large a spectrum to be directly relevant to the health care system, such as related to lifestyle. From the perspective of, for example, the monitoring of MDG related indicators, the existing ones are only peripherally actionable.
6. CONCLUSIONS

We have explored existing data used in the Tajikistan HIS using a proposed framework of interdependent dimensions in order to discover overlaps, duplications and ambiguities that adversely influence data quality more broadly and with it the data-indicator linkage more specifically. The analysis shows that the existing data elements being generated by the HIS are not useful, relevant and actionable with respect to the operationalization and use of indicators. If Tajikistan, and also other nations, need to achieve the prescribed MDGs (MDG 2004), the HIS should support a more effective monitoring of the progress on specified parameters, based on the strengthening of the data-indicators match on the three key dimensions identified in the analytical framework.

Addressing this mismatch could be guided by Braa et al’s (2007) proposed strategy of “Flexible Standards” for HIS in developing countries based on complexity science (Holland 1995; Holland 1998). This approach involves defining a hierarchy of data standards for different levels of the health administration, with the lowest level (the community) requiring the most disaggregated level of detail and the highest (the national) most aggregated. Each level further has the freedom to add locally relevant data and indicators as long as they don’t delete those that are required for the level above. Each level then has their own “essential dataset” that has a clear match with the indicators required to be generated at each level. To apply this principle, Tajikistan will need to define the MDGs (and other nationally required indicators) as requirements for the highest level (and with it the corresponding data sets). The level below (say viloyat) then must necessarily collect the data required for the generation of the national core indicators, plus they can add those indicators that their level requires and with it the required data elements. Similarly, the hierarchy principle applies for the levels below. However, creating this order as complexity science guides us (Dooley 1997) is an emergent rather than a predetermined process in which outcomes are often largely unpredictable. To engage with this process, Braa et al (2007) argues to identify the agents who can be seen as semi-autonomous units that seek to maximize some measure of goodness, or fitness, by evolving over time. An example of an attractor could be the norm of an “essential data set” that reflects an effective compatibility on the dimensions of completeness, fittingness and actionability with respect to the data-indicator linkage. Creating and spreading this attractor is a politically fraught process, and requires ongoing political negotiations with the different stakeholders who may “own” different components of the HIS. Tajikistan needs to set up such a process of political negotiations but guided by the principle of the flexible standards to try and strengthen the data-indicator linkage and with it the monitoring and evaluation mechanisms towards reaching the MDG goals.

7. REFERENCES


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ALIGNING NATIONAL POLICY IMPERATIVES WITH INTERNAL INFORMATION SYSTEMS INNOVATIONS: A CASE STUDY OF AN OPEN SOURCE ENTERPRISE CONTENT MANAGEMENT SYSTEM IN THE SOUTH AFRICAN PUBLIC SECTOR

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Abstract: This paper addresses the question: Can changes in internal organisational practices be effectively aligned with contentious national policy imperatives? One of the authors followed the implementation process of an Open Source Enterprise Management System in the South African Public Sector. During this process change management was observed in relation to challenges and opportunities in the alignment of the internal organisational changes to the imperatives of the national Free and Open Source Software policy. Based on this reflection it is proposed that the alignment of the organisational environment, change management strategies and ‘technologies in practice’ is required to address many of the ‘common’ change management challenges. However, this approach does not assist in addressing the major challenge of attaining harmonious internal organisational changes which attempt to implement contentious national policy.

Keywords: change management, alignment, open source, South Africa
ALIGNING NATIONAL POLICY IMPERATIVES WITH INTERNAL INFORMATION SYSTEMS INNOVATIONS: A CASE STUDY OF AN OPEN SOURCE ENTERPRISE CONTENT MANAGEMENT SYSTEM IN THE SOUTH AFRICAN PUBLIC SECTOR

1. INTRODUCTION

Castells (2000a, 2000b) describes in voluminous detail the impact of globalisation on the economy where the new form of business operates through the networked economy. For organisations there is a pervasiveness of change processes which are rising with these globalising effects. Change is often imposed by external factors in an organisation. These can come from global changes, national policies or national economic climate. This not only implies that the context in which organisations are situated are continuously changing, but also the nature of the organisation itself is subject to change (Van Tonder, 2004).

This paper explores one such externally imposed change around the implementation of a contentious national policy. This entails not alone dealing with the more usual dimensions of change in an organisation, but also the implications of the national debate and contentions around the national policy playing out in the local setting of the organisation. This paper explores the movement within a government department from a proprietary Enterprise Content Management (ECM) system, herein after referred to as the proprietary system (PS), to an open source ECM system, herein after referred to as the open source (OS) system. Two main aspects of the change process are explored, that of the external impact of the national open source policy within government departments and also the internal change of work processes and information systems changes in complying with that policy. These two aspects are intertwined. Alignment of the organisation mission, values and objectives, with the proposed technological innovation and change management models emerges as a necessary condition for managing change. However, what emerged as a more challenging issue was whether internal organisational changes can be aligned with contentious national policy imperatives?

This paper is accordingly structured. The next section reviews the Free and Open Source Software (FOSS) Policy of the South African Government. Section 3 outlines some of the theoretical change management approaches and Information Technology (IT) diffusion models. The research approach followed is described in Section 4, with a description of the case study following in Section 5. Challenges faced in terms of alignment of the internally proposed changes with the national policy are discussed in Section 6 and a framework is proposed that could improve greater alignment between the organisation, change management and IS in the concluding section.

2. SOUTH AFRICAN OPEN SOURCE POLICY

The following section provides a background of the history which led the South African Government towards accepting and implementing its policy on the use of FOSS, and was mainly gained from an interview which was held with the CIO of the Government Department and the Government policy documents (DPSA, 2006; GITOC, 2003).
The South African Government’s journey on the adoption of FOSS started in 2001. The Presidential International Advisory Council raised issues on FOSS and consequently there were questions asked in Parliament. In 2001 the National Advisory Council on Innovation (NACI) published a research paper on Open Source, Open Standards and the bridging of the digital divide. IT officers in government were asked to respond to this paper. A Standing Committee (SC) consisting of Government department Chief Information Officers (CIOs) were formed around what was the Government to do about FOSS (Otter, 2002).

In 2002 the SC held its first meeting which was attended by 3 people. Perception and awareness on FOSS in Government was investigated as an initial first step in the development of an FOSS strategy. There was little awareness on FOSS and a perception existed that FOSS was unthinkable in Government systems as this would imply using software that was unreliable, without support and developed by a group of people doing their own thing. Interestingly, in 2001 most of Government’s systems in terms of infrastructure, such as internet relays, web servers, DNS servers and web proxy’s, were already running on Open Source Platforms. This could be contributed to the fact that it was much easier to just download and use it than to go through the whole procurement process which was very lengthy. Alternatively, it could point to a lack of FOSS awareness of users of Government’s systems and what systems they are using. The strategy document written by the SC focused on raising awareness of the benefits of FOSS to Government. In 2003 a policy statement was developed which outlined a 3 phased approach to FOSS: create awareness on FOSS; pilot FOSS in Government and then roll it out; and aggressive mandating and forceful adoption of FOSS in Government. Government adopted the policy in 2003, but between 2003 and 2006 there were no new implementations of FOSS in any Government department.

Two accepted policy submissions have thus been made to the South African Cabinet on Open Source Software (OSS) since 2002 (DPSA, 2006). The first one titled, Open Software and Open Standards in South Africa: A Critical Issue for Addressing the Digital Divide, was done by the NACI (Cabinet Memorandum No. 13 of 2002). In this document NACI formulates the use of Open Standards to be a preset base for ICT in the public sector. Reasoning around this included that FOSS would promote interoperability and universal access to the South African government’s online services without exorbitant costs; reduce restrictions because of licensing or other related obstacles; and reduce the risk of being ‘locked-in’ by specific vendors of ICT commodities and services, which would in turn drop the entry barriers for local software developers who are able to offer ICT solutions to the public sector. The second submission to Cabinet was done by the then Department of Arts and Culture, Science and Technology. This submission, which encouraged the utilisation of FOSS in government, was a proposed FOSS policy for Government (Cabinet Memorandum No. 29 of 2003) and was fully backed-up by the Government IT Officers’ (GITO) Council.

In 2005 and 2006 several civil society organisations petitioned the Minister of Public Services and Administration, asking her to make sure that Government implemented the FOSS policy, as they were of the opinion that if Government adopted FOSS while being the biggest procurer of IT products in South Africa (around 60% of money spent on IT) it would make it easier for them to also adopt it, because it would result in better FOSS skills and better FOSS support.

By 2006 it was evident that the tide was beginning to turn. In his speech during Software Freedom Day (SFD) - a yearly international celebration of free software - the Director General (DG) of South Africa’s Department of Science and Technology, said that lack of
technology access due to insufficient funds and infrastructure is the primary challenge in Africa and that FOSS seemed to be ideal to solve this problem (DST, 2006).

In 2006 and 2007 Cabinet requested the SC to report back on the implementation of FOSS in Government. The SC submitted a reworked policy to Cabinet. The new policy mandated three things: Open Source, Open Standards and Open Content (OC). This policy aimed at an entire open philosophy to be developed in Government. According to this, all new systems developed by Government should be based on FOSS, but there was still a clause built in to give people the ability to back out for valid reasons such as privacy or security issues (mainly needed by the Department of Defence). The policy contains three statements: firstly, FOSS will be used unless there’s valid or justifiable reason that it shouldn’t; secondly, FOSS methodologies would be used in a collaborative open licensed way and everything should be open content, unless there was a valid reason, such as security or privacy issues; and thirdly that Government will not only use FOSS but will also encourage the use of FOSS and Open Content.

The South African Cabinet approved a FOSS policy and strategy on 22 February 2007 and agreed that all future software to be developed for government would be based upon open standards and that Government would migrate its current software to FOSS (GCIS, n.d.). Government departments were to include FOSS in their planning and a project office was to be established by SITA, with the Council for Scientific and Industrial Research (CSIR) and the State Information Technology Agency (SITA) tasked to ensure the smooth implementation throughout South Africa. A SC to implement the policy, consisting of the DGs of the Department of Science and Technology, Public Service and Administration and the CEO of SITA, was formed, and subsequently a Programme Office at SITA was established. The SC now plays an oversight role of the Programme Office at SITA, which is tasked to ensure the implementation of FOSS in all Government departments. The responsibility of implementing the policy still lies with the CIOs of every national Government department due to the unique nature of each department’s systems. Synergies between departments should be coordinated by SITA.

It is imperative to mention that there isn’t unanimous support for the FOSS Government policy and government departments, with the exception of a few, seem to be rather unwilling to jump onto the FOSS bandwagon. Although SITA was given the task to set up an Open Source Programme Office to ensure and coordinate the implementation of FOSS in all Government departments, the FOSS policy had by June 2008 not even been implemented in SITA itself.

The next section looks at what can be gleaned from the variety of organisational change management models and IT diffusion and innovation models which could inform the proposed move from the PS ECM to the OS ECM to be aligned with the FOSS government policy.

3. IS CHANGE MANAGEMENT MODELS

It is debatable whether change can be managed or not:

“Change can’t be managed. Change can be ignored, resisted, responded to, capitalised on, and created. But it can’t be managed and made to march to some orderly step-by-step process.” (Mintzberg, Lampel and Ahlstrand, 1998 quoted in: Van Tonder, 2004: 9)
This position can be juxtaposed with the numerous organisational change models which exist for the practical advice on managing change. Different ways in which to manage change are related to how change is viewed. Two main models relating to internal organisational change rely on two typologies of change: rational-purposive (Lewin, 1951) and cognitive (Van Tonder, 2004). Most of the models based on this view of change explicitly or implicitly imply that change can be managed in “one best way”, but recognise that organisational practices are complex, non-linear, that environments are turbulent and rapidly changing and that organisations have to adapt and evolve (Van Tonder, 2004: Chapter 9).

Emergent approaches to the management of change received popularity in the 1980s (Burnes, 1996) and emerged out of the need to gain a broader understanding of change management in a complex environment. Prescriptive approaches to change and conceptualisations of change as a linear sequence of events did not appear to be working (Macredie et al., 1998: 8). As each change context is unique, process oriented theories help understand the underlying nature of the change and encourage an enabling rather than a controlling approach to managing change. Most of these theories have the fundamental argument that change within an organisation can only work if it is aligned with its environment. One of these models is the Improvisational model of Orlikowski and Hofman (1997). The model is based on two major assumptions: change is an ongoing process, and; every technological and organisational change cannot be anticipated in advance. In managing change there needs to be dedicated resources for ongoing support for the change process, and alignment of the key dimensions of change (the interdependent relationship between the organisation, the technology and the change model). This is illustrated in Figure 1.

![Figure 1: Aligning the key change dimensions (Source: Orlikowski and Hofman, 1997: 18)](image)

Alignment of strategies is a requirement of this model and a recurring feature of process-oriented theories. The change process needs to be understood in order to be managed or guided.

In relation to change resulting from IT there are many different conceptualisations of the technology transfer process emphasised in the literature. These are mainly based on technology transfer understood from the perspective of diffusion (Rogers, 1995) which is also embodied in the Technology Acceptance Model (Davis, 1989). These approaches view technology transfer primarily as a one way and sequential process, and could be criticised for how technology is characterised in that they do not look at organisational culture; they do not provide for the different world views of the agent of change and the organisation within
which the change is implemented (Du Plooy, 1998a); and the technological frames of reference of the agent of change and the organisation is ignored. There is also a focus on voluntary use situations (voluntary decisions to adopt ICT are not very common and often is as a result of a mandate issued by higher management).

To address this list of shortcomings Du Plooy (1998a) built a comprehensive framework, which he calls the ‘human environment’ affecting IT adoption and use. The main aim of this framework is that it could be used to understand or make sense of the adoption and use of IT in organisations by emphasising the cultivation and nurturing nature of a human and social environment. Such an environment facilitates adoption, use and the integration of IT in a socially responsible manner. Du Plooy addresses the social factors through the inclusion of six social contexts: people; organisations; groups; tasks; environments, and; technology. These contexts are different in their natures, but should be viewed as a collective that is tied together by the notion of a human environment. In this model, learning can take place as consideration is given to the deep structural processes in engaging change.

![Figure 2: Du Plooy’s Human Environment Model (Du Plooy, 1998a)](image)

Though underpinning Du Plooy’s model is the duality of technology the structuring process of technologies in practice is perhaps a better way of describing the duality of technology within an organisation. One of the common theoretical understandings of the use and impact of IT in an organisation is the adaptation of Structuration Theory by Orlikowski (2000). She argues that technology structures are emergent, and not embodied. They emerge only through the recurrent use of the technology by humans, who would use some or all of the material and other properties of the technology. Thus, the focus is not on technology, but the interaction of humans with technology. She argues that:

“...while users can and do use technologies as they were designed, they also can and do circumvent inscribed ways of using the technologies – either ignoring certain properties of the technology, working around them, or inventing new ones that may go beyond or even contradict designers’ expectations and inscriptions.” (Orlikowski, 2000: 406)

It is these ‘enacted structures’ of technology which she terms ‘technologies in practice’. People use technology with their prior knowledge and experience in a given context, which has norms and values and recursively structure organisational practice and learning.
Three aspects of the change management debate emerged as of interest to this research and are drawn upon in the rest of the paper. Firstly, change is emergent and alignment of organisation vision and objectives with the technology and a change model is needed. Secondly, change in organisations should be viewed as multi-dimensional and Du Plooy’s six social contexts assist in obtaining this perspective. Thirdly, technologies in practice assist in gaining a better understanding of the human environment in which technology is used.

4. RESEARCH METHOD

An interpretive approach, using a single case study (Walsham, 1993, 1995: Barrett and Walsham, 1995) was used to gain an in depth understanding of the dynamics present during the process of rolling out an OS ECM system at one of the national Government departments in South Africa.

The collection of data took place from the 26th of March 2008 to the 22nd of August 2008. A total of 10 meetings were held throughout this period on a weekly basis. The meetings were held at the Government department’s premises and were aimed at keeping all stakeholders informed on the progress of the pilot project, and determining actions to be taken during the upcoming time period. There were about twelve people attending these meetings when the project started in March 2008. Parties involved were: the Government department (where rollout would happen); SITA; and the external OS Service Provider (who would be responsible for setting up and implementing the new OS ECM system). The meetings were chaired by a representative from SITA.

Throughout the project, data was collected by means of direct observations made during the weekly meetings and through regular visits to the Government department to observe the change process. Semi-structured interviews were conducted with end-users after the implementation and training. These included the Deputy Director (DD) and two assistant administrators in the DG’s office. Each interviewed lasted about an hour, were tape recorded and then transcribed. The questionnaire was built around the six dimensions of Du Plooy’s human environmental model (1998a) and the key dimensions of Orlikowski & Hofman’s improvisational change model (1997).

Initially the researcher wanted to commence the interviews with questions on the users’ background and their experience in the use of IT in general, but during the project meeting on which the proposed user evaluation questions were discussed, the meeting (and in particular the representatives from SITA) felt that users would feel threatened by these questions as some of them didn’t have any previous job experience which included the use of IT. As this apprehension could negatively influence the outcome of the questionnaires, it was decided to move these questions to the end of the interview.

All meetings were minuted and approved in the next meeting. The researcher also documented the meetings separately in more detail and made use of analytical memos to describe situations and to identify possible patterns and tentative explanations for these patterns as the case study unfolded. The interviews were transcribed, read through and verified by once again listening to the tape recordings. Themes emerged from the transcripts and the analytical memos and were used in conjunction with concepts from the change management literature to write up the case analysis.
5. CASE STUDY
This section describes the OS ECM system project case in terms of the key dimensions of Orlikowski & Hofman’s improvisational change model (1997).

5.1 The organisational context
The pilot project started at the beginning of March 2008 and was aimed to be completed at the end of May 2008. The new system was aimed to be run in the Minister’s office only. The plan was to evaluate the implementation on completion, and if found to be successful, the department was to embark on rolling out the OS ECM to the rest of the department as a second phase of the project. The initial aim was to accomplish all of this by the end of 2008.

The CIO of the Government department appointed the current ECM PS specialist to lead the new OS pilot project. At the first meeting of the regular weekly project meetings it was quite obvious that the Government department’s CIO was unhappy with SITA. In order to procure any services in Government SITA had to issue an appointment letter. This letter had not been issued to the OS service provider. The service provider had only received a purchase order. SITA’s response to this was that an appointment letter was unnecessary in this particular case. The department’s CIO insisted on a letter as his department wanted SITA to ensure that there was no risk in accepting the OS service provider’s appointment.

During the same meeting the CIO also insisted on getting the follow-up project (second phase) moving during which the pilot would be rolled out to the rest of his department. He accused SITA of holding up the process, as the request for proposal (RFP) for the pilot project was submitted to SITA in November 2007, but the service provider was only appointed in January 2008 – a process which should only take 2 weeks. The project manager (from SITA) requested that a business case be built for procurement of the second phase. He suggested that they try and get the phase two tender out in the middle of this pilot project, so that the Minister’s office would not be hindered by the further roll out and delays in commencing the second phase would be minimised.

Another complaint was lodged by one of the employees of the Government department, who regarded some of the paragraphs in the project charter (the document that formally authorises the project and which provides the project manager with the authority to apply organisational resources to project activities) to be ‘loaded’. The chairperson of the meeting (who was from SITA) suggested that the meeting went through the project charter to identify such phrases, so that they could be restructured. While this was done, the CIO of the Government department also pointed out that he could not see SITA’s responsibility towards the project in the project charter. He wanted to know what in the project charter would show him whether SITA has performed or not and suggested that SITA’s responsibility be added to the charter in a separate clause.

Due to the changes that now had to be incorporated in the project charter, one of SITA’s representatives (the project manager), suggested that the charter was signed by the Government department as it was, and that the issues with the charter would then get minuted. He would then get a Change Control Proposal (CCP) from SITA so that the project is not once again delayed – according to him if they changed the proposed charter, it would take another two weeks to go through language editing. The CIO agreed to sign but was not convinced that the changes would be incorporated by SITA if he signed the incomplete version. The project manager then suggested that he signed “subject to changes as minuted”, after which he agreed.
The exact location and boundaries for the pilot project were called into question in an informal meeting attended by the ECM PS specialist, the external OS service provider, one of the authors, and two of the ECM users in the Minister’s office. The two users noted that it would be difficult to confine the pilot project to the Minister’s office. There were only two to three things per month which were handled solely by the Minister’s office – the rest of the requests were sent down as workflow to various other people in the department, who had to respond to the requests and who had to provide feedback on their actions to the users in the Minister’s office. One suggestion was that the pilot project could be narrowed down to a particular workflow of documents at all levels in the Ministry over the next 3 months. This would have the implications that more users would need to be trained and that the old and new ECM would need to be run in parallel resulting in increased workloads for the users. A further meeting between the ECM PS specialist, the external OS service provider, and the supervisor of the users in the Minister’s office, agreed that the document tracking/workflow line between the Minster’s Office and the DG’s office would form the pilot project. Consequently the duplication of the two systems would be confined to the Minister’s and the DG’s offices and the DG office users would need to be trained.

5.2 The technology

Some of the main reasons for choosing the OS ECM project as a first OS pilot project were that the current solution was very costly and the OS implementation would make a significant difference on the department’s software budget. The department was not happy with the technicality of the PS and the support they got for the system was insufficient.

At one meeting the Government department’s CIO raised the problem of another proprietary ECM system which was currently available to other Government departments for purchase. The CIO was of the opinion that this would lead to double standards in Government departments with respect to promoting the governments FOSS policy. He further indicated that he knew of other departments rolling out this other proprietary system and that they were able to do so without any a proof of concept (POC) i.e. without any evidence that the system is viable and capable of solving the departments’ particular problems. He therefore said that they would want the pilot project’s OS ECM system to be as flexible, in terms of procurement and functionality, as the proprietary ECM, in that it would fit all the current processes of Government departments. In this way the OS ECM system would be as acceptable to all as the proprietary one.

The issue of evaluation was raised during the first meeting. SITA was tasked to come up with an evaluation ‘tick-list’ to evaluate the project after implementation and was to make use of the evaluation criteria used for a previous Government tender (the so called ‘Tender 398’) or the New Zealand Government specification. Concerns were raised over the timeframe for the evaluation metrics to be developed (CIO of the Government department); alignment of the metrics with the RFQ (OS service provider), and; the inclusion of a user perspective in the evaluation which was currently focusing only on a technical evaluation (researcher). These concerns were addressed.

A concern was raised by the Government department that all project communication, e.g. minutes of project meetings, should be done using FOSS. SITA was still in the transition phase to migrate to FOSS and this was only scheduled to happen in June/July, so SITA felt that they could not comply with this request. The CIO of the Government department mentioned that the project members should not wait for the entire SITA to be migrated to
FOSS, because this would make communication very difficult and that the installation of FOSS was very easy. The CIO of the Government department was then tasked to write a letter to SITA to put forward a business case for the team members to get at least Open Office installed on their computers.

5.3 The change model

The minutes of the weekly project meetings were generated and distributed by SITA. Throughout the project the heading “change management” was used in the minutes to address issues regarding the training of users of the new OS ECM system.

During the first meeting the ECM PS specialist noted that the training would not be able to take place on the times as stipulated in the proposed project plan. The members of the Minister’s office, which needed to be trained, would be in Cape Town in May, and the schedule indicated that they were to be trained on the new system during the same time. The project schedule had to be changed accordingly. The Government department’s CIO added that he wanted an extra day’s training to be included on Open Office, as he believed that it would add to the success of this pilot. The new OS ECM would require users to manage documents and these documents were, because of Government’s OS policy, soon to be only OS documents, and the users were not yet familiar with these either. In a later meeting the external service provider raised a concern in this regard. He was afraid that the users might give the new OS ECM system a bad evaluation, as they might resist the use of FOSS to generate the documents to be managed by the new OS ECM system.

User training proved problematic in terms of lack of commitment of users (they left the training to attend to other office business), separate one-to-one training being scheduled, and the DGs office cancelling training and being unavailable for the month of June. Apart from this having financial implications for the project, it hampered the project schedule, as the Minister’s office started to populate the document management system, but the workflow part of the system could not be utilised before the training of users in the DG’s office was completed.

The broader question of change management was raised by one of the representatives of SITA when he asked the PS ECM specialist what change management had been done on the project. He replied that the department organised a session with users from the Minister’s and DG’s office during which they were informed about the Government’s FOSS policy and given the reasons for moving to the new OS ECM system. During this session they were also notified about the user evaluation which would be done at the end of the pilot, as well as the dates which were set to train them on both Open Office and the new OS ECM system. The SITA representative replied that change management had to be included formally and properly during the second phase of the project, as the success rate would depend on it. It was not at all pointed out what the content or process of the change management was to be.

5.4 Project Outcomes to date

The pilot project started at the beginning of March 2008 and was to be completed at the end of May 2008. During the project several incidents caused the completion date to be extended, such as the system users in the Minister’s office not being available for training; delays in providing the external service provider with the necessary workflow so that the system could be set up accordingly, and; defining the project scope. The user evaluation, which was the final project task to be completed, was only done on the 22nd of August 2008. Feedback from the PS ECM specialist at the end of February 2009 indicated that the pilot
project had been completed, although the final report from SITA was still to be received. The Government department’s top management had though approved the second phase to roll out the OS ECM to the rest of the department and implementation was to start in a short while.

6. Discussion

Clearly there were several challenges with the Government’s FOSS policy playing out at local level. For the adoption of IS to take place in this context, aligning the internal organisation, the change management strategy and the way in which technology is used in practice, seems to be necessary.

6.1 Change Management Strategy

At the national level the decision of Cabinet to command SITA to ensure that FOSS is rolled out and coordinated in all Government departments could be questioned, as SITA had not even transformed their own IT policy to correspond with Government’s FOSS policy.

At the organisational level there was clearly tension between SITA who did not appear to embrace the FOSS policy and the CIO of the Government department who was keen to do so. There was no official plan for change management at this level and the process followed fits well with the Trukese way of open sea navigation as discussed by Orlikowski and Hofman (1997). It was apparent from the project meetings that change management was viewed as training and evaluation. Only on one occasion had any of the proposed users been informed of the FOSS policy and the proposed changes which were to take place.

During the interviews the users in the DG’s office complained that the training they received on the new system was insufficient in the sense that they didn’t have enough time to learn and implement what they learned on the new system.

“I did attend the training, but after I came back from the training, I didn’t have enough time to practise what I’ve learned.”

“The training was not long enough.”

As a result they didn’t find it easy to work with the new system. The fact that they had to run the old PS and the new OS systems in parallel increased their work load, and for all of them this added a lot of stress to their jobs. Because of this, they didn’t have time to update both systems one after the other (as one would expect them to), but some of them sent the document via the old system and would only duplicate this on the new system the following day.

All the users agreed that the support they got from the PS ECM Specialist, who assisted them whenever they needed it, was invaluable and was what kept them going on the new system.

“I’m satisfied with the support that I’m getting, because the person that is helping us is always there.”

“I think the training time was too short, but maybe we are too privileged to have ‘the PS ECM Specialist’ – he will come in and give us some lessons whenever we need it.”

It was therefore clear that the PS ECM specialist acted as a ‘champion’ for the project and one has to derive that his dedication and support for the project contributed immensely to achieving the end result, which could otherwise have been very different. This also correlates with one of Orlikowski & Hofman’s (1997) proposed enabling conditions to adopt an improvisational change model - that of “dedicated resources to provide ongoing support for the ongoing change process.”
6.2 Internal and External Organisation

Political play surfaced throughout the change process between the Government department and SITA. This was apparent in the accusations made by the Government department’s CIO that SITA wasn’t committed to contribute to the success of the described pilot project and that he struggled to find their responsibility towards the project in the project charter. It is also clear that there were serious trust issues between the Government department and SITA, with the CIO of the Government department accusing SITA of delaying the whole process from the start.

A lot of value could have been added to enhance the possible adoption of the new system, if special attention was paid to nurturing or cultivating the social context, as described by Du Plooy (1998a), within which the system was to be implemented. A lack of in-depth understanding of the organisational culture and politics could have resulted in the DG office’s cancelling their scheduled training at the last minute. The implementers could have pre-empted this if the culture of the group, relevancy of the new system to the users, users’ knowledge and perceptions of IT and their attitude towards management were investigated. Additionally there was an inherent assumption that the users were a homogenous group of people in relation to IS adoption and a ‘one-size-fits-all’ training was designed and planned.

What was also missing was an attempt to align the various actors to the Governments’ FOSS policy. Sessions on what the events were which led to the Government’s FOSS policy and why the CIO of the Government department was pushing so hard to implement the new OS ECM system would have been useful and might have shed light on SITA’s unwillingness to cooperate in the FOSS migration process before the project even started.

6.3 Technology in practice

On the individual level special attention could be paid to understand for example the technological frames of reference of the users before implementation. Few of the users were familiar with computers and the software used in this particular context. This general unfamiliarity with technology was not addressed.

Although the new system did not seem to change the reporting structure in the department, it seemed to have an influence on the power play, as some of the users described how the new system shows exactly where a document is, who has to work on it, and what has been completed on it.

“... she’ll (my boss) send me a document and she can still see whether there was action done on the document, or not. Now I’m going to be productive – like you know, I’ll know that this document – by looking at the urgently of the document – it has to go somewhere and my boss can check whether I’ve sent it on.”

Determining whether the new system would increase/decrease their productivity was impossible to verify, as the increased workload perplexed their ability to evaluate this.

“Doing the work in both ‘the OS system’ and ‘the PS system’ is extra work and we’ve got plenty of work here in this office!”

“It’s not a difficult process, but at the moment, you know, it actually takes a lot of our time, because you have to save your document in ‘the PS system’, then export the document to ‘the new OS system’ – stuff like that.”

When asked to compare the new system with the old one, and to elaborate on the new system’s ease of use, it was clear that the users had not worked with or seen most of the new system’s functionalities, such as document tracking, security, etc.
“I can think the new system has everything it needs. I haven’t seen it all, but they told me so…”

“At the moment it’s used only for document management – I don’t really know what else it can do.”

This raises a concern as one of the aims of the pilot project was to determine whether the new system would be considered a sufficient replacement of the old PS system and the interviews clearly showed that this could not be determined.

Some of the users mentioned that the old ECM system used document numbers to identify a document uniquely, and that they found the new system to be lacking in this regard. This doesn’t really exploit a functionality the new system doesn’t have, but rather reveals a change in the existing work process which could lead to a certain level of resistance, although it was not really pointed out to be a determining success factor.

“What I like about ‘the PS system’ is the document numbers – like after saving the document you’ll get a number – say like 1, 2, 3, 4 or 5 – so you can only use that number in your diary – then you know those are the documents that you’ve been sending through and which you need to track. ‘The new OS system’ does not have these numbers to refer to a specific document loaded onto the system.”

7. CONCLUSION

Du Plooy’s human environment model (1998a, 1998b) with Orlikowski’s (2000) technologies in practice model, assist in understanding the human environment in which technologies are used and reveals how one can ‘cultivate’ this human environment within which technology is to be implemented. Combining this with Orlikowski and Hofman’s (1997) alignment of the key change dimensions, adds an important aspect to the social context of ICT. Figure 3 provides a model of such a framework.

![Figure 3: Adapted model of alignment of key dimensions of change](image)

Such an approach to change could for example highlight key activities which should have taken place in the above case study. For example, looking at the philosophy behind the national policy and getting buy-in at departmental level may have been advisable before proceeding with the implementation of the new OS ECM system.
Many of the challenges raised are common oversights in change management literature, such as inadequate consideration for the social context in which the change was to take place. However, what makes this case different to the standard change management case is that one of the main challenges arose from the alignment of internal organisational change to a national policy which did not seem to have the full support of the agency which was tasked with implementing it. It is hard to see how the key challenge to the implementation of the new system could be addressed within the organisation – a contentious national policy will be a contentious internal policy if representatives of the same stakeholders are involved at both levels.

Can changes in internal organisational practices therefore be effectively aligned with contentious national policy imperatives? Our conclusion is that an awareness of the social context of the organisation and the environment in which it is to be implemented, might at least provide an understanding of what the contention is about, if not the solution on how to address it.

8. REFERENCES


EXPERTISE DETERMINATION AND SELECTIVE FORGETTING: ICT INITIATIVES AND POLICY IN DEVELOPING COUNTRIES

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Abstract: This paper argues that ICT for development research can benefit by increased attention to relationships which seek to set out what ICTs can and cannot do. These are not simply a function of the technology – the inscriptions in technology design – but arise from the interaction of technologies and economic, political and social relationships. It is the mediation of technologies that is of interest here: who speaks for them; re-arranges the context; describes their benefits. These are processes of entanglement and disentanglement in which the notion of technology as figure and ground is helpful. Turning to the example of Jordan’s state led policy on ICTs we find that donor led expertise is not challenged and that prior experience with ICTs within Jordan is selectively forgotten. This expertise determination and selective forgetting is important in enabling new projects and technologies to continue at the cost of limited learning from the experiences either within Jordan or elsewhere. Focusing on the mediation of technologies in this case gives insight into questions of the benefits or problems of ICTs for development.
EXPERTISE DETERMINATION AND SELECTIVE FORGETTING: ICT INITIATIVES AND POLICY IN DEVELOPING COUNTRIES

1. INTRODUCTION

In a recent edited book, Kevin Gallagher points to a ‘shrinking of policy space’ for governments arguing ‘that the current [global] trading regime is restricting the ability of developing countries to put in place the proper policies to raise standards of living in their countries.’ (Gallagher 2005: 10). ICTs are often claimed to be a key component of development and the provision of information important in improving the lives of the poor (see, for example, Jensen, 2007). The question this paper poses is how do ICT initiatives, on the one hand, and government policy on the other, engage to demonstrate benefits from ICTs?

One claim, seen in practice in the experience of countries as diverse as Ireland, India and the Philippines, takes the characteristics of ICTs as collapsing the importance of space, and enabling software development to occur more or less anywhere. This, perhaps, is a classic expression of trade theory going back to David Ricardo who suggested that countries specialise in what they can produce best and at the lowest cost. As communication costs have reduced and software, as a product, can be transmitted easily, then, in theory, any country can specialise in software production. Is this an example of a meritocratic and egalitarian ideal similar to Napoleon’s classic adage that ‘every soldier carries a field marshal’s baton in his knapsack’? Many countries would like to think so and there are a plethora of national initiatives in developing countries which seek to maximise their advantages as a place for software production (see Carmel, 2003). The time is ripe for a systematic appraisal of such policies, but the scope of this paper is less ambitious and seeks to put forward the argument that ICT initiatives and studies of ICT in developing countries are improved by an awareness of the socio, political, and economic characteristics of the circulation of ICTs. Arguably, we are never in a position to discuss ICTs as a natural or pre-given category, rather their constitution and contribution is framed in debates, exemplars and disputes which seek to provide a set of capabilities. This is more apparent in national or international settings in which contribution and policy fold together. Thus, the why and the how of ICTs and their relation to development are intertwined and need explanation together. To that end we use the example of Jordan’s programme to develop a software export industry to show the benefits of improved analysis to understand the outcomes of this programme and its implications as to how ICT initiatives and government policy interact.

2. STUDIES OF DEVELOPMENT

It is perhaps not too simplistic to claim that the history of ICT for development is primarily one of seeking to adapt, improve, and develop technologies for developing countries. Toyama and Dias (2008: 23) argue that this history is one of contradictory expectations. One is the idea of ‘leapfrogging technological solutions’ enabling developing countries to develop rapidly while the other is of continuing programmes to find new ways to apply established technologies. How far reaching these changes are is a matter of debate. Ernest Wilson (2004: xi –xii) refers to massive changes, what he terms strategic restructuring, which he suggests are ‘being driven on the ground by local information champions who struggle daily to overcome local apathy as well as entrenched opposition to the revolutionary reforms they
Continuing change remains synonymous with ICTs. The recent example of the rapid rise of mobile use is but one instance which led the Economist to propose that the digital divide is already disappearing as over half the world’s population has access to mobile phones (Economist 2005). However, it is easy to see this as contained in an analytic framework in which the focus of attention is on technologies from developed countries being applied in developing countries which are then to be understood drawing on theorisation from the self-same, developed countries (see Tsui, 2006). How an ‘other’ of local technologies developed and described through local understandings might be recognised, let alone produced, shows the difficulties with such an argument and how the travel of ideas and technologies render notions of the local increasingly suspect.

Avgerou (2008) in her survey of ICTs and development identifies three distinctive discourses. The first, and predominant, discourse, shares a view of technology as objects capable of being transferred to developing countries. The second addresses the appropriation of technologies in a dynamic of adaptation within the context of use. Avgerou describes this as social embeddedness. If the first discourse can be claimed to be the circulation of universals, in which the beneficial (or otherwise) qualities of technological objects are transferred, the second can be seen as addressing the importance of the local and how technologies are (or can be made) pliable to embed in specific situations. A third discourse for Avgerou is one of transformation whose distinctiveness rests on its interest in how the context of development in which ICT is deployed is itself changed. Such a move has interesting implications. For instance an important one is the questioning of culture and particularly cultural frames of reference. Culture turns out to be a dynamic, contested, and multiple. Furthermore, as a construct, its usage in understanding the local draws attention away from how culture is performed. As Kuper (1999: 245) puts it ‘[c]omplex notions like culture, or discourse, inhibit an analysis of the relationships among the variables they pack together.’ Avgerou invites us to look at ICT usage both more carefully and at the trajectories of ICT artefacts.

Acknowledging that discourse itself is shot through with contradictory elements (for a review see Wynn et al 2002) what might we say about a transformative discourse? One mode of analysis is to take it as attempting to hold both global and local in the same conceptual lens. This is intriguing ground as it can consider how the global is constructed and made mobile and, symmetrically, how the global becomes local or embedded. In discussions of systems development it is paying attention to the world(s) of design and that of implementation. A slightly different stance is to become aware of mediation; how, and by whom, are claims made of ICTs and properties assigned?

Whilst diffusion sees technologies and ideas as moving outwards from an original invention or thinker; translation, while recognising this movement, implies that the travel of ideas or technologies involves change (for example, Czarniawska & Sevón 2005; Latour 2005; Thrift 2005). Each use of a technology is an appropriation which becomes specific to that place and time while ideas too are changed in being taken up by others. The expectation then is that technologies and ideas necessarily change in their travel from North to South and yet it is also expected that recognising such change may be difficult. Often, companies or governments invest financially and symbolically in new technologies as exemplars of progress and modernity and to suggest that they are different in their application could be construed as a sign of weakness rather than, what we would claim, a sign of strength. Weakness is

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1 We can note wryly in passing the implicit critique of discourse.
recognised because technologies are applied in ways that go beyond what design envisaged (Akrich 1992). But why a sign of strength? If the travel of ideas or technologies is one of continuous translation then it is, but a small step, to argue that it is one of learning in which those taking up these technologies or ideas are active rather than passive recipients. This is more than an adaption to a set of local cultural values as a stream of literature suggests (for a review see Walsham 2001). It is, drawing on Callon (1998), a process of entanglement without which ideas or technologies cannot work as a necessary engagement with local contingencies and practicalities is what can be seen as providing benefit from their introduction and use. Equally, and on other occasions, a process of disentanglement must occur when items are produced that can be taken up and circulated elsewhere. Latour (1999) provides an interesting example of how the soil of the Amazonian rainforest is collected, measured, inserted into standard descriptions, for instance, of soil colours, and may then circulate as part of scientific knowledge. For ICTs the example of Heath Information Systems Projects (HISP) show similar characteristics as the disorder of sick people is diagnosed, classified, transformed into information to be further collected into digital resources for future interrogation.

A second move, drawing on the first, is to suggest that the revolutionary change coming from elsewhere is too strong a claim. This may, at first, seem to be counterintuitive. To return to the example of mobile phones it is clear that a major change is taking place in the way in which people communicate, organise and are accessing information. However, even here, a range of local services, political and legal agreements, physical infrastructures and so on have to be agreed and put in place. This entangling draws on existing resources, be they convincing local politicians, using a specific communications infrastructure, ensuring that a legislative framework is in place, to take three examples. In short, any technology has become linked into existing arrangements which are themselves changed in that process. The upshot of these claims, of translation, disentanglement and entanglement, is to encourage detailed analysis of examples of the introduction of new technologies and the use of existing ones. In both cases, we suggest that considerable skills are being learnt or deployed in making technologies work in ways that are seen as productive in the local setting.

However, we can go further, drawing attention away from the technology as object and to its wider relations. A way to look at this issue is to think in terms of figure and ground (see McLuhan 1967). Marshall McLuhan famously suggested that the medium is the message; in other words, focusing on the figure of message ignores the importance of the medium as ground which enables the message to occur. A well known example is that of the car on a highway. Rather than just paying attention to the car and its passengers, McLuhan sees it as just figure enabled by a ground of highways, petroleum companies and filling stations, car makers; legislative arrangements and so on. Systems seen as revolutionary ICT systems or even the movement of and incremental improvement of more established technologies can be addressed as figure, but a more thorough going analysis, understands them as a relationship of figure and ground. In this sense it is important to address social, political, economic and cultural issues in ICT deployment and use. Such an analysis returns us to the role of states and political (in)action in ICTs for development.

3. FACTORS OF DEVELOPMENT

The recognition of ICTs as a factor for development has also provided the state with new roles. First, states, looking at the exemplars of Ireland, Singapore, or India, seek to develop strategies to encourage foreign direct investment (FDI) in high tech areas within their
countries (Nicholson & Sahay, 2003). Second, a growing international awareness of ICTs as a means in themselves as a mode of development has stimulated a number of initiatives aimed at using ICTs to enhance educational possibilities and to reduce poverty (World Bank, 2003). Turning to IS academic publications, much of the literature can be characterised as either seeking to identify factors through quantitative analysis that can be correlated with a successful IT industry (Ein-Dor et al., 2004; Watson & Myers, 2001) or engaged in creating or using models of software industry success factors to analyse specific countries performance or future potential (Carmel, 2003; Heeks & Nicholson 2004). Both approaches have strengths but are limited by a lack of engagement in how change has been or could be initiated and by sidelining socio and political issues in development.

There are several examples of the second approach (Carmel, 2003 Heeks and Nicholson 2004; Nicholson & Sahay, 2003). For example, Heeks & Nicholson (2002) distil the experiences of the three I’s (India, Israel, and Ireland) into a software export success model which identifies a series of causal factors. These are international demand and factors at a national level – a national software vision that has effects on national factors such as people, research and development, technology and finance which in turn effect the national software industry which in itself has three key factors – competition, collaboration and clustering.

They argue that for countries, which are late entrants into this market, national government should develop a series of policies to produce a supportive infrastructure in accordance with the software export success model in the areas of education; investment/foreign investment in telecommunications; encouraging foreign investment; enabling free movement of information and investment/subsidies for research and development. Carmel (2003) extends this model (see figure 1) which he argues is of relevance to countries with small software exporting industries.

![Figure 1: The oval model of national software export success factors (Carmel, 2003: 3)](image)

In figure 1, two points are of interest: first, government vision and policy is seen as driving all other factors in the model – Jordan is mentioned as an example, and second, linkages outside the nation are found in the specific areas of human capital; the software industry and financial capital.
These models are useful in synthesising the experience of a number of countries in developing software exporting industries. Carmel (2003a) draws attention to these issues using a four tier taxonomy of software exporting countries from a first tier of countries with large and mature software industries, for example, many OECD countries and newer entrants such as India, to a fourth tier with very small software exporting industries such as Jordan. So, for instance, it is clear that the presence of existing software industries have major effects on countries developing industries in these areas which are difficult to specify in a success factors model. A related strand of inquiry explores the topic of liberalisation of trade and the growth of the computer sector which was the topic of a special issue of The Information Society in 2001. Kraemer and Dedrick (2001) argued that liberalisation is a necessary first step to gain access to international markets, technology investment and foreign investment. Liberalisation must not be restricted to the computer sector but should include telecommunications though, they caution that, one country's experience cannot be simply be followed by another country. Even after liberalisation, they contend that there remains a role for government in enhancing capabilities in education, telecommunications infrastructure and support of science and technology. In another article, Dedrick et al (2001) reviewed the experience of Mexico and argue that though liberalisation was a necessary first step which led to the diffusion of information technology throughout the economy, the absence of a national IT policy led to the demise of much of the local PC industry.

These approaches are useful, drawing attention to conditions that have important consequences on the development (or otherwise) of ICT in Southern countries, but they have their drawbacks. There is a certain ambiguity around issues of how ICT are to be developed. A major focus is on policies to be adopted by nation states, but these recommendations are advanced in economic and political climate when state action has been restricted by ideological beliefs on the efficacy of markets and by prescription from an international trading regime which limits the action of governments to support their economies and prevent access to their developing markets. Such models are not clear guides to which policies should be adopted and their focus on generic simplicity reduces their relevance to the specific issues of individual countries at a certain time and in a certain location. To illustrate how another approach, drawing on the theorisation discussed earlier, can be useful, we will turn to an ICT initiative in Jordan and how it was entangled with political, social and cultural aspects of this country.

4. THE ICT REACH INITIATIVE AND JORDAN

Investigating specific examples of ICT and development becomes complicated when we adopt the theoretical precepts suggested earlier. We are left wondering what is the object (as we expect it to be subject to change); where to look; and when can we stop looking. As one academic remarked recently, a problem with this type of approach is that you are left with everything connected to everything else. This, perhaps, is a profound remark but leaves us with a serious methodological dilemma. Can we provide a method of investigation? The approach taken here is to take a specific ICT policy of a developing country, investigate how it was framed as providing benefit, and conduct a longitudinal study of its effects. Particular attention is placed on the expectations placed on ICTs through expert opinion and aid driven development, and a curious lack of interest in the outcomes of past projects.

Jordan is a small, virtually landlocked monarchy with a population of over five million. The country was established after the First World War and it is surrounded by more populous
neighbouring states – Iraq, Syria, Israel, Saudi Arabia and the unresolved issue of the West Bank. Jordan has had a chequered economic past and remains a middle income country with no petroleum wealth, dependent on Iraq for oil supplies. Its greatest asset is usually considered to be its population who are well educated but who have often emigrated to find well paid employment. In 1999, after a long reign, King Hussain died and he was succeeded by King Abdullah II who was educated in England and the US and has a long association with the Jordanian army. King Abdullah quickly initiated a number of policy reforms which resulted in Jordan entering the World Trade Organisation (WTO) in 2000 and setting up free trade agreements with the US and the European Union in 2000 and 2001. Politically, policies were introduced that led to a certain increase in democratic accountability. It was in this atmosphere of change and expectation that Jordan launched its plans to develop a software exporting capability and to promote the use of information technologies in government and education.

Jordan has been described as a semi-rentier state (Yom 2005). A rentier state refers to countries in which the government has a source of income other than taxation of the people: usually it describes countries with rich natural resources such as oil, diamonds or minerals. In development terms such states often have poorer development outcomes than expected as resources are appropriated without any clear accountability to the population at large (see Collier 2007). A semi rentier state has some common attributes with the government being the predominant provider of resources to the population. In Jordan’s case much of these resources derive from developmental or military aid. The problematic for a semi-rentier state is whether substantial control of revenue generation and distribution by government is to be maintained to retain stability or whether other foci such as an entrepreneurial base developed through economic liberalisation, or an articulate civic society developed through allowing freedom of expression and association, are allowed to expand and perhaps bring into question the current status quo. In Jordan cultural and political attitudes have tended to coalesce around a strong central administration, headed by the King, in which the stability of the state, in a turbulent region, remains paramount. However, new opportunities for employment are important, and ICTs were seen as a new possibility to develop skilled jobs for an already educated population. Drawing, it appears, almost directly from thinkers such as Manuel Castells an early policy document, produced by US advisors, identifies ICTs as an important source of potential employment as an activity that does not take account of geographical location (REACH 2000).²

The first ICT initiative, named REACH, began in 1999 and continued to 2005. It was coordinated and led by a new industry group, Int@J, brought together for this specific purpose. Int@J had membership from different companies engaged in ICT activities in Jordan and had representation from the Jordanian government. It produced a series of reports which analysed the issues, set out policies to be adopted, and monitored results (Westrup & Al-Jaghoub 2008). Int@J was financed through the AMIR (Achievement of Market Friendly Initiatives and Results) programme which in turn was financed by USAID (US Agency for International Development). The analyses and policies adopted by Int@J drew on foreign management consultants who mainly came from the US. The Jordanian government acted on a large proportion of the legislative recommendations from REACH and, in response, created a new ministry MoICT (Ministry of Information and Communication Technology) with responsibility for digital and telecommunication policy and implementation within government. This quickly led to ambitious programmes to restructure and digitalise

² The details of the research which this paper draws on are discussed in Westrup & Al-Jaghoub (2008).
government in an e-government programme, to provide digital resources and substantial e-learning facilities in schools, and to create 132 centres known as Knowledge Stations where members of the general population to learn ICT skills, access the Internet for specific activities and use government electronically enabled services.

REACH had ambitious targets for 2005: employment in the ICT sector was to grow from less than 4,000 in 1999 to 30,000 and export revenue was to grow from less than $40 million in 1999 to $550 million. A final appraisal of the REACH programme was never produced, but figures in a later report show that 16,000 were employed in the ICT sector in 2005 and export revenues were $162 million (Int@j 2007: 57). How these export figures are arrived at is not very clear. Our research identified a number of companies exporting primarily to the Gulf States, but no FDI was generated that led to an export driven software industry. Interestingly total ICT revenue, which includes domestic consumption, comes to $580 million in 2005 and indicates that the bulk of the growth in ICT was in an increasing consumption of ICT products and services within Jordan.³

What are we to make of the REACH programme? Despite failing to meet the targets set in 1999, the figures produced in 2007 show that Jordan has had extraordinary growth in employment, in export revenues and in total revenue in the sector. REACH did not attract substantial investment from large overseas companies in either research or production facilities. The initiative triggered a restructuring of the government ministry (MoICT) and fostered collaboration amongst private sector companies and between them and the government through the creation of Int@j. In short the REACH initiative and the new role that ICTs were recognised to play have led to significant change in Jordan. However, this discussion of REACH has focussed on ICTs and, in particular, on policy to develop an ICT sector. Returning to notions of disentanglement and entanglement, the REACH initiative can be read somewhat differently.

It is perhaps fortuitous that the accession of the new King coincided with the height of what we now know as the ‘dot com’ boom in which ICT enabled change became conventional wisdom. However, how this was important to Jordan had to be made clear. An initial view in 1999, articulated by King Abdullah, was that educated Jordanians could be ‘bodyshopped’ to work in Israel (King Abdullah 1999). It was a few months later that the idea of Jordan as an ICT enabled nation became prevalent. It appears that the view of ICTs enabling distance-less development arose from the involvement of US based consultants on the initial REACH proposal. The participation of Int@j, as a newly convened private sector association charged by the government with developing REACH, in an important government backed policy initiative has no historical precedents within Jordan. One plausible interpretation is that the financial backing to develop REACH came from the AMIR initiative which was premised on expanding the role of markets and of civil society. Thus, for REACH to be funded, the private sector driven model had to be adopted and US based expertise had to be incorporated. If these points were important to obtain funding, for REACH to prosper, it had to be congruent to emerging Jordanian government policy and existing commercial interests in the ICT area. REACH was, at the time, seen as an exemplar, of a liberalisation and reform of previous policy towards inward investment. Accession to the WTO soon followed and Jordan’s market underwent reshaping by, for example, having new legislation that protected intellectual property. Jordanian commercial interests in the area were kept engaged by being

³ The data sources for these figures are not publically available.
One interesting approach to explain these processes is Cerny’s notion of the competition state (see Cerny 2007). States, he argues, have become more exposed to competitive pressures and, in response, have had to reinvent themselves either from being inward looking welfare states concerned with issues of re-distribution or from developmental states with national policies to develop specific industries. A competition state both seeks to develop its industrial and commercial interests and does so in relation to international pressures from multinational agencies and a global trading system. Jordan, it appears, can be seen as such a state (see Al-Jaghoub & Westrup, 2003), but a limitation of this analysis is that it is rather non specific and tends to assume that institutions within the state will work together in a competition state. What we suggest here is that Cerny is right to draw attention to how government policy is often shaped around ideas of competitiveness though how different agencies are brought together to entangle technologies and create institutions is particularly important.

The REACH initiative, at the time of its inception, we suggest was congruent with the aspirations of a new Jordanian government to find ways to modernise Jordan and provide a source of employment for its well educated and under employed population. It also turns out that REACH follows the precepts of what is known as the post Washington consensus: a reliance on the market and liberalisation as mechanisms for development and the establishment of non governmental institutions to foster such development (Stiglitz 1998; Gore 2000). Thus, Gallagher’s comment, which began this paper, on the shrinking of policy space for governments in a global trading regime has resonances with the experience of Jordan and its policy on ICTs. One illuminating comment came when we asked the Ministry Head of MoICT whether reliance on external experts was always the appropriate way to garner knowledge and policy advice. Her response was one of surprise that experts would not present policies that were appropriate for Jordan and helpful for its development. We, perhaps, were expecting a more nuanced reply which recognised that a divergence of expert opinions was to be found and that the role of MoICT might be to sift through a variety of policy advice. Thus, the absence of policy space identified by Gallagher may be, what we can term, an expertise determinism, in which the resources or capabilities to question external policy advice is lacking and where such advice is acted upon in, perhaps, an unreflective way. Such a shrinking of policy space is exacerbated when there is a confluence of sources of funding and policy advice which is widespread in development and found in this instance in Jordan. Cooke and Dar (2008) refer to development managerialism whereby the creation of a professional cadre of development managers and their projects run the risk that development becoming an end in itself. ICTs, given their perceived technical complexity, are even more likely to be less subject to questioning and debate. This is, of course, a re-running of a long standing argument in technology and organisational studies in which the very term technical is predicated on an inability to subject it to question (Woolgar 1991). One elaboration of this debate is a recognition that the ability to question technology varies; so, for example, workers were less able to question a new technology initiative than senior management. Likewise it seems important that policy space is actively created through situations whereby the givens of expertise determinism can be subjected to argument and debate.

We might legitimately ask, if REACH was, to some extent, an appropriation of funding led development advice characterised by a somewhat unreflective acceptance of policy initiatives, how does ICT policy evolve and new policies come into being? In 2007 a
National ICT Strategy for Jordan was published which set out policies for ICT to be ‘a major driver’ for the economic growth of Jordan (Int@j 2007:1). This policy sets out an agenda for the years 2007-2011, is written by Int@j; used a set of consultants and funding from USAID, and proposed a partnership between Int@j, the MoICT ministry and the Telecoms regulatory commission. Many of these features are very similar to REACH, but curiously only one mention of REACH is made in the new strategy. In this instance it appears that when new policies on ICT are developed they share many characteristics of what went before while not publicly identifying what can be learnt from the experience of previous policies. A combination of expertise determinism and, what we may term, selective forgetting may be useful in articulating new policy, but runs the danger of neither coming to terms with past experience nor being able to address current and future difficulties. Perhaps such a stance is useful in providing sufficient interpretive flexibility in the implementation programmes providing the obverse of the lack of policy space previously identified. Policies may be more inflexible in their articulation, a clear example of framing, but their implementation remains highly contingent and therefore capable of the necessary entanglement in the changing cultural mores of Jordanian society.

5. CONCLUSION

This paper began by setting out a dilemma of how ICT initiatives and government policy interact to demonstrate the benefits of ICTs. Our conclusion may not be very palatable. We suggest that Kevin Gallagher is correct in identifying a shrinking of policy space for countries in the domain of ICT policy, but this, we put down to, what we call, expertise determinism; a framing and an unreflective acceptance of one strand of policy advice. This coupled with a selective forgetting of the consequences of past policy initiatives can limit collective learning of the scope and benefits of ICTs in development. However, it is worth recognising that a positive feature of this approach is that it allows for considerable interpretative flexibility in how policies are to be implemented and thus help ensure that the entanglement of these policies is more likely. This, we suggest, was the case in Jordan, and it would be interesting for further research to see whether similar patterns emerge in other countries.

More generally, we would like to suggest that a focus of research should be not just on ICTs but on how their capabilities are framed and become entangled in the ongoing political, economic and cultural aspects of society. If that entanglement is taken as productive then we can claim that ICTs will work; if, however, the ICT initiative fails to garner the necessary relationships with the practical concerns of the local society, more often than not, the initiative will fail. Rather than see this as one of content and context, this paper considers the study of ICTs as one of figure and ground. A prediction arising from this approach is that we will only be able to understand the implications of any ICT project if we consider both figure and ground. Put differently, economic, social and political issues are central to any understanding of the contribution of ICT for development.

6. REFERENCES


HEALTH INFORMATION AND MANAGERIAL WORK: EXPLORING THE LINK

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Abstract: Health information systems are tools to support management. Responsible for service implementation; yet tasked with monitoring performance of service delivery; PHC facility manager cadres lack the authority to take decisions about change in practices. It is thus relevant to explore the nature of management work at this functional level and how this work links to the information system created to support management processes. Three key questions were asked: what is the role of these managers; what is the context within which information is used; and, what information is relevant to support management practices. Within common core management tasks, a range of management roles were identified. These were largely utilised in processing information about operational issues that impact on service delivery. As in related empirical studies on management work, the findings revealed a high dependency on soft data obtained from informal information systems rather than that of the formal system; an information mismatch. Future challenges involve discussion on how to align this information mismatch.

Keywords: management work, roles, information systems, decision making, South Africa.
HEALTH INFORMATION AND MANAGERIAL WORK: EXPLORING THE LINK

1. INTRODUCTION

It is often stated that an information system is a tool to help improve management by using available information for decision making (Mandelli & Giusti, 2005; T Lippeveld, 2001). Underlying this is a number of assumptions. Firstly, that the aim of an information system is to use information for action and secondly that if available, it will be used to facilitate decision making. This implies a relationship between management and information; that the main job of managers is to make decisions and that information is linked to decision making.

Empirical evidence suggests that the reality is often very different. This paper sets out to explore the role of information in management within a health care setting. Specifically, this paper will explore what it is that local level primary health care (PHC) facility managers do, how they do it and how this links to the use of information and the information system. The research rationale is twofold; firstly, to deepen our understanding of the role of managers by exploring the context within which information is used and secondly, to contribute to a broader discourse on how to support the practice of health managers, specifically, how to strengthen the use of information in the decision making process amongst health management cadres.

The paper provides some initial data on the nature of management work carried out by PHC facility managers. This provides an opportunity to learn whether a common core of management tasks is performed. The aim is to determine what information is relevant for PHC facility managers in performance of these tasks and how this information links to the formal information system.

Significant improvements are being made in healthcare due to information and communication technologies (WHO, 2006). Effective, integrated information systems are seen as a vital strategy to develop, implement and monitor global health interventions aimed at reducing the burden of disease (AbouZahr & Boerma, 2005). This is particularly relevant in developing countries that are juggling the, often competing, demands of government and donor organisations for information. Implicit in monitoring as a decision making activity is the power to make decisions about policy and, or practice change strategies. Differentiation in responsibility and accountability for policy development, strategic and operational planning for service implementation as well as monitoring and evaluation of performance between various management levels in the health system is described in a range of policy documentation (Hall, Ford-Ngome, & Barron, 2005; T. Lippeveld, Sauerborn, & Bodart, 2000). However, while functional responsibility for service delivery may be delegated to local levels, management authority tends to remain highly centralised in many developing country contexts (Berman & Bossert, 2000; Haga, 2001). While information is commonly required at district and national levels, it is the local level services, bearing responsibility for implementing services that generate and provide this information. Tasked with monitoring performance, it is thus relevant to explore the nature of management work at this functional level and how this links to the information system created to support management processes.

Health management literature provides rich examples of the management practices of nurse managers in a range of patient based service settings (Edwards & Roemer, 1996; Young, 2002). However, the nurse driven PHC setting within which facility managers in the South African context work, poses different challenges. With implementation of the PHC package of
services there has been a dramatic shift in the work practices of nurse clinicians at this level, from providing traditional preventive services within a community health paradigm, to offering a broad range of curative services that involve diagnostic and prescribing procedures. The nurse clinicians are responsible for interventions that impact on the health status of communities, as determined by global health status indicators. As part of their responsibility for implementation of services, the PHC facility manager is called upon to monitor performance in terms of coverage, quality and efficiency of service delivery for whole communities served. Yet there has been limited discourse on how this translates into practice, specifically with regard to the role of the PHC facility manager and the context within which information is used; what information is relevant to support management practices at this level is unclear. In an environment where local level providers do not have real decision making power to change operational policy and practice, the nature of management work, and thus the relationship with the information system, is unclear (Østmo, 2007).

The challenges posed by trying to balance the health needs of individual patients on the one hand, yet deal with the realities of working in an ever changing socio-political and economic policy environment, requires a knowledgeable and skilled manager. The regulatory environment within which the PHC facility manager works is uncertain and as a scope of practice for the PHC facility manager slowly unfolds there is ongoing debate on the knowledge, skills and competencies required. In addition, this paper will contribute to deepening our understanding of the role of the PHC facility manager in the practice setting.

2. THEORETICAL PERSPECTIVE

It is recognized that effective management is essential to improving accountability in health service delivery (T. Lippeveld, et al., 2000). Health information systems are the tools whereby managers can monitor and evaluate performance. Why are managers not using these tools? Two main reasons are cited. On the one hand the information systems themselves are not comprehensive or readily available. On the other hand, the structure of the health organisation does not clearly identify the managers, their roles or their authority; these three aspects are inextricably linked.

Health information systems literature abounds with case studies that describe the organisational complexity in re-shaping the management work practices of health care staff (J. Braa, Heywood, & Hedberg, 1999; Hunter, 1996; Jacucci, Shaw, & Braa, 2006; Mukama, Kimaro, & Gregory, 2005; Mutemwa, 2005). The changing socio-economic environment, within which organizational change is taking place, has resulted in a ‘mixed-bag’ approach to the development of management structures within the health system. In many developing country contexts health managers are drawn from the ranks of practicing clinicians, resulting in a duality of roles for health managers, the clinical - managerial paradox (H. Muquingue, Kaasbøll, & Berg., 2002).

Although there is extensive discussion on the complexities and problems of information systems in health organisations (Alvarez, 2004; J Braa, Monteiro, & Sahay, 2004; Gouws & Gregory, 2005; Heeks, 2002; Williamson & Stoops, 2001; Williamson, Stoops, & Heywood, 2001), what is lacking are empirical studies that ‘reconcile the normative rhetoric for health information systems with observed problems in relation to management tasks’ (Mutemwa, 2005). It is only when we understand what managers do; that we can customize health information systems to meet the practice needs of management cadres. This will in turn inform the core knowledge, skills and competencies required at each level of management; the basis of management capacity building programmes (Hales, 1999).
Management is commonly described in terms of activities aimed at achieving desired objectives and the powers and responsibilities to make decisions. Gorry and Scott Morton (1989) provide a useful framework for exploring the nature of managerial work that includes an understanding of both the purpose of management activity (involving planning and control at strategic, tactical and operational levels) and the way in which managers solve problems and make decisions. The “distinction between problem solving and decision making as more than just semantic” highlight both the complexity of issues and tasks that confront managers and the need for flexibility in developing relevant models of decision making support systems.

Information systems are designed to support management activities, in particular, better decision making. Critics of decision making models such as Van Lohuizen’s knowledge driven model and Lasswell’s linear model reinforce the ‘messy reality’ and unstructured nature of management issues within complex cultural, social and political contexts (Lippeveld et al. 2000). The identification of technical, behavioural and organisational determinants in the PRISM analytical framework provides an approach to understanding both barriers to information use and strategies to strengthen decision making (LaFond et al. 2005).

The strengthening of data demand and information use is suggested as a useful approach for supporting evidence based decision making (Foreit et al. 2006). However, a review of the steps involved in evidence based decision making processes highlight the uncertain arena of managerial work within the activities of problem solving and decision making. A first step in exploring decision making models relevant to the health sector is to deepen an understanding of the nature of managerial work.

Despite ‘identifying variations and particularities’, accounts of management work over the past thirty years have largely reinforced Mintzberg’s categorization of management roles. The various management activities, described in terms of ten roles performed, were categorized into three groups; inter-personal, informational and decisional (Hales, 1999; Mintzberg, 1975). It therefore seems appropriate to initiate an exploration of what PHC facility managers do by determining how their work relates to these ten roles (table 1).

In recent literature, the leadership role has been emphasized as dealing with change through engaging and inspiring others, while management is coping with the complexity of the daily operations of an organization. Muquingue (2008) found that novice managers with clinical background were trained for handling complexity but lacked leadership skills.

3. METHODOLOGY

This study forms an initial exploration of management work. The researcher set out to capture the views and experiences of PHC facility managers in a variety of PHC facilities; urban and rural, large and small in two health districts in the Western Cape, South Africa. The rationale was to obtain insights into how these contexts differentially affect the nature of management work. A series of both structured and semi-structured interviews were held with sixteen PHC facility managers in order to explore their role, information needs, sources of information and how this knowledge is learned.

Secondary interviews were held with four managers in order to clarify identified themes. On-site observation was done in five cases wherein managers were observed in performance of their routine tasks. A combination of note taking and recording was done during and after interviews and discussions. No statistical analysis was done; rather Mintzberg’s (Mintzberg) categorization of management roles was used as an analytical tool to organize and frame the data.
Documentation related to the practice of management such as legislation, policies, strategic plans, meeting agendas and reports were reviewed for contextualisation of information in management activities.

4. CASE DESCRIPTION

4.1 THE CONTEXT WITHIN WHICH PHC FACILITY MANAGERS WORK

The backbone of health care delivery in South Africa is the nurse-driven PHC service with over 4500 mobiles, clinics and community health centres. In each health facility there is an individual appointed to be in charge of the facility, the facility manager. Commonly, this manager is a senior professional nurse with extensive clinical and administrative experience. In charge means translating health policy into practice within a socio-political, ethical and legal framework. In practice the facility manager is responsible for implementing a core package of health services in accordance with national policy guidelines.

In the South African context, democracy related health sector reform implemented the vision of a primary health care approach to service delivery with the creation of a district health system as the vehicle for managing health services. However, despite policy statements about decentralising service delivery to the local level, without the effective transfer of power for decision making, there has been limited freedom to take strategic or operational decisions about change in practices (Consortium, 2004; Leon, Bhunu, & Kenyon, 2001). This is particularly relevant for PHC facility managers who have responsibility for service implementation, but no real decision making authority.

The broad policy framework within which PHC facility managers work state that the aim of management is to improve, maintain and monitor service performance in terms of efficiency, coverage and quality of care (Campbell, 2003; The Primary Health Care Package for South Africa: a set of norms and standards, 2000). Indeed, the national health management information system (HMIS) is comprised of health status, quality of care and service efficiency indicators. The optimistic suggestion that the implementation of a district based HMIS will promote a culture of local analysis and use of information has had limited success. Reality has demonstrated that managers seldom seek information from the formal information system and once given it, do not find it relevant, useful, understandable or meaningful (J Braa, et al., 2004; Gouws & Gregory, 2005; Williamson, et al., 2001). This was challenged by Østmo (2007) who found that this type of discourse neither described nor addressed the context within which the PHC facility manager functions. This was reinforced by Gouws and Gregory (2005) in their conceptualisation of information systems as social systems wherein the failure of the formal information system to consider the information needs of managers was reinforced by the inappropriateness of defined indicators for local relevance.

The norms and standards for practice as laid out in the PHC service package (The Primary Health Care Package for South Africa: a set of norms and standards, 2000) describe the core management functions of planning, control and supervision with the following types of statements: hold monthly staff feedback meetings, provide community consultation and use data from the standard health information system. In this regard, the PHC facility manager is required to ensure that monthly and annual data is checked, graphed, displayed and discussed with staff and the community health committees. In theory this sounds good, but in reality, the individual is left without clear instructions of how to implement this.

While policy documentation refers to the development of global and national strategies to deal with critical health issues, there is limited discussion on the strategic and operational use
of information by PHC facility managers to support local initiatives. Over the past fifteen years, the vacuum created by the delay in finalising health sector legislation, with the associated policy and practice guidelines, has resulted in confusion about management roles and decision making power.

Three contextual distinctions are made of the context within which PHC facility managers work; the urban – rural work setting, age and formal training and facility size. Historically, PHC facility managers appointed from the ranks of professional nurses with the longest clinical service record required no formal management training. This is changing. Increasingly, the trend is to appoint a professional nurse with broad experience in a variety of clinical settings as well as interest in and, or training in management. In rural settings, facility managers tend to be older and have a long service record, while in urban settings; managers tend to be younger, with formal qualifications in nursing or public health administration and often, management. A similar trend was found with regard to facility size.

4.2 THE NATURE OF PHC FACILITY MANAGERS WORK

PHC facility managers all stated that they have learned their craft from their predecessors. This mentoring process forms the most powerful and important source of experiential learning of both explicit and tacit knowledge of the work of a manager. As PHC facility managers, in the roles of figurehead, liaison, disseminator and spokesperson, interact with a wide stakeholder group such as facility staff, senior management, colleagues and community members, they are ideally situated to utilize these networks to both strengthen their own knowledge and skills base as well as use the information generated to support decision making processes.

When asked what the role of a PHC facility manager is, the most common reply given is, to plan, to control and to supervise. In unpacking what is meant by these terms, managers highlight three main areas of work in carrying out the many and varied tasks that they deal with on a daily basis; i) dealing with staffing and resource issues, ii) dealing with patients, community and senior management and iii) handling service demands and unexpected problems.

Data concerning the work of PHC facility managers revealed a high degree of consistency in the roles described in both urban and rural settings. The data reflected both a common core of management tasks and the wide variety of roles performed by this management cadre. The data was explored for thematic groupings according to the ten roles described by Mintzberg. These are described in Table 1.

<table>
<thead>
<tr>
<th>As figurehead, fulfil organisational and social obligations, ceremonial and symbolic</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ I represent the facility at all official functions - management and community meetings</td>
</tr>
<tr>
<td>➢ As manager, everyone comes to me – to discuss with me - all matters come back to me</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>As leader, deal with all HR issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ I set the tone and make sure we all work together as a team - I must keep my staff happy</td>
</tr>
<tr>
<td>➢ I sort out staff duties – shifts, shortages, workstations – coordination of the team</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Through liaison, create networks to interact with staff, colleagues, community and managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ I liaise with others service levels and managers such as programme managers (TB, ARV)</td>
</tr>
<tr>
<td>➢ I must know what is going on everywhere in my facility - must have good ‘people knowledge’ and communication skills to be able to deal with everyone - patient complaints, community and staff issues</td>
</tr>
</tbody>
</table>
Through monitoring, observe and collect information on what is going on

- I must have an in-depth knowledge of what goes on – do quality assurance checks – walk around - find gaps – reshuffle resources and give feedback on performance
- I must compile monthly reports and sign off on all stats before it leaves my facility

As disseminator, provide information to facility staff

- I must keep my staff informed about what is going on in the health service
- I must give feedback to my staff from meetings I attend on what I am told about the services – new things that are happening and on how well or poorly we are doing

As spokesperson, represent the facility at outside meetings

- I must inform senior management on facility activities - defend our performance and report ad-hoc problems to supervisors
- I must inform the community on what we are doing and plans to improve services

As entrepreneur, handle the demand for change process

- I must organise staff training so that we can provide quality services
- I must manage new health programmes – if staff are resistant to change – talk to them – show them what to achieve and how it improves service delivery – it helps to reduce resistance

As disturbance handler, deal with urgent problems

- I must fix any problems that arise at any time
- I must deal with emergencies, both clinical and administrative – sort out transport for a critically ill patient - patient complaints

As resource handler, facilitate and coordinate work activities

- I must balance workload with resources - reshuffle resources such as staff allocations
- I must make sure that work gets done - interconnect all points – staff, patients and work

As negotiator, deal with staff, patients, supervisors and community

- I must keep my staff happy - deal with patient complaints
- I must sort out supervisory issues and negotiate for more staff and service cutbacks

Table 1. Activities of Facility Managers according to roles

The high degree of consistency in the roles described indicates that the context does not differentially affect the nature of management work. However, descriptions of how information is used suggest variation in the approach to decision making activities. The categorisation of work into roles facilitates exploration of the link between management and information. In a basket exercise conducted to test Mintzberg’s classification, Shapira and Dunbar (1980) concluded that there were two main facets in management work and regrouped the ten roles into two categories; roles dealing with the generation and transmission of information and roles that involve formulation and execution of decision making (Table 2).

The categorisation of roles further suggests two ways of dealing with information; action triggered information, the information pull and information triggered action, the information push. A large focus of management work is directed at processing information about operational activity, the information pull. The formulation and execution of decisions is based on presentation and discussion of received information, the information push. An information push - pull model to explain this phenomenon is currently being developed.
5. DISCUSSION

PHC facility managers relate to information in various ways. A large component of management work is directed at generating information about operational issues that potentially impact on service delivery. Regular ‘walk-about’ to observe staff and work allocation functionality enables identification and clarification of potential problems, the action triggered information pull.

Liaising with staff, peers, management cadres and community groups enables both the generation and transmission of the so called ‘soft information’ obtained through informal data sources. Thus PHC facility managers process information from different sources in order to facilitate their ability to act in a variety of roles, such as figurehead, liaison, disseminator and spokesperson, resulting in information pull or action triggering information. This information can then be used to engage in discussion with stakeholders about the services. These discussions are multi-purpose; to inform, to explore possible solutions to identify problems, or to motivate for changes in operational practices, resulting in information triggered action, the information push.

The nature of PHC facility manager work is twofold. Firstly, PHC facility managers are concerned with patient based activities. A large component of their work is related to dealing with issues such as patient tracing and follows up, continuity of care, referrals and organising transportation to other services. Related to these activities are the human resource issues around addressing staffing shifts and work allocations. Solving ad hoc facility based problems often require on the spot decisions; decisions which are based on the extensive tacit knowledge of an experienced PHC facility manager. This is the information push. The soft information generated in this regard is commonly obtained through the informal information system.

Secondly, PHC facility managers are concerned with addressing the larger health service and community health status activities. The main activities are related to disseminating information to a range of external stakeholders such as senior management and community forums on performance of key service areas. An aspect of this is related to negotiating changes in policy directives or addressing community concerns. This is the information push.

While PHC facility managers have authority to make decisions about patient based activities, it is in the larger health service and community arena that the use of information based on the
formal information system is debated. The health systems organisational structure and authority base for decision making is unclear and discussion in this arena is limited.

Exploration of the sources commonly used to obtain information revealed a strong ‘information pull’ approach; that most information was obtained through informal sources, comprised soft data and that PHC facility managers responded to this information differently. In two facilities, one urban and one rural, PHC facilities managers identified a common problem, that of low immunisation coverage.

In the small rural clinic, the manager stated that the staff had informed her that there was a problem – ‘they knew their community and reports were that children were not coming’. In consultation with her staff, they planned to conduct an ad-hoc immunisation campaign within the month. On further questioning, the manager was uncertain what the status of immunisation coverage was in the formal information system and had not referred to it for verification. There was no recent immunisation data available in the facility.

In the large urban community health centre, in identifying the problem of low immunisation coverage based on information obtained from staff and community, the PHC facility manager believed that they could not rely only on data from the formal information system. In recognising the need to verify the information, they requested a formal investigation into the situation to verify the information. A public health graduate student was contracted to research the case.

Although both PHC facility managers acknowledged that data from the formal information system was useful, more relevance was placed on the soft data obtained from informal sources such as feedback from staff, health educators and community workers. It is interesting to note that in neither facility was recent immunisation data from the previous quarter readily accessible and that data tables used were based on raw data. There was no conversion of this data into health status performance indicators, despite explicit national policy on monitoring performance of key health status indicators. Further query revealed that although the managers believed the formal data on number of children immunised to be correct, there was concern that the denominator data was not a true reflection of the population in the catchment area. In both communities there had been a large migration of people in recent years. The data suggests that the urban – rural context affects the way information is processed and thus decision making activities, indicating further research in this arena.

PHC facility managers engage with the formal information system on a regular basis when they, in figurehead, liaison and spokesperson roles, attend monthly and quarterly service and programme management meetings held with peers and supervisors at district level management forums. The ‘information push’ through feedback on facility level performance provides a valuable mechanism for discussion of operational factors that impact on service delivery. This processing of information expands the tacit knowledge base of the PHC facility manager. This in turn informs the type and format of information disseminated to their staff. In liaison and spokesperson roles, the PHC facility managers engage in negotiating the formulation and execution of decision making. However, the final decision on execution is generally made by higher level management cadres.

Informal information thus forms both the primary mechanism through which they are informed about service issues as well as the process through which problems and decisions are handled. This reinforces the findings that they collect and use information related to patient management to a large extent and health service performance to some extent (Østmo,
There is a strong well established culture of information use at PHC service level, albeit one that is not formally acknowledged or formalised in the policy driven formal information system. This suggests that there is a mismatch between the formal and informal information systems. Strategies for strengthening of information use may require a radical revision of the way in which we structure the health information system, incorporating aspects of the informal information that is relevant to lower level management cadres.

Given the narrow scope of decision making authority within which PHC facility managers practice, managers tend to concentrate decision making activities around streamlining operational service delivery. Decisional roles tend to focus on resource allocation and ad-hoc problem solving. Although PHC facility managers deal with ‘real-time’ operational issues that make up their day to day tasks, consideration of the increasingly well defined legislative and policy structures that provide the operational framework for service delivery, such as monitoring performance and target setting, informs the organisation of both new and existing services and associated staff training needs. An in-depth knowledge of service delivery, from both a clinical and managerial perspective has been identified as a critical factor in addressing such challenges.

Muquingue (2008) found that district managers in Mozambique were ill equipped for the leadership role. The South African managers devoted most of their time at the operational issues, confirming that coping with the complexity of day to day operations is more emphasized than leading change efforts. However, the immunization campaigns and investigations into such need found in South Africa, demonstrates that they are capable also of initiating change, being the hallmark of the leader. While the district managers in Mozambique came directly from the medical school in the capital, the South African managers were experienced clinicians and had experienced being managed by others before being promoted to the role themselves. They had thus become socialized into the managerial practices of their predecessors, while the Mozambicans had not been exposed to similar experience.

6. CONCLUSIONS

The idea that information use is central to effective health management is not questioned. While many PHC facility managers state that they use information in the discussion of health related issues, few examples of how information from the formal information system informs action in decision-making are available. The description of the nature of management work illustrates both a common core of tasks performed and that information is central to management work. As in related empirical studies on management work, the findings revealed a high dependency on soft data obtained from informal information systems rather than information generated in the formal system; an information mismatch. Knowledge on what information is relevant, as well as where and how to obtain it, is strongly influenced by the tacit knowledge gained through experiential learning. Recognition of the relevance of soft information from informal sources in processing information for the multiplicity of management roles supports the call to acknowledge the value of their management work and the building of local ownership for management of service delivery at the facility level.

The description illustrates a link between information and management and more specifically, the nature of the relationship between management activity, authority for decision making and use of information. This paper contributes to the discourse on the use of information for management by building on the work of Østmo (2007) who, in describing the context within which PHC facility managers work, argued that they have a strong culture of information use; that they ‘value and use information for management, both formal and informal, when the
available information is relevant to their tasks and they have the authority to use the information to make decisions’.

The use of information, irrespective of availability, is linked to and may be regarded as dependent on decision making authority and relevance to managerial work (Lippeveld et al. 2000). A large focus of management work at the PHC facility level is directed towards operational problem solving. The development of evidence based decision making support systems must address both management activity relevance and practice based ways of solving problems and making decisions. Framing a description of the nature of management work carried out by PHC facility managers in the context of roles performed, deepens our understanding of the complexity and variety of tasks performed in a multiplicity of roles.

The preliminary work on development of the information push-pull model to explain ways of dealing with information offers opportunity for further investigative study. While the findings suggest that the urban – rural, facility size context does not differentially affect the nature of management work, descriptions of how information is used suggest variation in the approach to decision making activities. Further research into this aspect will support identification of core knowledge, skills and competencies required to support management capacity building initiatives.

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Assessing the Contribution of ICT to Development Goals

Practitioner Reports
EXPLORING SOME THEORETICAL FOUNDATIONS OF PRACTITIONER-BASED INQUIRY RESEARCH

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Abstract: There are many practitioners in organisational settings and their practitioner-based inquiry earnings are often not published in journals. In this practitioner report some reflections of a practitioner-based inquiry research conducted in a selected organisational setting (eThekwini Municipality) in the developing country of South Africa are described. A mixed-methods research approach was adopted: (1) knowledge claim – pragmatism; (2) strategy of inquiry – transformative procedures; and (3) methods of data collection and analysis – secondary data and analysis were used. From this survey, in which practitioner oriented knowledge is reported, the author suggests that encouragement be given for more practitioner-based inquiry research.

Keywords: Information and Communication Technology (ICT), practitioner-based inquiry, practitioner-research, reflection and practice.
EXPLORING SOME THEORETICAL FOUNDATIONS OF PRACTITIONER-BASED INQUIRY RESEARCH

1. INTRODUCTION

There are many practitioners based and employed in organisational settings and their practitioner-based inquiry earnings are often not published in journals. This practitioner publishing ‘shortcoming’ does not encourage learning which is relevant to real-life practice in organisations. The objective of this practitioner report is therefore to document some reflections of a practitioner-based inquiry research conducted in a selected organisational setting in a developing country of South Africa. This may serve to encourage more practitioner reflection and facilitate practice learning and development in organisational settings. Furthermore documenting practitioner experience and reflections may also serve as an opportunity for peer-review in assessing Information and Communication Technology (ICT) contributions to development goals in a developing country. South Africa is a developing country.

A practitioner is “someone who holds down a job in some particular area [such as ICT] and is at the same time, involved in carrying out systematic enquiry which is of relevance to the job” (Robson, 2002: 534). Action research (AR) is a reflective process of progressive problem solving by an individual (such as a practitioner) with others in a team to improve the manner in which they address issues. Practitioner-based research implies an openness to any appropriate methodology that will inform the practitioner whereas AR implies the critical and reflective use of an AR methodology to inform practice and contribute to the field of knowledge through reflective writing (Hardman, 2009). Donald Schön (1930-1997), who was an influential thinker in developing the theory and practice of reflective professional learning, is an advocate of practitioner-based inquiry. The objective of this report is to explore some theoretical foundations of practitioner-based inquiry research.

This practitioner report is structured as follows: A background to reflection and practice are introduced. The practitioner-research concept is then discussed. Thereafter research design for the author’s practitioner-based inquiry is presented. The research setting of eThekwini Municipality in South Africa is described. Reflecting on the author’s practitioner-based inquiry research is then given. Finally some concluding remarks are presented.

2. REFLECTION AND PRACTICE

The notions of reflection-in-action and reflection-on-action were central to Schön’s (Schön, 1983) work. Reflection requires space in the present and the promise of space in the future (Smith, 1994: 150). Reflective practice is thus therefore enacted. Practitioners usually need to combine reflection and practice when addressing practice issues in organisational settings. According to Price (2004: 47), the purpose of reflection is threefold:

- To understand one’s self, one’s motives, perceptions, attitudes, values and feelings. Practitioners understand themselves and in so doing become more open to understand the different perceptions of others;
- Reflective practice is based on the notion that everyone constructs meanings for and explanations about events (and some of these may be misguided); and
- To reflect on the possible consequences of one’s actions.
Schön (1983) brought ‘reflection’ to the centre of an understanding of what professionals do. In the epistemology of practice, “the knowledge inherent in practice is to be understood as artful doing” (Schön, 1983). Given the purpose of reflection and the characteristics of reflective practice, it is argued that they can be seen as an approach to encourage practitioner learning and practice development in an organisational setting.

3. PRACTITIONER-RESEARCH

Practitioners often apply theories and exemplars to their own experiences and situations in organisational settings. What exactly is practitioner-research? Practitioner-research can be identified as “a systematic form of enquiry that is collective, collaborative, self-reflective, critical and undertaken by the participants of the inquiry” (McCutcheon and Jung, 1990). In a practitioner-research culture, individual enquiry is encouraged. The underlying question on the mind of a practitioner researcher is: Given the continuing technical change in an organisation, how can the researcher improve what is happening in a selected environment?

Schön’s seminal book, *The Reflective Practitioner* (1983), challenges practitioners to reconsider the role of technical knowledge in developing professional excellence. Given that the author has a technical ICT background, is employed as an ICT Research Analyst at eThekwini Municipality in South Africa, is a professional member of the Computer Society of South Africa, he actively participates in contents and contribution to academic conferences and journals, it is contended that he is ‘qualified’ to undertake practitioner-based inquiry that is relevant to real-life practice and for improving what is happening in the selected organisational setting of eThekwini Municipality.

Methodologies (e.g. AR, case study, mixed methods) used in research provide a systematic approach to study the issues or problems in an organisational setting. AR, case study and mixed methods all emphasise the importance of the context and explicitly support the concept of practitioner research. The subject or area of study and the selected methodology are largely defined by the needs of the organisational environment where the practitioner researcher is subject to a variety of personal, interpersonal and organisational influences (Costley and Armsby, 2007: 132). Robson (2000) suggests that practitioners require a high level of flexibility in their choice of methods (e.g. primary or secondary data and analysis) and tools to help ensure credibility and dependability in the complex and context-bound research situation.

Research and development undertaken for practice-led research projects are located within a real-life social and work-based organisational community and give tangible meaning rather than in a hypothetical or devised scenario (Costley and Armsby, 2007: 132). In this case the focus is real-life research and a reflection on real-life practical and pragmatic activities which makes work meaningful to practitioners and researchers. Gray (2004) suggests that his meaningfulness and the implicit understanding of the context are starting points for practitioner researchers to theorise and become more reflective in their practice to enable an outcome (e.g. an improvement to what is happening in a selected environment of an organisational setting) to emerge. It entails the practitioner to build new understandings in the situation that is unfolding. Schön (1983: 68) suggests that the “practitioner … reflects on the phenomenon beforehand and on prior understandings which have been implicit in his behaviour” (Schön, 1983: 68).

Practice-led research projects usually involve a meshing of practical and intellectual capabilities that rely on the context of the community of practice in which the research
practitioner is engaged (Costley and Armsby, 2007: 132). It is within each research practitioner’s context that a pragmatic analysis and a synthesis of empirical and theoretical knowledge that a justification for the selected research methodology or approach should be made. In order to address the real-life problem in an organisational setting, the research design for practitioner-based inquiry is now discussed.

4. RESEARCH DESIGN FOR PRACTITIONER-BASED INQUIRY

Philosophical ideas remain largely ‘hidden’ in research but they still influence the practice of research and need to be identified. The question is thus posed: When adopting a theoretical perspective (i.e., philosophical stance) on research, what lies behind the methodology in question? In order to answer this, Cresswell (2003: 5) suggests three questions central to the design of the research:

- What knowledge claims will be made by the researcher?
- What strategies of inquiry will inform the procedures?; and
- What methods of data collection and analysis will be used?

From these three elements of inquiry (i.e., knowledge claims, strategies of inquiry and methods of data collection and analysis), they combine to form different approaches to research – see Figure 1.

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Figure 1: Knowledge claims, Strategies of Inquiry and Methods of data collection and analysis and the Design Processes of Research (Adapted from Cresswell, 2003: 5)

From Figure 1, a researcher can identify whether a quantitative, qualitative or mixed methods approach to an inquiry should be adopted. Some researchers adopt a pluralistic approach to using multiple methodologies. Knowledge claims, strategies of inquiry and methods of data collection and analysis are now discussed:

4.1. Knowledge claims

A knowledge claim means that the researcher commences with certain perspectives about how the practitioner will learn and what he will learn during the practitioner inquiry. Cresswell (2003: 6) suggests four schools of thought about knowledge claims:

- Postpositivism\(^1\) – deals with the ‘scientific methods’ or quantitative research and reflects a deterministic philosophy;

\(^1\) This term is more generally referred to as positivism. For a discussion of both terms, see Jackson, Søren (2007: 247-266).
• Constructivism – deals with interpretivism ie. addressing the ‘process’ of interaction among individuals while realising that their own backgrounds shapes their interpretation;
• Advocacy – deals with advocating for an agenda to help marginalised people and that the inquiry should be blended with a political agenda; and
• Pragmatism – deals with actions, situations and consequences rather than antecedent conditions. There is a concern with applications ‘what works’ (sic) and solutions to problems.

Cresswell (2003: 12) suggests that pragmatism provides a basis for inquirers drawn from both qualitative and quantitative assumptions when they engage in research and researchers are ‘free’ to choose from the methods, techniques and procedures of research that best meet their needs and purposes. Pragmatism allows an openness to appropriate methodologies in a mixed methods study.

4.2. Strategies of inquiry
Strategies associated with mixed methods include combining field methods eg. observations and interviews (qualitative data) with traditional surveys (quantitative data). The practitioner needs to engage with a situation in a organisational setting. Since all methods have limitations, researchers believe that biases in any single method can ‘neutralise’ the biases of other methods. Cresswell (2003: 17) suggests three general strategies for a mixed methods approach:

• Sequential procedures – the researcher seeks to elaborate on or expand the findings of one method within another method;
• Concurrent procedures – the researcher converges qualitative and quantitative data in order to provide a comprehensive analysis of the research problem; and
• Transformative procedures – the researcher uses a theoretical lens as an overarching perspective within a design that contains both qualitative data and quantitative data. This lens provides a framework for topics of interest and changes anticipated by the study. Within this lens there can be a data collection method that involves a sequential or a concurrent approach.

4.3. Methods of data collection and analysis
For a research approach, the specific methods of data collection and analysis must be identified. For example, for a mixed methods approach, Cresswell (2003: 17) suggests both open- and closed-ended questions, multiple forms of data drawing on all possibilities and statistical text analysis. For a mixed methods approach, the researcher tends to base claims on pragmatic grounds, employs strategies of inquiries that involve collecting data other simultaneously or sequentially a nd collection that involves both qualitative and quantitative data. This lens provides a framework for topics of interest and changes anticipated by the study. Within this lens there can be a data collection method that involves a sequential or concurrent approach.

4.4. eTHEKWINI MUNICIPALITY IN SOUTH AFRICA
eThekwini Municipality is the local authority governing the City of Durban, South Africa. Durban is South Africa’s major port and the second largest industrial hub after Johannesburg. Durban is becoming recognised for its ability to contribute towards building a knowledge and

eThekwini Municipality comprises six clusters (excluding the Office of the City Manager): Treasury, Governance, Sustainable Development & City Enterprises, Corporate & Human Resources, Procurement & Infrastructure and Health, Safety & Social Services) and employs approximately 18,000 employees. For the 2008/9 financial year, eThekwini Municipality has a capital budget of ZAR5.9 billion (approximately €0.39 billion) and an operating budget of ZAR17.5 billion (approximately €1.17 billion). eThekwini Municipality has some 6,000 networked desktops (personal computers, thin clients and laptops).

During 2005 eThekwini Municipality embarked on a knowledge management (KM) initiative and the practitioner was (and continues to be) part of this KM workgroup initiative. Joining the KM workgroup was on a voluntary basis. The KM workgroup comprises some fourteen employees from different clusters/departments within eThekwini Municipality’s organisational setting. The purpose of this KM workgroup initiative was to ‘explore’ whether existing knowledge-sharing processes exist in eThekwini Municipality and to make recommendations towards a KM strategy for eThekwini Municipality. Exploring this real-life phenomenon in eThekwini Municipality and the author’s reflection on the practitioner’s research undertaken are now given.

6. SOME REFLECTIONS ON PRACTITIONER-BASED INQUIRY RESEARCH

A detailed account of the practitioner’s inquiry research is reflected in Averweg (2007). The mixed-methods research approach adopted in the practitioner’s research was as follows:

- Knowledge claim – pragmatism;
- Strategy of inquiry – transformative procedures; and
- Methods of data collection and analysis – secondary data and analysis were used.

During the inquiry, the researcher was mindful that practitioner-research should be self-reflective and critical. From the notion of reflection-in-action, the practitioner reflected “on the phenomenon before him, and on the prior understandings which have been implicit in his behaviour” (Schön, 1983: 68). The researcher made use of a theoretical lens or perspective to guide the selected study. The researcher used theory inductively (as in qualitative research) and deductively (as in quantitative research). This pragmatic approach was to ensure that the researcher drew from both qualitative and quantitative assumptions. This act of reflecting-on-action enabled the practitioner to spend time exploring why he acted as he did. In doing so, the practitioner developed a set of questions and ideas about his activities and professional practice.

The survey on which the researcher reported was practitioner-oriented knowledge. The researcher’s survey design, process and results were presented as an exemplar of practitioner-oriented knowledge and should be seen in the context of informing the researcher’s study. While the study was a practitioner-based inquiry, the researcher was mindful of “the threats to the quality of … the data by being too close to … the research setting” (Saunders, Lewis and Thornhill, 2006: 99). This served as a grounding of professional knowledge (as advocated by Schön). When the author reflects thereon, the researcher was able to construct valid meanings from the research inquiry.
On reflecting-on-action, the researcher had to find a compromise between the ideals of good research and the numerous practical constraints that present themselves in real-life research settings (Terre Blanche and Durrheim, 1999: 36). The researcher had to look to ‘what’ and ‘how’ to research the real-life problem. This implies that from the practitioner’s professional experiences, meanings for the events and the consequences of the practitioner’s actions were taken into account. There was a clear relationship between reflection in and on action. By the author reflecting thereon, there was an emphasis of learning through a practice episode experience. Furthermore the practitioner-based inquiry research. Furthermore the practitioner's experiences, meanings for the events and the consequences of the practitioner’s actions were taken into account. There was a clear relationship between reflection in and on action. By the author reflecting thereon, there was an emphasis of learning through a practice episode experience. Furthermore this has resulted in his practitioner report documenting the reflection of a practitioner-based inquiry research.

7. CONCLUDING REMARKS
It is in the interests of practitioner-based inquiry research to find ways of encouraging learning that is relevant to real-life practice and which does not require unduly tortuous and ideological debate about the merits of reflection. Practitioners are in essence, pragmatic. The wheel of learning consists of question, theory, test and reflection (Handy, 1989).

Practitioner-generated research is the way an area’s content (such as ICT) will commonly be produced and out of which theories about practice can be formulated. Such academic theories about practice can then serve as a way for future practitioners to learn and apply new knowledge to current and future practice. The author bases his comments on his active participation in contents and contribution to academic conferences and journals and this practitioner-based inquiry reflection. These are two different research traditions and it is contended that each field can learn from the other. When the author reflects thereon, it is suggested that encouragement be given for more practitioner-based inquiry research.

8. REFERENCES


Abstract: Empathetic consultancy articulates positive characteristics of long-term ICT capacity building engagements using external advisors. Consultants need to demonstrate commitment to capacity building rather than service delivery, flexibility in adaptation of technical skills to local contexts and resilience in the face of crises. Partner organisations must harness and sustain resources to ensure capacity building takes place. Counterpart team members should be committed to learning, prioritising their own personal and professional development. A case study comprising six education institution ICT installation projects is used to identify factors influencing achievement of project objectives. Projects that do not align with strategic priorities of organisations and personal priorities of counterpart team members are not likely to succeed. New skills must be nurtured with confidence building increments over time. For example, a web presence project did not succeed because senior management commitment was not sufficient to overcome a skills gap and lack of an organisational process for content generation. Three projects that had support from senior management and coincided with technical interests of team members met their objectives and are currently in use. These projects demonstrated a growth of counterpart team skills and confidence, encouraged by declining levels of technical supervision.

Keywords: ICT Capacity Building, ICT for Development, Development Informatics
EMPATHETIC CONSULTANCY: A REFLECTIVE APPROACH TO ICTD

1. INTRODUCTION

Globalisation (Freidman, 2007) (Stiglitz, 2003) and the “Information Age” are creating profound social, cultural and economic changes of historic proportions (Castells, 2000). ICTs have become a fundamental and essential need for any society during the information age. If IT projects are to achieve their objectives, in a development context, they must move from being supply-driven serving passive consumers to being demand-driven by active producers and innovators (Heeks, 2008).

This paper introduces the novel notion of Empathetic Consultancy which characterises factors that positively enhance the achievement of IT capacity building project outcomes. Empathetic Consultancy arises from personal reflections on two years spent on ICT for Development placements with the international NGO Voluntary Services Overseas1 at two educational institutions in Ethiopia.

The rest of this introductory section describes some features of the educational context in Ethiopia, factors influencing capacity building outcomes and a brief overview of commercial consulting. A case study comprising six education institution ICT capacity building projects is presented in Section 2. The six case study projects are discussed to show how organisational, social and technical factors explain different outcomes. The lessons and reflection presented in Section 3 introduce Empathetic Consulting and describe factors influencing case study project outcomes. There is a discussion of the findings and some concluding remarks in Section 4.

1.2 EDUCATIONAL CONTEXT

The Government of the Federal Democratic Republic of Ethiopia (FDRE) has established Capacity Building Strategies and Programs that are designed to achieve the country’s broad development goals (FDRE, 2002). The strategic priorities of the FDRE Ministry of Education (MoE, 2005) highlight expanding access and establishing new universities. The chronic shortage of skilled professionals (Commission for Africa, 2005) and increased demand for secondary school teachers are factors that have precipitated a dramatic higher education expansion plan in the country (Saint, 2004). In 2006-07 a further 13 universities were opened. It has recently been announced that a further 10 universities will be constructed (making a total of 31 universities in Ethiopia). The total number of students enrolled has gone from 54,285 in 2002-03 to 203,399 in 2006-07 (MoE, 2008). This rapidly expanding student population, and a colleague described it as an “environment of constant change” is not without considerable pressure on staff (Assefa, 2009).

The educational culture in Ethiopia has inadvertently tended to promote shallow learning. This has been due to the overwhelming focus on lectures followed by terminal examinations. This educational culture is symptomatic of a “banking” conception of education critiqued in (Friere, 1970). Education is seen largely in terms of a transfer of knowledge from teacher to student.

1 This paper presents the personal reflections of the author and is not intended to represent any official policies of VSO or the Higher Education Strategy Centre.
1.3 CAPACITY BUILDING

Development informatics is essentially about the use of technology to achieve some social or economic development goal, such as poverty alleviation or acquisition of basic literacy skills. Technology diffusion requires adoption of a range of new skills, practices and processes. Thus, lasting change is achieved by changing individuals; new organisational structures and processes will consequentially follow (Black, 2003).

The need to consider both technical and social issues has long been understood in the information systems field, for example see (Bostrom, 1977). More recent research recognises that technology diffusion brings with it the need to develop new trust relations between stakeholders (Barrett, 2001) and identifies seven project success dimensions (Heeks, 2002a):

- Information (data stores, data flows)
- Technology (hardware and software)
- Processes (user activities)
- Objectives and values (culture, politics)
- Staffing and skills (quantitative and qualitative aspects of competencies)
- Management systems and structures
- Other resources (time and money)

The seven dimensions include two that have a strong information systems flavour: information and processes. The other five dimensions can readily be applied to hardware infrastructure projects. Differences are highlighted between hard and soft models in each dimension (Heeks, 2002a). The case studies presented in Section 2 below are interpreted using soft models. Technology is seen as complex and value laden. Objectives are seen as potentially differing between management and counterpart team members and between organisations and individuals. Staff members are seen as political, sometimes prioritising short term self-interested behaviour above longer term personal or professional development. Management systems are observed to be informal and subjective. Resources, such as time, are sometimes seen to be used to further personal objectives. More recent research has used the concept of maturity to model both the skill set of the development team and the organisational project management (Joubert, 2007).

2 CASE STUDY PROJECTS

Six information technology capacity building projects have been chosen to illustrate selection factors that affect outcomes. The projects were conducted over a two year period in the town of Debre Birhan, 130km north east of the Ethiopian capital Addis Ababa. These were not the only projects conducted, but they are representative and illustrate the contrasting outcomes of ICT in Development. Three of the selected projects were completed, while three were not. Completed, as used here, means handed over to users in a working condition. A completed project is a weaker measure of success than a sustainable project (Ali, 2007). Completion is used here since insufficient time has passed in some of the projects to know if any required changes or technical problems can be locally managed.

2.1 Case Study Context

The projects were undertaken in two different institutions, Debre Birhan Teacher Education and Vocational Training College (DBTEVT College) and Debre Birhan University (DBU). The college is administered by the Amhara State Regional Education Bureau and trains...
primary teachers and vocational students. The college celebrated its 50th Anniversary in 2008. The University is a Federal Government funded institution, one of 13 new universities currently being established in the country. The University started teaching classes, accommodated in classrooms on the college campus, in February 2007. The University campus was inaugurated in June 2007. I spent one year each in DBTEVT College and DBU on placements with Voluntary Service Overseas (VSO).

The counterpart team comprised University instructors working with instructors and the technician from the college. Subsequently, the University hired its own technicians who joined the team. Local volunteers from the nearby Health Science and Vocational Colleges contributed to several weekend installation activities.

Some senior officers in the university had been recruited from the college, so several management team members from both institutions had worked together for some years. They share a common outlook, sense of purpose and commitment to education in Ethiopia. Both institutions were prioritising IT, using a variety of techniques to raise funds: from within existing budgets, by reallocating from other budgets and by attracting external funding.

2.2 Case Study Projects

Project A - DBTEVT College Computer Classroom Installation
This project involved moving the college’s main computer teaching classroom into a new building. The room was selected in November 2006. The project involved distribution of electrical power and installation of a 50 seat computer classroom. The capacity was designed to be large enough to accommodate a class of students without the need for computer sharing. Electrical power was supplied to the new site by the Ethiopian Electrical Power Company. I arranged purchasing of equipment and worked with the counterpart team to install power regulation, UPS units and computers (some new, some moved from previous classroom). The first classes, with one student per computer, were run at the new location in April 2007.

Project B - DBTEVT College User Account and File Server Installation
This project was intended to establish a campus intranet including a file server to manage user accounts and provide centralised file storage. This was in order to subsequently provide a data back-up and restore service. A proposal was developed in October 2006 and the team were notified of funding approval, from the Amhara Regional Education Bureau, in March 2007. Procurement started in June but equipment was not obtained until July 2007. The team started work on installation of Ethernet UTP cabling and network sockets for each classroom computer location. The project established provision of dial-up Internet access to computers in a newly established teaching resource centre for staff. However, the placement came to an end before the team was able to install network connections in offices or establish user accounts and storage space on the server. Installation of enterprise anti-virus software solution was also an intended goal of this project which has not yet been completed.

Project C - DBU Internet Service Installation
This project involved installation of an Internet server providing shared access to a dial-up connection. The project followed two computer classroom installation projects completed in early December 2007. An overhead Ethernet UTP cable was installed from the server-room to the remote classroom block where the computer classroom was located. A wooden pole was installed to lift the cable over a rack for vehicle traffic on campus. Ethernet switches were installed, both in the server room and computer classroom. There were problems with telephone line installation. Initially the monopoly telephone company installed the line to the wrong building. The Internet Service was launched during early March 2008.
Project D - DBU Student Registration System
This project was to design, implement and deploy an information system to support staff working in the registrar’s department. The information system was to provide features for student registration, collation of examination results and preparation of transcripts. The system was to be secure, with six to eight users and a student population of about 10,000, including distance, part-time and full-time students. Counterpart team members conducted a requirements gathering workshop with staff from the Registrar’s department. A work plan was developed and work tasks allocated. Some prototype user interfaces, class diagrams and database tables were developed. However, the project team were unable to develop an overall design for the system. This project has not yet been completed.

Project E - DBU Campus Network Extension, Library
Staff Internet access was initially provided in one of the student computer classrooms. Subsequently a small room in one of the buildings designated for use as a library was identified to provide staff Internet access. A wooden pole was installed outside the server room to carry an overhead Ethernet UTP cable linking to the Registrar’s department and on to the library. Internet client computers were installed in the library block, with a N Ethernet switch. This work was completed by local staff during July 2008.

Project F - DBU Web Presence
This project was to gather and edit relevant information from departments and faculties for a brochure website. A domain name needs to be purchased from the Government-owned monopoly telecommunications provider. The web server is located in the campus server room. This project involves establishing a process for gathering, editing and publishing information. Counterpart team members have not had an opportunity to acquire experience of web server technology. This project has not yet been completed.

3. LESSONS AND REFLECTION
Empathetic consultancy is a novel philosophy that seeks to characterise the best practices of consulting in a development context. Engagement of external consultants is one way to build capacity. Empathetic Consultancy recognises that social as well as technical arenas must be managed in order to achieve capacity building project objectives. Empathetic Consulting is organised around three cooperating communities:-

- Partner organisation,
- Counterpart team, and
- Advisors/consultants.

The partner organisation is the host organisation both for the counterpart team and advisors/consultants. The partner organisation is typically a college, university or other institution that seeks enhanced capacity through an external advisor.

The counterpart team comprises technical and/or teaching staff of the institution. They undertake infrastructure development projects, usually on a part-time basis and seek enhanced skills through knowledge transfer. They are often burdened with considerable teaching loads and work in a resource constrained environment.

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2 Philosophy is defined here as the general principles or laws of a field of knowledge or activity (Garrity, 2001).
The advisors/consultants in this study are international volunteers placed with the partner organisation through the NGO Voluntary Service Overseas. It is assumed that the consultants bring technical skills which are lacking in the partner organisation. It is also assumed that the partner organisation finds these skills or capabilities desirable, usually because they will help with the achievement of some other institutional goals or objectives. The advisors/consultants typically project manage capacity building interventions.

Empathetic Consulting assumes a long-lived relationship between consultant and partner organisation. The initial period of apprenticeship, which in Ethiopia seems to require six months, builds trust and enables sensitivity to local culture and work practices. The six selected case study projects reveal several modest successes but also unresolved challenges. The organisational, cultural and political contexts for the projects remained constant and yet the outcomes clearly varied. This confirms the arguments of (Orlikowski01) that technological solutions emerge from socio-economic contexts and become interdependent with them. The need to understand in detail the interaction between contexts, including coercive, mimetic and normative organisational factors has been elaborated elsewhere (Avgerou, 2001).

The college server, student registration and Web presence projects did not achieve their objectives because of the large skills gap among counterpart team members in the areas of software development and Web server technologies. The team members had no prior experience of developing anything more than simple software.

The college server was adversely affected by procurement delays, including equipment and internal construction server room in part of the newly established computer classroom. These delays reduced time available to commission the client-server network and conduct staff training on server configuration and management.

For the student registration software project, there was also a problem of organisational commitment. The information system implementation would have been desirable to management in the registrar’s department. However, there was little or no commitment to the project from senior university management. The project would have required significant investment in staff time to learn the necessary skills to build a prototype, never mind a production system. The consultant and the counterpart team were not successful in ring-fencing sufficient time to progress the project.

The Web presence project has enjoyed organisational support and commitment from partner organisation senior management. However, none of the counterpart team members have previously used web hosting software. There was considerable interest in learning about web server software, although it was difficult to set aside sufficient time. The need to establish a process to gather relevant information from middle management officials, such as Deans and department heads, presents a major challenge for relatively low status staff such as IT technicians. Senior management remain unaware of the need for such a process, imagining that the whole web site can be built by the technical team.

The large (by local standards) project budgets revealed challenges to the purchasing capabilities of both the partner organisation and the purchasing department. Procurement must comply with a legal framework to minimise the risk of corruption. Procurement (even for small items) is conducted by a process of sealed tenders reviewed by a committee. Detailed specifications must be prepared for each item, suppliers identified, tenders obtained, tenders reviewed and approved by a committee before any purchasing can take place. The time taken to negotiate the purchasing process
introduced considerable delays between project approval and work starting. Furthermore a lack of detailed planning meant that missing items were discovered during project implementation which imposed significant procurement challenges while work was in progress.

The three successful projects showed an evolution in skills acquisition by counterpart team members. There was a reducing level of technical supervision from one project to the next. In this way, counterpart team members gained experience and confidence, eventually taking responsibility for conducting some of their work installation work without the consultant.

These projects successfully combined organisational and personal interests. Provision of computer classroom facilities and staff Internet access was a high priority for management at both institutions. Instructors were enthusiastic to enhance their networking skills in order to more successfully teach courses. Thus it was possible to achieve project objectives and provide technical solutions that are in use at the time of writing.

4. DISCUSSION AND CONCLUDING REMARKS

The novel concept of Empathetic Consultancy has been developed to encapsulate positive characteristics of IT capacity building projects using external consultants on long-term, full-time placements with partner organisations. Partner organisations in this study were: a well-established teacher education college and a new university under construction in Debre Birhan in Ethiopia. Core counterpart team members comprised instructors and technicians from the university and college. In addition, local volunteers from nearby colleges contributed to several of the projects.

Senior management in partner organisations need to galvanize and sustain commitment to IT capacity building. Only if the commitment of external stakeholders, decision-makers and middle management is maintained can organisations attract and deploy the resources needed to achieve project objectives. Detailed strategic plans are required to ensure targets are resilient to abrupt changes of priorities due to turn-over of key staff.

Counterpart team members must be able to spare the time to learn new skills and gain experience. This requires a commitment to learning that overcomes short-term temptations for personal income generation.

Consultants using Empathetic Consulting undergo a period of apprenticeship, which in Ethiopia seems to require about six months, to build relationships of trust with counterpart team members. The apprenticeship allows consultants to gain understanding of local culture and work practices. Consultant empathy with organisational goals and personal aspirations of counterpart team members helps develop commitment from the partner organisation. Consultant flexibility enables technical skills acquired elsewhere to be adapted to a local context. Resilience is required to ensure that plans are adapted, or if necessary rewritten, in response to abrupt changes in fragile, and sometimes dysfunctional, partner organisations.

Project selection, within the context of a long-term consulting engagement, is critical. Over ambitious projects may not succeed in attracting sufficient resources and may not be sustainable with the skill-base available in the partner organisation.
Six case study projects were selected for inclusion in this study to demonstrate contrasting outcomes. The college server, University student registration and web presence projects were all over ambitious. There was insufficient time and commitment to undertake both network installation and learn about server configuration. The placement finished before it was possible to obtain financial approval, conduct procurement and develop the necessary counterpart team member skills.

The University student registration project required the counterpart team to learn too many new skills without gaining sufficient support or encouragement from partner or organisation management. The project was not a high priority for university senior management, although the information system would have been attractive for the registrar’s department.

The Web presence project was supported by senior University management, but progress has been hampered by a lack of organisational processes to develop content. The counterpart team were also unable to commit sufficient time to learn new skills in the area of web hosting software.

Three of the projects, involving computer classroom and Ethernet network installation, achieved their objectives and are still in use at the time of writing. The projects showed an evolution in the acquisition of new skills and experience in the counterpart team. The level and detail of technical supervision was decreased from one project to the next.

The study shows that project selection, within an Empathetic Consulting context, needs to be given greater attention by practitioners. Projects must align with both the strategic aspirations of partner or organisations and personal aspirations of counterpart team members to achieve their objectives. Technologies requiring skills outside the current knowledge base take considerable time and resources to develop.

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REFERENCES


Abstract: To strengthen the Afghan higher education in the field of Computer Science, 25 Afghan lecturers are studying at the Technical University of Berlin (TU Berlin) in a Masters program, that has been designed to fit to the specialized needs of Information Technology (IT) in Afghanistan. This report summarizes the national IT strategy of Afghanistan, the framework in which the Masters program was conceptualized. An overview of the structure and the curriculum of the program, which combines teachings and practical projects at both TU Berlin and the six participating Afghan universities in Kabul, Herat, Nangarhar, Kandahar, and Balkh, is given. After the first year of the program, some reflections are made on the problems that have arisen, solutions that have been found, and experiences that have been gained. The paper concludes that while higher education in Afghanistan has not reached an internationally comparable level, there is a demand for further qualification of lecturers abroad. These study programs can be most effective when offering courses that conform with the IT demands of Afghan society.

Keywords: Afghanistan, Capacity Building, Computer Science Education, ICT for Development
1. INTRODUCTION

1.1 IT IN AFGHANISTAN

Afghanistan has come a long way since the Transitional Islamic State of Afghanistan came into existence in December 2001. After the end of the Taliban regime, Afghanistan’s infrastructure was in a desolate condition. Water and power supply had been either destroyed during the years of war or never been developed broadly, the educational system had been widely disregarded and telephone lines where limited to few households.

When the international community had agreed upon supporting the extensive rebuilding work in late 2001, the role of education in this post-conflict reconstruction received a lot of attention. The number of enrolled students is now as high as never before and with the increasing number of students graduating from high schools still on the rise. The challenge for the government of Afghanistan is to meet this demand, as higher learning forms the basis for state- and nation-building and there continues to be a critical shortage of professionals to comply with the needs of reconstruction, growth and poverty reduction.

Information technology (IT) plays a crucial role as it provides many opportunities to improve overall educational conditions of today such as

- the lack of libraries and technical literature,
- the lack of cooperation between national and international universities,
- the limited computer experience,
- the complicated and non-transparent administration.

This impression is reflected in the ambitious intentions of the donor countries as well as private companies to invest in IT. It is widely considered an opportunity for Afghanistan to become part of the “global knowledge society”.

However, the IT landscape had to be build up from zero, because any technology usage was strictly forbidden during the rule of the Taliban. Beginning in 2002 the universities started introducing Computer Science study programs with the help of foreign lecturers from mostly Pakistan and Iran, as well as some Afghan lecturers who had studied in exile. Currently there is a Faculty of Computer Science at Herat University; the universities of Kabul, Nangarhar, Bamyan, and Kabul Polytechnic University all have Departments of Computer Science. In addition to these offers by public universities, there are six private universities and numerous institutes offering IT courses (Herlitz 2008), though quality assurance standards are difficult to achieve in the current situation in both sectors.

The universities do not have enough qualified lecturers to meet the demand for IT qualification. Currently the gap on the supply side is still filled by foreign lecturers who support teachings for one or two semesters as well as young graduates who still lack the necessary qualification.
1.2 National IT Strategy for Higher Education in Afghanistan

The lack of qualified IT personnel is only one of the many problems IT faces in higher education in Afghanistan. These problems have been analyzed by the Ministry of Higher Education (MoHE) which has been involved in supporting IT projects at several Afghan Universities in the last six years and as a result has developed a “National IT Strategy for Higher Education in Afghanistan” (MoHE 2008), which is composed of the following areas:

**IT infrastructure**

As mentioned above, the physical infrastructure of Afghanistan is in a state of rebuilding. Reasonable computer usage though requires a certain stability in power supply; buildings need to be clean, dust free and the temperature variations should not exceed a certain level.

**Acquisition and use**

To meet with the deficiency of equipment the incomplete knowledge to maintain them, the organization and planning of IT supply for institutes of higher education needs to be coordinated.

**Budgetary and personnel**

Offering introductory courses for university administration and academic staff is necessary to assure efficient management of the resources.

**Supervision and quality control**

Quality assurance standards for IT trainings as well as academic degrees have to be developed, monitored by a national IT board. IT representatives at each institute of higher education assure a close collaboration with the MoHE.

**Coordination of all national and international co-operations**

All IT projects in higher education are coordinated by the IT Department of the MoHE in close cooperation with the international partner organizations.

These initiatives show the great demand for IT specialists and computer scientists, which currently cannot be met due to the lack of sufficient educational programs in IT and Computer Science.

1.3 Support by TU Berlin in Building Up IT Structures in Afghanistan

This lack of IT specialists had also been recognized by the Technical University Berlin (TU Berlin), which started its activities in Afghanistan in 2002. In that year Dr. Nazir Peroz, head of the Centre for International and Intercultural Communication (ZiiK) of the university, joined a fact finding mission in Kabul in order to examine the current situation of higher education in Afghanistan. TU Berlin agreed upon supporting the process of bringing IT into Afghan higher education by constructing an IT center at Kabul University (ITCK), opened in March 2003 (Peroz 2008). The technical realization of the ITCK was accompanied by a training program for future administrators and trainers, who trained the students, lecturers and personnel of Kabul University in the upcoming years. Up to today, more than 1800 university members have received IT training as part of this program.

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1 Currently the average household in Kabul receives three hours of electricity per day. The situation in Kabul University is better, with an average of 1 hour of power blackout per day. A backup power supply by inefficient and polluting diesel generators therefore remains necessary.
In the following years, the engagement of TU Berlin in Afghanistan has been extended to many other projects, which include the establishment of a Computer Science Faculty at Herat University (Mahr and Peroz 2006), summer and winter academies at TU Berlin, and support in the establishment of an IT section within the Ministry of Higher Education.

All projects conducted have had a holistic approach, covering infrastructure and education as well as concepts and management.

2. CONCEPT OF A MASTER PROGRAM FOR AFGHAN LECTURERS

Since the lack of qualified Computer Science teaching personnel at Afghan higher education institutions is one of the biggest challenges that IT development in Afghanistan faces today, a concept has been developed to further qualify the best young graduates from six universities in order to become the future lecturers in Computer Science. This concept has been elaborated by TU Berlin in a joint effort with the Ministry of Higher Education of Afghanistan and Herat University.

The curriculum of the Master Program has been designed to meet the requirements for future lecturers in Afghanistan. These lecturers are going to teach in an environment, in which the field of Computer Science is only some six years old. To meet the demand for IT specialists, Computer Science studies in Afghanistan are focused on building capacity to work on IT solutions within the Afghan society rather than on scientific research on an international level.

<table>
<thead>
<tr>
<th>Sem.</th>
<th>CP</th>
<th>Studies in Computer Science</th>
<th>Application Project</th>
<th>General Studies</th>
<th>Place</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. CS Studies II</td>
<td>30</td>
<td>Focus Studies in 1 of the 3 expertise areas (6)</td>
<td>Focus Studies in 1 of the 3 expertise areas (6)</td>
<td>Computer Science and Society (6)</td>
<td>Teaching Computer Science (Didactics) Part II (2)</td>
<td>TU Berlin</td>
</tr>
</tbody>
</table>

Table 1. Structure of Special Master Program for Afghan Lecturers

The program is made up of five semesters (see Table 1), the first being a preparatory semester in which the Computer Science fundamentals, normally taught at Bachelor level are laid. This propaedeutical semester gives the opportunity to flatten the knowledge and experience gap that existed between participants from different universities. The two
subsequent semesters at TU Berlin provide a compact education in the most important Computer Science fields for the needs of Afghanistan.

The National Strategic Plan for IT in Higher Education of the Ministry of Higher Education (MoHE 2008) suggests four departments for Computer Science Faculties at Afghan universities: “Computer Networks and Operating Systems”, “Information and Database Systems”, “Software Engineering”, and “Computer Science and Society”. The curriculum for the special program has been developed to fit around these four pillars. Everyone is participating in basic courses of all four fields. One of the former three fields has to be chosen as a study focus, the area in which the participant will teach in the future. The courses offered are new modules within the Master studies in Computer Science at TU Berlin, that are designed to meet the special demands of Afghanistan. Topics such as the internationalization of database systems and the localization of user interfaces to Dari and Pushto, the official languages of Afghanistan, were included in the modules. The courses are being taught by lecturers that have experience in the implementation of IT projects in developing countries. Since sustainability in Afghan universities can only be assured by relying on Open Source Software, all courses use Open Source technologies to impart the relevant concepts.

The focus on didactic techniques is important since the action field of the participants is teaching of Computer Science. The Afghan educational system is based on repeating memorized facts. In the course “Didactics of Computer Science” the participants are familiarized with teaching methods suitable for transferring Computer Science techniques and training abstract thinking and problem solving. The action fields of the graduates of the Bachelor programs of Computer Science at Afghan universities are numerous. There is demand in the public and private sector as well as in the offices of international donor organizations. Due to the demand caused by the latter, the wages of a Computer Scientist in Afghanistan reach amounts of up to 5000 US dollars per month. To avoid a brain drain of the participants of the program to the non-educational sector, the Ministry of Higher Education obligates all participants to sign a contract of working in the university for at least five years after their return to Afghanistan.

The theoretical knowledge gained in the first three semesters is going to be put into practice during the fourth semester, in which an application project is being implemented by the participants at their respective universities. The application projects do not only help the participants gain practical knowledge on implementing IT projects, but will also directly help to improve the IT landscape of the university or institution. The final semester, in which the Masters thesis is being written, is again held at TU Berlin.

After a selection process from different concepts by international organizations, World Bank decided to finance the deployment of the concept from TU Berlin as part of the Strengthening Higher Education Program (SHEP). The financing for the preparatory semester has been granted by the German Academic Exchange Service (DAAD).

3. EXPERIENCES AND REFLECTION

The deployment began in late 2007 with a selection process for candidates for the program. At current the program concluded its third semester and the participants returned to Afghanistan to start their application semester. Having passed more than half of the program gives the opportunity to reflect on some problems, solutions, and experiences.
3.1 Selection Process
In order to select candidates for this scholarship, the Universities of Kabul, Herat, Balkh, Nangarhar, Kandahar, and Kabul Polytechnic University were asked to select eight lecturers of Computer Science in order to participate at a selection process in Kabul in late 2007. The selection committee was compound of members from the Ministry of Higher Education, DAAD, and TU Berlin. The requirements to participate in the program were

1. completed studies in Computer Science or a related subject at a higher education institution in Afghanistan, and
2. at least two years of teaching experience as lecturer or tutor.

Since Computer Science is so far only taught in Kabul, Herat and Nangarhar, graduates from subjects similar to Computer Science were given the opportunity to participate. This is the only possibility to build up Computer Science Departments at Balkh and Kandahar Universities, as graduates from Kabul University are unlikely to be willing to move to Kandahar for their professional career.\(^2\)

The examination procedure consisted of a personal interview and two written tests: English language as well as mathematics and logical thinking. In the personal interviews the candidates were asked for their experiences and the motivation for becoming lecturers and were tested on the fluency and understanding of English language. Selection of the participants was not an easy task, as the education that the different candidates had received in their respective provinces had been of different quality levels. Minimum requirements were defined that all participants had to meet, regardless of their university. Not all the lecturers chosen by the universities met the minimum requirements so that it was not possible to have an even distribution of participants across the universities as it was originally planned. This caused some frustration among the members of the universities of which many candidates had to be rejected. From each university between two and six of the applicants were finally chosen for the program.

Only the universities from Kabul and Herat sent women as candidates to the selection process. Eight of them were chosen for the program. Due to the strong family ties and the weak stand of women in the Afghan society, a lot of effort had to be put into convincing their families. Some families argued it was a weakness of the program that it is not possible to get a scholarship for an accompanying family member for the stays abroad.

3.2 Preparatory Semester in Kabul

The preparatory semester was held by three lecturers from TU Berlin at the IT Center of Kabul University. This provided the opportunity for the students of getting acquainted with teaching methods used at a German university while still being in a familiar environment (cf. Carver 2008). During this propaedeutical semester, the most experienced students of the group were giving tutorials on the topics taught, so that it was possible to narrow the knowledge gap a little. The lecturers were able to profit from the experiences gained in introducing a tutorial model to Herat University in 2005, as the tutorial concept is completely new in Afghan higher education.

\(^2\) The situation can be compared to the first study programs in the field Computer Science in the 1960s and 1970s in western countries in which the lecturers came from Mathematics, Electrical Engineering, and similar fields.
Nevertheless the time was too short to narrow the knowledge gap to a satisfying level. At the end of the semester there was still a very wide distribution of final test results. In a repetition of the program there will probably be a complete propaedeutical semester at TU Berlin and a preceding additional introductory course in Afghanistan for those participants that have not studied Computer Science before joining the program.

3.3 Second and Third Semester at TU Berlin

In the beginning of the second semester the students chose one of the three study focuses. This distribution had to be done in a coordinated manner, so that students from the same Afghan university are now studying in different study focuses. It was difficult to convince students, that a basic knowledge of the remaining two study focuses is also necessary. The basic knowledge was taught in lectures with accompanying exercises. The study focus classes were taught always taught by the same lecturers. This resulted in a very close relationship, since the students had a constant contact person in their study field throughout the whole program. Almost all participants visited the weekly consultation hours on a regular basis. Additionally there was a constant e-mail exchange on all kinds of technical issues.

The Afghan education system seems to encourage the students little of studying independently outside the classroom. Continuing motivation of the students was necessary, which could be achieved by constantly providing examples of how the theoretical foundations taught could be used in practice in the context of Afghanistan. This was even more effective in the study focus classes, since there were only between seven and nine students in one class. In each of these classes a semester project that could be used in the Afghan context was implemented. The courses showed that soft skills as project management and team work had not been exercised before. In a future instance of the program the students should some theoretical introduction to these skills before applying them directly in a project.

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Some of the participants criticized, that in the second semester there was only a limited offer of Computer Science modules, which were not part of the special program. This made interaction with other students more difficult. Countering this issue was not an easy task, since not all modules at TU Berlin are offered in English and many of them were based on fundamental courses offered only in the winter semester. This situation improved in the third semester in which more elective courses in English language were available. Having been fascinated by the idea of Open Source in the previous semester, many participants chose the module “Open Source and Development Cooperation”. Future instances of the program should be arranged in such a way that the second semester of the program is a winter semester at TU Berlin, so that more fundamental modules are offered at the faculty.

Students who had failed courses in the second semester were given the opportunity of attending repetition courses during the semester break and taking a retest at the end of the semester break. This gave the possibility of not having to repeat the course in an upcoming semester and thereby extending the duration of study, which would not have been possible due to the limited amount granted by the scholarship. Failing courses has been a new experience to Afghan students, since this is practically impossible within the Afghan higher education system (cf. Carver 2008).

To cope with this kind of situation was just one of the cultural shocks that the participants had to experience. An accompanying cultural program was aimed to getting to know other aspects of German culture and thereby reducing the risk of such cultural shocks. One student assistant was taking care of this cultural program. He was also the contact person for all kinds of administrative, health, and personal problems. Having a full time student assistant in
charge for the Master's program proved to have been a wise decision. Currently there are
thoughts of extending this role to two student assistants, because currently the women
participating in the program feeling better contacting a female scientific employee, who is
dedicating a lot of her work time in helping to solve problems.

To further narrow the knowledge gap between the participants, a special course was offered
in the semester break for all students that had not studied computer science before. It repeated
some of the fundamentals of algorithms, as well as other topics in which difficulties had been
identified.

3.4 Application Semester
In the upcoming semester, each participant will design and implement an application project
in their home university. Depending on the current development of IT at the respective
universities, the students designed projects ranging from laying the basic infrastructure
foundations for a future IT center at Kandahar University to developing specialized software
systems for university administration in Kabul. As a lot of the projects are functionally
interwined, a colloquium was held in the last weeks in Berlin, in which each participant was
introducing his or her plans to the other participants and the supervising lecturers from TU
Berlin. The supervision of the implementation of the projects will be the most difficult part in
the application semester, as there is only limited internet access in some of the Afghan
universities. A communication platform has been established that consists of a project
management system (Trac) and an IRC channel. The participants are asked to publish a bi-
weekly progress report on the wiki in the Trac system. The IRC channel gives the opportunity
to communicate directly and with fast responses using only a minimum of bandwidth.
Additionally there is a constant communication by e-mail between lecturers and students.
Personal progress reports and feedback from the projects will be collected during a lecturer's
visit to Kabul in May 2009.

4. CONCLUSION
The action fields that graduates from Afghan universities will be working in, differ from
those in western countries. This leads to a curriculum which is orientated more on the
practical application of IT solutions in Afghan society. Computer Science lecturers at Afghan
universities need to gain a profound knowledge of their field, which so far can not be gained
within Afghanistan. Afghan teaching staff must therefore receive further qualification at
foreign universities. The differing prerequisites of the participants and the different kind of IT
demand in Afghanistan results in a different profile for the lecturers which can be achieved
by offering specialized courses within a Master study course in Computer Science at an
internationally comparable level.

Since the presented project is a pilot project in this area, there is a need for further evaluation
of the outcome, once the participants have completed their studies and are teaching in
Afghanistan. Experiences gained in this program can be used to provide similar courses
aimed to participants that are going to work in a developing country in the future.

5. REFERENCES

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Abstract: This paper outlines an applied research project which was successfully conducted in Bangladesh. Prior research has shown that attitudes and a lack of knowledge have been the major stumbling blocks preventing ICT adoption in Bangladesh’s public sector. Accordingly, this one-year project under the auspices of the Australian Government’s Public Sector Linkages Program (PSLP) addressed two critical issues: filling the ‘knowledge gap’ on eGovernment processes and empowering government officials and decision makers to prepare them for successful implementation of eGovernance. In addition to preparing a strategy based on the prior research, the project aimed to build the capacity of government officials through a comprehensive but concise training program. The training was supported by a handbook specially prepared to suit the context that is likely to serve as a constant companion and guide for day-to-day IT management for government officials.

Keywords: capacity building, eGovernment, ICT4D, public sector
1. INTRODUCTION

The least developed countries (LDCs) are the victims of an increasing digital divide. Many struggle to find a workable modality to bridge or reduce this gap in the global information race. Initiatives at both the national and international level have created a lot of rhetoric but have failed to deliver programs that promote the adoption of Information and Communication Technology (ICT) (Heeks, 2002). Often it is the bureaucratic tradition of the colonial system with its stubborn hierarchical structure that is slow to respond to the changes that modern ICT offers.

Prior studies indicate that correct use of ICT has the potential to improve efficiency and productivity in the public sector in LDCs, which can also have flow-on effects to other sectors (World-Bank, 2005). It is encouraging to find that the Government has gained importance on the Bangladesh government’s agenda (Sobhan et al., 2004). However, the government lacks the required knowledge, expertise and resources necessary for the adoption of ICTs (Imran, 2006). Greater strategic direction and institutional help supported by strong political will is necessary to take eGovernment forward. While the developed countries are engaging themselves in fine tuning government services at higher stages of eGovernment, LDCs like Bangladesh are struggling to overcome the initial stages of eGovernment adoption (Imran and Gregor, 2007).

The project described here aimed to first develop “know-how” among key decision makers and government officials in Bangladesh for the effective use of ICT in modern public organizations through a comprehensive, concise training program supported by a handbook as a constant companion and guide for daily IT management issues. The handbook is expected to equip officials with sufficient knowledge to prepare requirement documents for software developers, pre- and post-evaluation procedures, ICT governance, ICT auditing and some project management skills specifically for eGovernment projects.

This project stands out by focusing on the critical issue of filling the ‘knowledge gap’ on eGovernment processes and process reengineering, in a systematic way to achieve successful implementation of ICTs. It was found that government officials with a good understanding of the effective use of ICT and eGovernment can be important drivers in the implementation of eGovernment in a LDC.

This paper briefly narrates the project, its goals and objectives, major deliverables, challenges and some lessons learnt to date.

2. THE PSLP eGOV PROJECT

The project reported here was initiated by the National Centre for Information Systems Research (NCISR) at the Australian National University (ANU) in 2008 through a competitive AusAID Public Service Linkage Program (PSLP). PSLP is a special scheme of AusAID, which aims to improve public sector capacity in selected Asian countries for governance and management. This project is a nationally determined development outcome (AusAID, 2008).
2008). Improving internal government processes (G2G), which is an important part of eGovernment is the major focus of this project. The project was based on PhD research on ICT adoption in the public sector of an LDC largely motivated by the personal experience of the lead author while working as an IT administrator in the public sector in Bangladesh. Earlier research (Imran, 2006) found a lack of knowledge and the attitudes towards ICT of senior public servants as the major stumbling blocks that are preventing ICT adoption in Bangladesh’s public sector. These deep-rooted underlying causes have not been addressed adequately or systematically by any past eGovernment initiatives in Bangladesh, where the focus has been mostly on technological aspects. Based on a framework taking insights from Roger’s (1995) Diffusion and Innovation theory, Scott’s (2001) Institutional theory and Attewell’s (1992) Knowledge Building framework, earlier research recommended a slow and steady approach to overcome the institutional inertia prevailing in the public sector environment in Bangladesh (Imran, 2006).

The counterpart public service agency of this project was the Ministry of Science and Information and Communication Technology (MOSICT) of Bangladesh. The Bangladesh Institute of Peace and Security Studies (BIPSS) provided support as a third party organization. The one year project was implemented in three phases.

2.2 Goals and Objectives of Project

The activity was aimed towards adoption of effective eGovernment in Bangladesh, focusing on capacity building of government officials to improve government processes (e-Administration) or G2G (Government to Government) services.

The objectives of the activity were:
- To develop “know-how” among key decision makers and government officials in Bangladesh concerning the effective use of ICT in public sector organizations.
- To develop strategies for the effective uptake of ICT and eGovernment in Bangladesh.
- To support ongoing projects in eGovernment in Bangladesh.

2.3 Major Deliverables

The project had two major deliverables:

2.3.1 eGovernment for Bangladesh: A Strategic Pathway to success

This was a comprehensive report with a strategic direction (Imran et al., 2008), which gives an outline for long-term eGovernment adoption and implementation for Bangladesh based on the findings of ongoing research and detailed review and recommendations by the project team. This significant part of the activity will have long-term implications. Despite many initiatives over the past few years in Bangladesh, satisfactory progress has not been achieved in this area. As such, this strategic direction will be an important starting point towards attaining eGovernment capacity in the public sector of Bangladesh which will serve as a constant reference and guideline for future eGovernment initiatives in Bangladesh. The report included details of the PSLP activity, including the training plans.

2.3.2 ICT Management Handbook and Training Package; A Guide for Government Officers of Bangladesh
This concise handbook (Gregor et al., 2008) includes four modules: (a) Introduction to the eGovernment Framework (b) Making an ICT Business Case (c) Project Management and (d) Managing Outcomes. Each module has been developed by expert consultants in the respective areas based on research findings and, through close consultation and extensive local involvement, tailored to suit local conditions. The training package includes Teaching Material with PowerPoint slides, Exercises and/or Quizzes with suggested answers, and Video clips, all of which take two days to deliver. The Teaching Package is a self-contained package that can be re-used over multiple offerings of the teaching program and be able to be delivered by people other than the original developers.

3. PROJECT PHASES

3.1 Phase 1 (Jan – Sep 2008)

Review of existing eGovernment strategies and training needs was carried out with extensive local involvement and previous empirical study. Input was sought from current collaborators such as the Australian Government Information Management Office (AGIMO) and other agencies. Two mini-workshops were arranged with stakeholders to prepare the schedule and task list; one in Bangladesh and one in Canberra. The aim of the workshops was to build a common understanding through the exchange of views on strategies and training needs to initiate the project and also to share best practices and develop strategies for continued effective utilization of ICT in eGovernment in Bangladesh. During Jul – Sept 2008, the package for the “ICT Management for Government Officers” – the 2 day program – was developed with extensive local involvement to suit local conditions.

3.1.1 Road Test

The entire Program Package was piloted and refined. A preliminary road test was carried out with the team and some invited participants (Bangladeshi-born students studying at ANU). A further revision was carried out based on the feedback and evaluation of the road test to suit the local condition.

3.2 Phase 2 (Oct 2008)

A seminar was delivered followed by the launch of the Strategy in Bangladesh, where the final report with a road map for the project was presented to the Minister for Science and Information and Communication Technology (MOSICT) of the Government of Bangladesh.

The training package was delivered as a two-day workshop over multiple offerings. Participants (total 107) were senior and middle managers from the public sector selected by MOSICT. The participants fell into two groups: (a) potential champions, from among relevant department Heads and similar positions of influence and (b) people who are likely to become trainers in the follow-on stages. The 3 Training Programs had about 35 participants on average, with a mix of “champions” and potential “trainers”. Workshop attendees then returned to their agency to act as a nucleus for further change. Prior experience and innovation literature suggest that having a group rather than a single “change” agent in an organization provides more credibility and leads to more effective uptake of ideas.
3.3 Phase 3 (Nov 2008 onwards)

Phase 3 is a follow-up rather than an immediate part of the activity. This however depends on the interest and willingness of all the parties involved. In Bangladesh the follow-up activities could include further knowledge delivery programs and mentoring of key eGovernment development projects. Engaging in these follow-up activities fits well with the mission of NCISR, which is to engage in applied research that has practical and societal value. Follow-up studies are being planned to evaluate and monitor the training outcomes and the change of attitude and mindset of the government officials after the activity. The result of these evaluations and best practice guides will also be published in the print media and Government media in Bangladesh, so that the stakeholders can derive benefit.

The willingness of the counterpart organization to support further offerings of the program by local trainers will also be evidence of its effectiveness. An early positive sign is that MOSICT has taken initiative to reprint another 500 copies of the handbook at its own cost to be distributed amongst the public servants and departments within the government.

4. DISCUSSION AND LESSONS LEARNED

The reported activity is an initial step towards adopting sustainable and workable eGovernment in the context of Bangladesh. It offers a holistic approach that addresses the major issues and barriers to ICT adoption in this country. These issues and barriers need to be addressed before infrastructure and technological solutions can be effectively implemented.

The ‘Educate to Innovate’ activity to raise awareness through targeted training is expected to build the capacity of the key officials who will be dealing with future eGovernment projects undertaken by the government. It is not expected that participants attained an in-depth knowledge of IT management with this intensive two-day training module. Rather the program is designed to enable the important officials who are sparing two whole working days to utilize their acquired skills in the best possible manner. Such courses are often effective in bringing the participants in line with the contemporary and modern changes in public sector management.

Using an initial execution of the training program for senior officials as an ‘ice breaker’ was found to be very effective. Many of them shared their experiences at the training workshop with their colleagues in their department, which created a very positive impact. Personal responses, both verbal and email, were very satisfying and evidence of the training’s effectiveness.

Dealing with bureaucracy and public sector of officials in a developing country is always a challenging task because of the hierarchy and complexities that the procedure involves, especially in implementing an applied research project from overseas. This challenge was met through prior connections established through the lead researcher’s previous working experience in the Bangladesh Government and a continued relationship, persistence and, above all, strong motivation about the novelty and impact of the outcome of the project. A willing and committed champion within the counterpart organization was also found to be essential.
In the LDCs, a majority of the population are under the poverty line, deprived of education and knowledge, and are heavily dependent on government or their leaders (UN-OHRLLS, 2007). Often they tend to be good followers rather than exercising their own rights. As such, a top-down approach can be effective to bring change. A single good government decision affects millions in LDCs. These millions would otherwise be difficult to reach through a bottom-up approach, which would also be a lengthy and time-consuming procedure. Thus, educating a single government official or decision maker is sometimes equivalent to educating millions because his/her one good decision could bring change to the lives of millions (Imran et al., 2008).

A working experience and immersion in the context of the public sector environment in an LDC helped to address the challenges and also to capture the underlying issues that are often overlooked. Reputation, trust and working experience of the researcher in the context was instrumental in this project. Having the support of NCISR of ANU which has been designed to be able to carry out such a project and its experienced and capable researchers and members to work as a team provided the means to take this forward. ANU’s world-class research capability and reputation is widely recognized. Further, the topic and project being originated from PhD research; the rigor and relevancy required for such an important national level project was obtained through sound theoretical and academic foundation. Good access and personal liaison with the stakeholders of ICT in the country, some national policymakers, and Government agencies were instrumental for the project to be a success.

5. CONCLUSION

The activity in Bangladesh has a strong potential to contribute to the overall development of the country by addressing one of the key hindrances in the development of public sector organizations: a lack of efficiency and transparency. This activity focused on an important underlying issue of bridging the knowledge gap, which is likely to resolve a lot of other associated issues with ICT adoption in the public sector such as, attitude and typical mindset, lack of willingness to change the status quo, procrastination in decision making, and motivation for such innovation. It is hoped to build the capacity of government officials who are expected to deal with future eGovernment projects in Bangladesh. Institutional strengthening is a long process but the right direction and progress toward this is extremely important. Adoption of eGovernment will not only improve internal efficiency of the Bangladesh public service, but will also facilitate international business connectivity and transactions, as well as fulfill other international agenda including poverty alleviation and attainment of the Millennium Development Goal (MDG) set by the United Nations.

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BUILDING SOFTWARE DEVELOPMENT CAPACITY AND COMPETENCE IN RURAL NIGERIA: PITFALLS AND PROSPECTS

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Abstract: This paper explores issues facing ICT education at the university level and its potential for socio-economic development and job creation. An internationally outsourced student software development project is assessed to find the pitfalls, prospects and lessons learnt on how to better prepare students to develop capacity and competence and attract paying jobs to sub-Saharan Africa to help bring socio-economic development, build a nascent knowledge economy and a new middle class.

Keywords: ICT education, software development, ICT and social-economic development, ICT and job creation

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BUILDING SOFTWARE DEVELOPMENT CAPACITY AND COMPETENCE IN RURAL NIGERIA: PITFALLS AND PROSPECTS

1. INTRODUCTION

Access to modern software, Internet connectivity, ICT infrastructure and adequate faculty with the appropriate education and training in ICT is scarce in many institutions in sub-Saharan Africa thus affecting the quality and competence of graduates.

This practitioner's report assesses issues confronted and lessons learnt in a software development project undertaken by third year students at the School of Information Technology & Communications through The African Center for ICT Innovation and Training (henceforth, the Center or ACIT) which recognized the value of training a small cadre of very bright, technologically advanced students excelling in ICT courses at American University of Nigeria (AUN) by providing mentoring from ICT faculty and assigning supervised locally relevant software development (such as health informatics) with the expectation of developing products and services, good enough for the internationally competitive market, and for the socio-economic development of rural communities and Nigeria.

2. HOW DO YOU EDUCATE UNDERGRADUATES TO BECOME CAPABLE IT PROFESSIONALS?

Providing the human capital required for ICT-enabled industries is perhaps the best form of intervention to expand employment opportunities for young people, with track record better than subsidies and tax breaks to industry (Kenny, 2006). However, educating undergraduate students to be capable IT professionals poses several significant problems (Scott 2004; Dawson & Newman 2002). According to McGuire and Randall (1998), the growing global economy for software products and services has caused a shift which increasingly necessitates the effective use of information technology. This includes amongst others, communication technology as well as organizing, accessing and generating information. Software professionals are thus confronted with the dynamic, sometimes unstable and complex nature of software development environments and must be able to rise to the challenge of dealing effectively with these situations.

Several authors (Scott, 2004; Dawson and Newman 2002; Noll and Wilkens 2002; Tuttle 2000; Kussmaul 2000) have therefore argued the revolutionary and rapidly changing field of Information Systems places stringent demands on IT/IS educators, which calls for continually revising and changing programs and curricula in an attempt to better equip students for the marketplace. Phukan (2001) is of the opinion determining the exact content required by these curricula is a real problem. Enormous technological advances have brought the global marketplace within reach of even small organizations, creating both enormous opportunities as well as threats. However, to effectively operate in a global environment and escape its negative effects, IS/IT students who will move into their careers by working for international organizations, businesses or governments, need to be equipped with a comprehensive array of skills. A further implication is that IS education across the world needs to provide a basic foundation of skills and knowledge emphasizing effective delivery of information to prepare future IS professionals (Scott, 2004; Phukan, 2001).
Experiential learning has been touted, especially in the development economics field, as a viable strategy to empower students. Dawson and Newman (2002) adopted a strategy of empowerment by utilizing experiential learning. They created a project environment to motivate and challenge. Therefore, in the School of Information, Technology and Communications (SITC) at AUN and at the Center (ACIT), experiential learning is largely encouraged.

3. ARE STUDENTS PREPARED FOR THE COMPETITIVE ICT SECTOR?

The IT infrastructure in place at AUN is as good as those in campuses and organizations in the USA, Indian or China that typically attract software work. Further, the technical and programming skills of the students are excellent as a result of a well thought out computer science/software engineering and information systems curricula.

The students’ skill sets were developed and strengthened through curricula modeled after ACM/IEEE and ABET guidelines. The faculty members were recruited from top universities in the UK, USA and Russia. The courses emphasized problem solving and applied skills. The class sizes were small and students had access to modern textbooks and each one of them, as well as all students at AUN, were given a wireless enabled laptop with 24/7 Internet access.

The students who were selected to build software applications were third year students who had already taken adequate computer science, software engineering and information systems courses including two programming principles courses using Java, introduction to UNIX and systems administration, data structures & algorithm, discrete structures, systems programming, data base management systems, software engineering, software construction, software process management, user interface design, software architecture & design, software testing & QA, software requirement & specifications, etc. and were equipped with vital and appropriate skills and competencies.

A diverse range of topics were covered in their project management courses such as group dynamics, time management, testing and deliverables. Boot camps were also run by a faculty member at the Center to provide the students with working prototypes, exhibiting advanced programming principles and enabling groups to complete their project in a .NET environment.

4. ICT PROJECTS FOR SOCIO-ECONOMIC DEVELOPMENT

The student’s YolaSoft project illustrated in this paper was an attempt at developing an ICT for socio-economic development by becoming involved in a project for the Millennium Development Goals (MDG) in agriculture. The link between the MDGs and agriculture has been well argued by Rosegrant et al (World Bank), 2006, noting that 70 percent of the MDGs' target group lives in rural areas, particularly in Asia and Africa, and for most of the rural poor agriculture is a critical component in the successful attainment of the MDGs. All MDGs have direct or indirect linkages with agriculture, however, the linkage between agriculture and MDG1 (eradicating extreme poverty and hunger) is particularly strong through agriculture-led economic growth and improved nutrition. In low-income countries, economic growth, which increases employment and wages, is the only means by which the poor will be able to satisfy their needs sustainably. Students in rural Nigeria contributed in small part to help their sponsor respond to the challenges facing the MDG in agriculture.
5. TESTING STUDENT’S PREPAREDNESS IN AN MDG AND AGRICULTURE OUTSOURCED SOFTWARE DEVELOPMENT PROJECT

The importance of developing a culture of “techno-preneurship” via the Center’s incubator as a mechanism to develop the next generation of ICT companies and leaders in Nigeria and sub-Saharan Africa was put to the test by a team of students tasked to develop a Knowledge Support System for the sponsor, an International organization based in Washington, DC.

A Terms of Reference (TOR) and a Memorandum of Understanding (MOU) were received from the sponsor for collaboration and partnership to work with the Center’s faculty associates and students to develop a Regional Strategic Analysis and Knowledge Support System (ReSAKSS) in ICT Environment (RIE). A key element of the knowledge systems management component was the establishment of a YolaSoft interactive website environment with ready access to tools and information, promote mutual learning and peer-review, and facilitate dialogue on future priorities.

6. HOW WAS THE YOLASOFT PROJECT MANAGED AND EXECUTED BY THE STUDENTS?

The students embarked on the project by submitting completed tasks via the web and got responses and feedbacks from the sponsor. This was the first time these students were exposed to a real life project where the work expectations went beyond just a grade from a professor.

Four of the team members were selected to spend a semester at the American University in Washington, DC as exchange students. This opportunity is only reserved for top students at AUN. This provided a huge opportunity for the project since some of the team members were within twenty minutes from the sponsor.

This opportunity also exposed students to the vagaries of software developing from a remote location, with team members distributed, for overseas clients. Working in different time zones, periodic interface with the sponsor, living in a completely new culture, team members working at different pace on expected deliverables were some of the new challenges.

During this period and in collaboration with the remaining team in Yola, a mapping tool was developed with charting capabilities and data administration according to the client’s specifications. This was a huge milestone and gave the students and the Principal Investigator (PI) a lot of pride. The YolaSoft Project was executed in three phases. Table 1 below shows the different goals and outcomes for the different phases, Table 2 shows the team members and their responsibilities and Table 3 shows the technology requirements and tools used in the project.
### Phase I – Developing a Prototype

- Sample websites for different nodes allowing for customization of coloring, logos, and graphics, but also maintain a standard look-and-feel.
- YolaSoft websites with a centralized database server serving data to all nodes.
- An application for efficient storage and quick access to relevant information.
- Platform for information sharing and collaboration between stakeholders.
- An application to perform credible and timely analysis on stored information.
- The prototype had sample websites in West, South and East & Central Africa) as well as the Africa-wide YolaSoft website.
- Demos of knowledge sharing and information collaboration systems.
- Embedded data analytics.
- Graphical and geospatial presentation of data.
- Analysis of data through Visual, geospatial & statistical tools.
- Common data storage.
- Access to data from all regions.

### Phase II – Geospatial Data Presentation & Mapping Tools

- Reviewing prototype to better understand role of ACIT and needs of the sponsor-YolaSoft.
- Looking at real data from sponsor to validate database design.
- Deployment of prototype on the sponsor’s servers and hand over of source code to the sponsor-YolaSoft team.
- Develop geospatial data presentation of existing YolaSoft website. Develop mapping tool component in the original prototype to embed into the YolaSoft website. Achieved following:
  - Embedded mapping tool with actual data on a single indicator to understand the business needs and benefits of the mapping tool.
  - Demo of charting tool to allow chart images to be dynamic and connected to a database.
  - Use Google Docs to share and store data, suggested various database systems to better suit the data needs of the project.
  - Sponsor required working demo of the mapping tool for presentation in Seychelles, delivered on time by the ACIT team using free hosting to deploy the application.
  - Required by sponsor as development areas:
    - User Interface (UI) improvements, completion of the tool to allow stand-alone view, selection of indicators, years and other parameters.
    - Further improvements to the charting tool.
    - Integrating functionalities from other mapping tools.
    - A back-end administration needed to manage data on chart and map, in a Google Docs-like interface.

### Phase III – Completing Systems Requirements
- Mapping tool to incorporate stand-alone mode, selection of indicators, years, zooming by user, improvements to look-and-feel of the map.
- Development of back-end administration to manage data.
- Migration of database from Microsoft Access to a server-side database system, such as MySQL.
- Full development of charting tool, and embedding into the mapping tool.
- Deployment of prototype on some stable server hosting solution for demonstration to the sponsor.

| Worked through Summer 08 and Fall 08 to complete the requirements. All needs expressed by sponsor during phase 2 were completed. Stand-alone mapping tool with functionalities completed: |
| Interface was vastly improved. |
| Incorporated ideas of the sponsor on IMF Data Mapper, MDG Monitor, and Google Maps. |
| Charting tool incorporated into mapping tool as stand-alone and linked to the database. |
| Moved database to MySQL. |
| Working and fully operational prototype of back-end administration site completed. |
| The PI provided hosting on his website, after the sponsor did not host on their servers. |
| The full solution-based system was completed. |

**Table 1: Yola-Soft Project Goals and Outcomes**
<table>
<thead>
<tr>
<th>Official Role Played</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phase I - Yola Team</strong></td>
<td></td>
</tr>
<tr>
<td>Project manager, Coding Team</td>
<td>Project Management</td>
</tr>
<tr>
<td>Assistant Project Manager, System Design</td>
<td>Project Management</td>
</tr>
<tr>
<td>Team</td>
<td></td>
</tr>
<tr>
<td>Coding Team leader</td>
<td>System Coding</td>
</tr>
<tr>
<td>System Designers’ Team leader</td>
<td>System Analysis</td>
</tr>
<tr>
<td>System Analysts’ Team leader</td>
<td>Database Design</td>
</tr>
<tr>
<td>System designers’ Team member</td>
<td>Database and User Interface Design</td>
</tr>
<tr>
<td>System Coders’ Team member</td>
<td>Coding</td>
</tr>
<tr>
<td>System Analysts’ Team member</td>
<td>System Design</td>
</tr>
<tr>
<td>System Analysts’ Team member</td>
<td>System Testing</td>
</tr>
<tr>
<td><strong>Phase II - Washington Team</strong></td>
<td></td>
</tr>
<tr>
<td>Project manager, Coder</td>
<td>Project Management</td>
</tr>
<tr>
<td>System Designer, Database Designer</td>
<td>System Design</td>
</tr>
<tr>
<td>System Analyst, Database Designer</td>
<td>System Design</td>
</tr>
<tr>
<td>System Analyst</td>
<td>System Testing</td>
</tr>
<tr>
<td><strong>Phase II - Yola Team</strong></td>
<td></td>
</tr>
<tr>
<td>Analyst</td>
<td>Review new user requirements.</td>
</tr>
<tr>
<td>Designer</td>
<td>Review and advising on database changes.</td>
</tr>
<tr>
<td>Coder</td>
<td>Coding of new functionalities.</td>
</tr>
<tr>
<td><strong>Phase III – Yola Team</strong></td>
<td></td>
</tr>
<tr>
<td>Analyst and Designer</td>
<td>Redesigning database.</td>
</tr>
<tr>
<td>Analyst</td>
<td>Reviewing client needs.</td>
</tr>
<tr>
<td>Coder</td>
<td>Coding assistance in projects.</td>
</tr>
<tr>
<td>Analyst and Designer</td>
<td>Redesigning database, design of backend</td>
</tr>
<tr>
<td>Designer</td>
<td>Implementing new database and reviewing functionality of backend.</td>
</tr>
<tr>
<td>Coder and Project Manager</td>
<td>Coding all implementations and changes to backend, charting tool, and mapping tool, deployment of product on stable host.</td>
</tr>
<tr>
<td>Coder</td>
<td>Coding backend functionalities.</td>
</tr>
<tr>
<td>Designer</td>
<td>Review and implementation of database changes.</td>
</tr>
<tr>
<td>Project Manager</td>
<td>Overall project manager for student projects, responsible for documentation and assignment of tasks.</td>
</tr>
</tbody>
</table>

Table 2: YolaSoft Team Compositions and Responsibilities for Each Phase
<table>
<thead>
<tr>
<th>Software</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>CorelDRAW</td>
<td>Graphics Development for the site, in conformance with Web 2.0 standards.</td>
</tr>
<tr>
<td>DWebPro</td>
<td>Deployment of Server-based site prototypes on a CD for viewing by the client.</td>
</tr>
<tr>
<td>Macromedia Flash</td>
<td>Development of visual appeal of the website based on Flash technologies.</td>
</tr>
<tr>
<td>Microsoft Office</td>
<td>Production of reports and other essential documents and project management requirements.</td>
</tr>
<tr>
<td>DIY Map</td>
<td>Embedded Flash XML geospatial map.</td>
</tr>
<tr>
<td>FusionCharts</td>
<td>Embedded Flash XML charting tool</td>
</tr>
</tbody>
</table>

Table 3: Technology Requirements/Tools Used in YolaSoft Project

7. WHAT WERE THE PITFALLS, PROSPECTS, LESSONS LEARNT AND CONCLUSIONS?

In phase I, some of the issues faced included lack of clarity of the business requirements or how the technology aspects would assist in achieving the MDGs. Limited resources were available to the team to achieve their objectives and there was lack of feedback from the sponsor on progress of the project.

In Phase II, the goals and business needs pertaining to the mapping tool were not made definite and the sponsor looked at other options and developers. The sponsor’s YolaSoft team was given the source code of the mapping tool in its entirety, but this was not deployed on their servers and no definite answer was received on hosting the application and the ACIT team never met with the YolaSoft web team to discuss detailed technical aspects of the project and its requirements.

Another challenge faced by the team was not meeting with those in charge of the hosting server and not being able to deploy the product. The sponsor’s team opted for hosting the mapping tool on a free host. However, it was made clear to the sponsor that there were risks involved in having this as a solution such as sudden suspension of services, unreliable bandwidth and data privacy concerns.

In phase III, there was a lack of communication from the sponsor about any upcoming crucial deadlines. The sponsor’s change in management of the project resulted in an unexpected decision to stop this collaborative work and to outsource to a professional company. Relationships and trust are essential ingredients in outsourcing models and are as important as technical skills. When these variables change, they can have an effect on the nature, structure and continuance of the outsourced software project.

The students delivered a high-quality finished product, YolaSoft, and the assigned tasks were completed using various mapping tools. As a result of the demands of the project and changing requirements and expectations, the technology learnt and knowledge gained by the students were invaluable and went beyond what is gained in their regular course work towards their degrees.
The knowledge gained by the student members will be valuable as they venture into software development after their graduation in few months - May 2009. The ACIT team proves that there is hope to develop capacity and competence in software development which can attract paying jobs to sub-Saharan Africa and help build a nascent knowledge economy and a new middle class.

The exposure to real-world projects is critical for the development of students into marketable IT/IS professionals. Given the competitiveness of the software development industry, students need to experience deep learning by enhancing not only their technical but interpersonal and project management skills. The opportunity to work in groups and go through the systems development and build process, team work and communication with real world users had a noticeable impact on the confidence levels of students. However, ongoing research on student competencies and the usefulness of the systems developed is essential if the hope of these students becoming more aware of the demands presented in a globalized world and being at par with their peers from other programs and countries is to become a reality.

8. REFERENCES


The Multiple Perspectives Approach as a framework to analyse social systems in a developing country context

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Abstract: The Multiple Perspectives Approach (MPA) of Mitroff and Linstone is presented here as a promising framework to analyse messy social systems in a developing world context, and in particular to analyse the social context into which information systems are introduced in this environment. Two applications of the framework are discussed, one in a poverty alleviation context and the other as part of a Masters course in Systems and Decision Making. The MPA has to date only been described at a very high level, and needs to be translated into a method. In both cases, methods were tried out to generate Multiple Perspectives on a problem situation, namely Technical, Organisational, Personal, Ethical and Aesthetic perspectives. In the second case, the use of a Group Support System (GSS) was evaluated as a means to reach perspective synthesis. It is shown that the MPA succeeded in broadening analysts’ perspectives on a messy problem, and that the appropriate use of GSS can assist with perspective synthesis.

Keywords: multiple perspectives, unbounded systems thinking, information systems theory, group support systems, decision support, developing countries.

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The Multiple Perspectives Approach as a framework to analyse social systems in a developing country context

1. INTRODUCTION

The Multiple Perspectives Approach is presented here as a framework for analysing messy social systems. From a systems perspective, the approach is holistic and comprehensive. However, it is a philosophy more than a method, and thus a challenge to use in practice. To date, the authors have been involved in its application to two multidimensional South African social systems. In the process, much frustration was experienced, but a large amount of learning also occurred, the essence of which will be reported here. The Multiple Perspectives Approach, with some operational guidance added, is believed to have value as a general systems analysis framework, but in particular for use on messy social problems. In this respect, it could be applied to analyse the difficult social context in which information systems are introduced in developing countries.

The main challenge posed in this paper is that of applying the Multiple Perspectives Approach (MPA) in practice. It has been identified as a new and promising approach for studying messy social systems (Mitroff and Linstone 1993, Courtney 2001). When the authors first attempted to apply it (Turpin 2006, Meyer et al 2007), it was found to lack practical guidance as to its use. In the two studies reported on, several methods have been tried and evaluated that could be used in its application. The areas of the MPA that lacked most clarity as to its application were the Ethical and Aesthetical perspectives as well as perspective synthesis. Of the studies discussed below, the first resulted in a possible means to deal with the Ethical perspective, and the second study with suggestions to capture the Aesthetical perspective and perspective synthesis.

Two case studies were undertaken in the application of the MPA. In the first study, a multidimensional poverty alleviation programme was analysed, using a combination of secondary data and interviews (Meyer et al 2007). The second study occurred in a teaching context, where the students involved each acted as an analyst. The exercise was done as part of an experiment designed within the curriculum of an information systems Masters course. This paper summarises the first study and largely focuses on the second study.

The rest of the paper is organised as follows. We mention the issue of messy problems, after which the MPA is introduced as a suggested way to deal with such problems. The first case study, where the MPA is applied in a poverty alleviation context, is briefly discussed. This is followed by a presentation of the second case study where the MPA is applied in a teaching context. We conclude with what we learnt from trying out the MPA philosophy in practice, including the use of group support systems to reach perspective synthesis.

2. MESSY PROBLEMS

A mess or a wicked problem is a complex issue that contains a high level of uncertainty and disagreement (Pidd 2003:61). There are multiple ways to describe and define the situation, and it is not possible to know upfront whether a solution exists, let alone how to arrive at it. A problem, in contrast, may not be easy to solve but is at least well formulated. Pidd regards a mess as a set of interrelated problems. According to Rosenhead and Mingers (2001),
traditional problem-solving or systems approaches are not suited to deal with messes. Courtney (2001) suggests the use of the Multiple Perspectives approach to assist with decision support in an age where societal problems are increasingly messy in nature.

3. THE MULTIPLE PERSPECTIVES APPROACH

The Multiple Perspectives approach to problem solving is introduced by Mitroff and Linstone (1993). It is based on what they call unbounded systems thinking, namely “sweeping in” as many perspectives as possible on a situation when analysing it. This approach is introduced to decision support system practitioners by Courtney (2001), who uses it as a basis for a new paradigm in decision support. Courtney’s work has attracted significant interest, as can be seen in e.g. Cil et al (2004), Chae et al (2005), Hall et al (2005), Hall and Davis (2007) and Petkov et al (2007).

The Multiple Perspectives approach is believed to be attractive for two reasons. Firstly, its underlying philosophy is well expressed and very satisfactory from a systems point of view. It attempts to incorporate the methods of inquiry of four philosophical schools, namely the inductive-consensual school, represented by Locke, the analytic-deductive school, represented by Leibniz, the multiple realities school, represented by Kant, and the dialectic school, represented by Hegel. These schools of inquiry are integrated and enriched by what Mitroff and Linstone (1993:90) introduce as Unbounded Systems Thinking (UST), based on Singer’s and Churchman’s work that refers to the interrelatedness and inseparability of all systems. UST is translated into an approach called the “Multiple Perspectives Concept or Method” (1993:97). From here onwards, this will be referred to as the Multiple Perspectives Approach (MPA) as it is more of an approach than it is a method. The MPA classifies the possible perspectives on a situation into the categories of Technical, Organisational, Personal, Ethical and Aesthetic. The Technical (T) perspective reflects the scientific method as found in science and engineering, and thus any rational approach to problem-solving (Mitroff and Linstone 1993:101).

The Organisational (O) and Personal (P) perspectives represent the respective subjective views of the groups (formal and informal) and individuals involved. Mitroff and Linstone’s discussion and examples focus on the T, O and P perspectives, while the Ethical (E) and Aesthetic (A) perspectives are added as an afterthought and not elaborated on.

The second reason for the MPA’s attractiveness is that it can be used to address three of the sociological paradigms given in the classic paper by Burrell and Morgan (1979), namely the functional (T perspective), interpretive (O and P) and radical humanist (E) paradigms. These correspond quite closely with Habermas’s three interests, namely technical, practical and emancipatory (Mendelsohn & Gelderblom, 2004). Nepal and Petkov (2002) present a framework that also attempts to cover these three paradigms with a particular combination of methods. However, their framework differs from the MPA in that it uses Critical Systems Thinking (Jackson, 2000) as a philosophical foundation.

The MPA is an attractive framework but has been found to pose a major challenge, namely that it is a philosophy more than a method, and contains little guidance as to how it should be implemented in practice. As will be described below, an attempt was made to apply it to the analysis and evaluation of a South African poverty alleviation programme. The project team had to do some hard thinking and improvisation to “operationalise” the MPA, the lessons of which are currently being recorded and will be briefly summarised.
3.1. Previous work: applying MPA to a poverty alleviation programme

During 2004 – 2007, the Council for Scientific and Industrial Research (CSIR) in South Africa embarked on a research project where a combination of systems approaches were used to study the effectiveness of the South African Poverty Alleviation System. This system was not formally defined and managed, and was assumed to consist of the combined poverty alleviation efforts of multiple government departments, non-government organisations (NGOs) and other role-players. In one of the case studies undertaken, the MPA was used to study the effectiveness of the Community Based Public Works Programme, an initiative of the National Department of Public Works. This programme was meant to assist with job creation and skills development while maintaining government’s public buildings and facilities across the country as well as building new infrastructure for communities. A new process was created where local contractors from poor communities were employed and trained to do building and maintenance, instead of using large established contractors. The Programme was carried out country-wide and spanned all levels of government, namely national, provincial and local. It contained all the challenges of coordination, implementation and interfacing with the poor that the CSIR team wished to study. At the time of the CSIR research project, the first phase of this Programme had been completed and documented, leading to easier access to both operation-oriented and reflective information on the Programme.

3.1.1. MPA application

The CSIR research team was a multidisciplinary group, consisting mostly of experienced Operations Researchers and IS practitioners with a keen interest in decision support in messy environments. They attempted to apply the MPA in such a way that the project would benefit from the expertise of the various team members. The T perspective was developed making use of available expertise in Systems Engineering as well as Operations Research. The system around the Programme was defined at a high level, and various Systems Engineering diagrams were drawn to map flows and processes occurring during the design and execution of the Programme. The O and P perspectives were obtained by means of interviews and an assessment of documentation and reports on the Programme, carried out by a researcher with knowledge of the social aspects that surround facilities planning in South Africa. The O perspective was enriched by a comparison of the Programme’s design with an evaluation approach from Organisational Design literature undertaken by an MBA graduate. Whereas the research team could make use of Mitroff and Linstone’s (1993) guidelines as well as a case study for the application of the T, O and P perspectives, there was no help provided by either Mitroff and Linstone (1993) or Courtney (2001) for generating the E and A perspectives. For the E perspective, the team decided to apply Ulrich’s (2002) Critical Systems Heuristics as well as Kass’ (2001) model, the latter which was developed for health systems. After some debate, the A perspective was shelved, since the team could not reach agreement on how to define and apply it in this context.

3.1.2. Findings

Some elements of the findings will be supplied. The Systems Engineering diagrams drafted for the T perspective helped to uncover a number of design flaws in the Programme. These mainly related to Programme as well as project reporting and coordination functions. For example: “in certain cases the contracting body was not the body that the contractors had to report to, thus creating confusion and a lack of accountability. Functional analysis also
revealed missing functions such as monitoring and evaluation” (Meyer et al 2007:96). Frustations resulting from the design could be confirmed from the information supplied by role-players in the O and P perspectives. The E perspective assisted in uncovering ethical concerns in the Department’s interaction with the poor communities and small contractors, and within the communities themselves as they interfaced with projects of the Programme. An example of an ethical concern was that it appeared that the Programme was operationally serving the interests of the Department of Public Works as opposed to those of the beneficiaries (Meyer et al 2007:95).

Much improvisation had to be done in order to arrive at an MPA which was usable at the level of method. The way that the MPA was made operational depended on the knowledge and skills set of the research team, which was fortunately rich and varied. Some conclusions from the CSIR research team on the use of the MPA, as found in the case study project report (Meyer et al 2007:97), are the following:

- “….these perspectives provided a very rich description and analysis of the programme.”
- “Each brought unique insights on the system that provided pointers towards redesign.”
- “There was also overlap, in for example, the problems that were highlighted, albeit in different languages. This assisted in confirming the major issues and thus identifying and clarifying the key problems of the system.”
- “We would recommend that a multi-perspectives systems framework is used in the design process of any intervention of this magnitude.”

4. THE USE OF THE MPA IN AN INFORMATION SYSTEMS MASTERS COURSE

The MPA was introduced to students in a Masters course at the Department of Informatics, University of Pretoria, South Africa. The course is called “Systems and Decision Making” (INF 821) and is meant, among other things, to introduce students to general systems thinking approaches that complement and enhance the systems analysis skills taught in undergraduate information systems courses. In particular, students are exposed to messy problems and approaches to deal with these. This should equip them to manage the messiness of the social and organisational environment where they have to introduce information systems. During the 2008 INF 821 Masters course, the students were given an assignment to apply the MPA to analyse a messy South African problem, namely an aspect of a xenophobia crisis. In the process, the lecturer wanted to ascertain the following:

*Does the MPA, as presented to the INF 821 students, lead the students to gain a rich and well balanced collection of perspectives on the topic?*

During the first INF 821 lecture, the students were requested in a class group exercise to use Daellenbach’s (1994) problem structuring approach to analyse the South African xenophobia problem. It was found that most groups (three of four) came up with a very biased description of the problem situation. These groups each took a particular view on the matter and presented Rich Pictures only representing their own view. In the second INF 821 lecture, the MPA was presented to the students, and they received the following individual assignment:
Use the Multiple Perspectives Approach to analyse the current accommodation problem of foreign nationals in South Africa (with particular reference to the temporary shelters provided by government).

The students received the following guidelines. These are based on experience gained by the authors during the first MPA case study:

- **T perspective**: perform at least one analysis using influence diagrams or a hard systems method you are familiar with (from systems analysis, operations research or systems engineering).
- **O and P perspectives**: Try and include the perspectives of as many role-players as you can find. Remember that O and P perspectives need to represent organisations'/groups'/individual’s own, subjective perspectives as closely as possible.
- **E perspective**: use a critical systems approach to uncover some of the ethical issues.
- **A perspective**: address this in one paragraph, in which you have to state your interpretation of aesthetics.

For reading on the MPA, the students received a section from Mitroff and Linstone’s (1993) book that includes a case study, as well as Courtney (2001). The case study in Mitroff and Linstone only covers the T, O and P perspectives, and they do not fully explain or show how to apply the E and A perspectives. Some of the recent literature on the MPA attempts to address this shortcoming, for example Chae et al (2005) suggest an E approach. For the INF 821 assignment, students were expected to use one of the two critical systems approaches presented to them, namely Flood and Jackson’s Total Systems Intervention (1991) and Ulrich’s Critical Systems Heuristics (Daellenbach and McNickle 2005, Ulrich 2002) to generate the E perspective. The A perspective, which has to date received the least attention in the literature, was left open to the students’ own interpretation.

4.1. Background to the assignment

In May 2008, a number of xenophobic attacks occurred in South Africa. These were aimed at people from other African countries who resided and worked in South Africa, legally or illegally. Sixty-two people were killed and many thousands left homeless as they fled their residences in fear (Sowetan, 2008). Temporary shelters were set up to accommodate and provide safety to these people. However, the shelters gave rise to a number of new problems. The main one was the need to re-integrate foreigners into the community. Foreign nationals were typically scared to return to their previous residences and unwilling to return to their country of origin. The antagonism in some of the local communities, fired by the perception that the foreigners were taking their jobs, also remained a problem. In August 2008, when the assignment was given, the shelter camp problem was not yet resolved and appeared frequently in the news.

The shelter problem was chosen for its messiness: there is no clear problem definition, let alone a singular solution. The various role-players (government, NGOs, local people, foreigners, neighbouring states, to name a few) all have different perceptions of what the problem is. Many emotions are involved, as well as long-term underlying issues, such as poverty in South Africa and political instability in neighbouring states.
4.2. Analysis of the students’ responses

4.2.1. Technical perspective:

Three of the four students presented the T perspective first, all giving diagrams with some explanation. Two students drew an influence diagram (as per Daellenbach and McNickle, 2005), one an activity diagram and the last a kind of process diagram where the blocks were connected with verbs. All the diagrams were fairly comprehensive in terms of their inclusion of major role-players, incidents, causes and effects. However, each chose to highlight and focus on different issues. A clear relationship could be seen between the information collected under the O and P perspectives and the interpretation of the situation as shown in the diagrams, or T perspectives. Here is an example of a T diagram (Mc Alister 2008:8):

![Image of a T diagram related to temporary shelters for foreign nationals]

Figure 1: Activity diagram related to temporary shelters for foreign nationals

4.2.2. Organisational and Personal perspectives:

These two perspectives were done in the same exercise, mainly via consultation of the electronic media as a secondary source. Each student consulted a large number of articles, although, surprisingly, each from a single or limited publication pool. One only used articles
from the South African *Mail & Guardian*, two of them only used *News24*, and the latter, a foreign student, some foreign news sites combined with the official South African government web site. This resulted in clear biases in their perspectives. The *Mail & Guardian* articles were typically critical of government and made an effort to represent NGO perspectives. *News24* sources tried to represent the plight of the local poor, whereas the foreign student’s sources led him to omit the local community as a role-player altogether.

### 4.2.3. Ethical perspective:

Three of the four students used Ulrich’s Critical Systems Heuristics (CSH) (Daellenbach and McNickle, 2005, Ulrich, 2002) as was suggested, while the fourth gave his own interpretation of an ethical perspective and analysed the situation accordingly. The twelve critical questions of CSH query the following: system boundary choices, who decides what observations are relevant as well as assumptions concerning the client of a system, its decision-makers, the system analysts and people affected by a project but not involved. This is meant to lead to “reflection, appreciation and debate about legitimate and alternative views and values” (Daellenbach and McNickle 2005:197). The responses of the students to the twelve questions show clear critical reflection on the situation, in line with the information gathered under the O and P perspectives. For example, a student who used *News24* as source came up with the following response to the last of the twelve questions:

> What worldview is (ought to) be determining? That is, what different visions of “improvement” are (should be) considered, and how are they (should they be) reconciled? *(Source: Ulrich 2002)*

“It is not clear which vision of improvement is considered. There should be justice to all and opportunities for all people to make a fair and just living in South Africa. Instead of everyone blaming someone else, there should be plans and action to understand and include everyone within the country. The government must take action to attempt to reunite the people in South Africa by breaching borders and developing a multi-racial culture.” (Kriek 2008:13).

The CSH appears to provide an appropriate means to capture the E perspective in the absence of guidance from Mitroff and Linstone (1993) and Courtney (2001).

### 4.2.4. Aesthetic perspective:

Two of the four students looked up a definition for aesthetics. A third provided an acceptable definition of his own, while the fourth gave no definition at all. All the students, in some way or other, associated aesthetics with a subjective sense of beauty. Most of them proceeded to indicate the beauty of ideals towards freedom of oppression, the “desire to live in an integrated society, in which chaos and disorder do not reign or take a foot hold” (Mc Alister 2008:10) and contrast these beautiful ideals with the “horrible situation” (Kriek 2008:13) of the xenophobic violence and “non-aesthetic elements like the informal settlements, temporary shelters and dire circumstances of the foreign nationals” (Koekemoer 2008:13). An overlap between ethical and aesthetic issues was also sensed: “the aesthetic perspective highlighted the need to take the collective values into account, and to develop the same level of appreciation from all parties involved” (Mc Alister 2008:12); in other words, it does not help if a situation or process is only aesthetically pleasing to some. The decision to leave the definition and application of the A perspective open-ended was rewarded by innovative responses such as these.
4.3. Assessment of research question

The research question to address was as follows:

*Does the MPA, as presented to the INF 821 students, lead the students to gain a rich and well balanced collection of perspectives on the topic?*

The responses provided by the students were predominantly framed in a careful, non-judgemental way, in stark contrast to their assessment of the xenophobia problem during the first class exercise, before the MPA was introduced to them. They made a real effort to gather as many perspectives as possible, although some bias was introduced by the particular sources of information used. They took care to apply the paradigms associated with the various perspectives, namely to be rational and detached while generating the T perspective, place themselves in the shoes of role-players while doing the O and P perspectives, and to show empathy for the marginalised while attempting the E perspective. It is our conclusion that the MPA has led the students to gain a richer and more balanced collection of perspectives on the topic than what was displayed beforehand. In the process of the exercise, it has also been shown that the MPA’s challenge of being a philosophy rather than a method can be addressed by means of instructions on specific methods to be used when applying it.

4.4. Perspective synthesis by means of Group Support Systems

Another practical challenge of the MPA is to converge the variety of perspectives into a synthesised description for decision-making benefit. This is the step following perspective development as indicated by Courtney (2001:31):

![Diagram of a new decision-making paradigm for DSS](image)

**Figure 2: A new decision-making paradigm for DSS**
The challenge of perspective synthesis was experienced in the CSIR project discussed above: all the disparate threads of information, collected from different sources, using different means and subject languages and performed by different people, had to be integrated into a coherent, summarised whole, from which the essence of the problem could be distilled for decision-making purposes.

On the INF821 course, one of the course topics is group decision making by means of a Group Support System (GSS). GSS refers to a technology-enabled environment for intellectual collaboration by a group of participants, supported by computers, group support software, meeting procedures and a facilitator (De Vreede et al 2003:203). Previous experience in using GSS as a vehicle to reach consensus, led to the belief that it had the potential to assist with perspective synthesis as part of an MPA process. During the second part of the 2008 INF 821 course, an attempt was made to ascertain the following:

In what way could GSS be used to facilitate a synthesis of multiple perspectives generated through the MPA (Multiple Perspectives Approach)?

During the second part of the course a group assignment was set that was to be done using a GSS. They were given the following brief:

Your group is appointed as an Advisory Council for a joint implementation task team of the Department of Home Affairs and the UNHCR (United Nations High Commissioner for Refugees). The task team has been briefed to resolve the shelter problem of foreign nationals in South Africa.

Provide the joint task team with one synthesised description of the problem situation, to be used during the Home Affairs/UNHCR action planning session. Generate this description using the GSS toolset.

The students were set up in a GSS lab equipped with GroupSystems software, and with the following GroupSystems agenda:

1. Present class with activity description above.
2. Students open their individual assignments which are on an accessible folder.
3. Students type in key aspects of individual synthesis (copying from own assignments) and submit. (Topic Commenter with T,O, P, E, A headings, 20 minutes)
4. Students contribute to synthesised description in a new Synthesis category, with free electronic debate allowed. (Topic Commenter, 30 minutes)
5. Break with coffee (10 minutes)
6. Designated lecturer facilitates the remainder of the session using the patterns of collaboration engineering at his/her discretion. All discussion is online. Students to reach consensus and deliver synthesis paragraph(s). (Variety of tools, 1 hour)

4.5. Outcome of GSS session

The students contributed in a positive spirit. The fact that they could copy from their individual assignments eased their typing burden, but resulted in some lengthy pieces being pasted into GroupSystems. This increased the reading burden on others and also did not force them to summarise their ideas concisely. No confrontational debates with opposing viewpoints were recorded. This could be ascribed to the nature of the group, or possibly to
the MPA, where any number of perspectives on a situation could be added. The students submitted and discussed their contributions under the headings of T, O&P, E and A. The T perspective proved awkward to discuss, since without being able to present influence or process diagrams, they could only provide a linear listing of key role-players, processes and the like. The joint discussion on O and P perspectives was an enriched version of the students’ individual contributions, helping them to overcome the bias introduced by the singular media sources of individual students. Even here, no conflicting debate was observed. The liveliest discussion occurred under the A perspective, since consensus was required on the definition of aesthetics. The students were left to their own devices for a limited time to see if they could reach consensus by themselves. Although they gained some ground, it did not happen very fast. After the coffee break, they were assisted in summarising and grouping their ideas into a list of headings by means of a categorising tool, the Group Outliner. The headings were then moved to a voting tool, where students performed a rank order vote. Unfortunately, there was only time to complete this process for the E perspective. The E perspective was chosen to this end, because some clear trade-offs were observed in the ethical concerns listed by the students which made a voting exercise appropriate. The more challenging synthesis aspect of showing the interplay of the perspectives to indicate, for example, how a process problem picked up in a T analysis was worsened by the actions of a key role-player and also highlighted an ethical issue, was only briefly touched upon. More thought needs to be given on how, and whether, the online part of the GSS can assist with this final integration.

The exercise of generating a synthesis and developing an action plan was deliberately kept separate, as this is the way Courtney’s diagram was interpreted. In hindsight, an explicit instruction to generate an action plan to deal with the accommodation problem of foreign nationals might have facilitated a synthesis, which would have been implicit in the action plan.

5. CONCLUSION

As part of the 2008 INF 821 Master course in Systems and Decision Making, two research questions relating to the MPA have been addressed, namely:

*Does the MPA, as presented to the INF 821 students, lead the students to gain a rich and well balanced collection of perspectives on the topic?*

*In what way could GSS be used to facilitate a synthesis of multiple perspectives generated through the MPA (Multiple Perspectives Approach)?*

Concerning the first question, it is the view of the authors that the MPA assisted students in broadening their views on the accommodation problem of foreign nationals in South Africa. This conclusion is based on the stark contrast between what the students presented during the first class exercise and the rich set of perspectives collected during their second assignment. As mentioned below, the authors’ impression will be compared to the students’ responses to the same question.

The GSS showed promise as a means to generate perspective synthesis during a MPA process. The best results were obtained when students were guided through a process of free idea sharing and commenting, followed by a process of categorisation and distilment of key
ideas, and ending with a qualitative voting process such as rank ordering. More thought needs to be given to the appropriateness of GSS to assist with a synthesis of diagrammatic information such as was had in the T perspective. In addition, it is suggested that an outcome such as an action plan is requested from GSS participants rather than a synthesis by itself.

5.1. Further work

One of the questions in the INF 821 exam assignment (in progress at the time the article is being written) is to reflect on topics similar to the two research questions posed. The students’ responses to the related question will be compared to the findings of this paper.

Further, one of the authors is currently researching suitable systems analysis frameworks to analyse the present-day social context into which information systems are introduced in a developing country. The MPA is one such a framework that holds promise and will be evaluated further, while particular methods for generating the perspectives are being experimented with.

In closing, we suggest that ICT for development practitioners take cognisance of theoretical frameworks such as the MPA to better explicitly deal with the multiple perspectives of role-players. Heeks (2008:31) calls for a new wave of ICT4D 2.0 champions that understand computer science, information systems and development studies. The MPA could play a role in addressing his plea by introducing students as future ICT4D 2.0 champions to an approach that covers computer science and IS aspects (via the T perspective) and development studies (via the O, P E and A perspectives). This would enable them to focus on the complexity of the problem as well as the technical challenges.

6. REFERENCES


Assessing the Contribution of ICT to Development Goals

Works in Progress
COMPLEX DYNAMICS IN THE SOCIO-TECHNICAL INFRASTRUCTURE: THE CASE OF THE NIGERIAN HEALTH MANAGEMENT INFORMATION SYSTEM

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Abstract: This paper discusses the results of an ongoing research which contributes to the current discourse of how the application of information and communications technologies can foster socio-economic development. Specifically, it discusses the socio-technical dynamics associated with the implementation of a computer-based health management information system as well as factors that contributed to a successful implementation. The Nigerian health system continues to negotiate a dramatic turn with the implementation of a computer-based public health information system, based on the principles of primary health care. Important findings in this study have included: the realization of the role of political buy-in as crucial for successful implementation; the HIS is an installed base in constant evolution; democratization and political decentralization contribute to the success of the primary health care-based information; and the implementation of a free and open-source solution reduces total cost of ownership.

Keywords: Nigeria, health management information system, socio-technical, primary health care, dynamics, complexity, DHIS.
COMPLEX DYNAMICS IN THE SOCIO-TECHNICAL INFRASTRUCTURE: THE CASE OF THE NIGERIAN HEALTH MANAGEMENT INFORMATION SYSTEM

INTRODUCTION

Health is an issue of central concern to all countries and societies as it is a crucial cornerstone for socio-economic progress. The fundamental struggle to provide good health care to all in the society is epitomized by the Alma Ata declaration of 1978 which states that health “is a fundamental human right” and its attainment is a “most important world-wide social goal whose realization requires the action of many other social and economic sectors in addition to the health sector”. This code, to which Nigeria is signatory, prescribes that “primary health care is the key” and that “governments have the responsibility” [1]. Unfortunately, this goal of universal primary health care, as stated in the Alma Ata declaration has not been achieved. One of the impediments to this is thought to be the lack of an information system to guide decision making and planning [2]. This is a major issue that has continued to plague most developing countries [ibid] including Nigeria. But this is gradually changing. Currently, the Nigerian health system negotiates a dramatic turn, with the implementation of a computer-based public health system that is based on a district health information system embedded with data handling practices. This district health management information system is based on a free and open source health information system developed by an international team, configured and maintained by a local team with considerable expertise. But, how did this implementation come to happen? This paper discusses the dynamics involved in the establishment of the health information system and how this is tightly linked with policy and socio-political factors. The lesson to be learnt here is that a number of external factors influence the dynamics of the health information system, a major one being health policy – the installed base. The paper also mentions important areas that health management information system policy needs to address.

1. BACKGROUND

1.1. Nigeria - The Context

With a population of over 148 million people [3], Nigeria is a heavily populated country that accounts for about half of West Africa’s population [4]. However, 71% of the population lives below the international poverty line [5] and the average per capita income is US$930 (ranking 161st in the world) [6]. In April 2007, Nigeria held its third consecutive national elections, further consolidating the military-to-democratic transition that began in 1999. Health indices have remained poor and healthcare provision remains a major concern for the democratic government and its partners. The poor condition of health and health care in Nigeria is one of the factors responsible for an average life expectancy of only 47 years [7]. The country is committed to the long-term United Nations-sponsored Millennium Development Goals (MDGs) [8]. Under the program, which covers the years from 2000 to 2015, Nigeria is committed to achieving a wide range of ambitious objectives involving poverty reduction, education, gender equality, health, environment, and international development cooperation. In an update released in 2004, the UN found that Nigeria was making progress toward achieving several goals but far from achieving others. Specifically, Nigeria had advanced efforts to provide universal primary education, protect the
environment, and develop a global development partnership. However, the country lagged behind on the goals of eliminating extreme poverty and hunger, reducing child and maternal mortality, and combating diseases such as human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) and malaria. Thus, the "development of human capital through provision of health services" represents a central thrust of the present democratic government’s 7-point agenda [9].

1.2. Policy and Implementation

Nigeria inherited a weak colonial health system from England at independence in 1960 [10]. Subsequently, it went through three unsuccessful National Development Plans and did not have a comprehensive strategy for the health care system [10]. It was only until the Alma Ata declaration in 1978 that the country was primed for health reform. Nigeria made official commitment to the Alma Ata declaration which called for a primary (grassroots) healthcare approach in line with providing care for all citizens. The country worked towards a National Health Policy which was only realized ten years later. Within these ten years, there existed 4 successive national governments - three of them being military governments enthroned by coups d’états. As expected, the National Health Policy that was promulgated had primary health care as the central thrust. The policy provided, for the first time, the establishment of a coordinated and robust country-wide Health Management Information System (HMIS).

In response to this legal platform, the HMIS framework was articulated in 1992. A work plan was devised (in 1996) and implementation commenced (in 1997) in a number of states, with support from donors (World Bank and the UK Department for International Department) [11]. In 2000, when donor support fizzled out, the project failed. However, with a successful transition from military to democratic rule (in 1999), the ban on funding from the United States Government was lifted later in 2000.

HMIS funding came through VISION, a collaboration between the US-based EngederHealth, Johns Hopkins University and other partners [12]. Working with the Federal Ministry of Health, the VISION program implemented the country’s first computer-based national health information system in 2001 with pilots at Bauchi, Oyo and Enugu states. This system, Health Information For Action (HIFA), was proprietary (not open-source) and was DOS-based. It worked with the EpiInfo 6 and EpiMap 2 software applications [13] and was network-aware [12]. Its implementation represented the first introduction of computer technology for managing the HMIS. However, the implementation encountered a number of challenges that included the use of a dataset that was too large, poor supervision at the facility.
level, poor interconnectivity and multiple parallel systems [12]. The project ended after the scheduled time and HMIS activities were again underfunded for a few years.

In 2003, as the VISION pilot projects were ending, the United Kingdom-sponsored Partnership for Transforming Health Systems (PATHS) project started. This program, gaining from lessons of the past and utilizing principles that had been learnt from similar HMIS work in South Africa and other countries in the HISP network introduced the minimum dataset approach. A free and open source software, the District Health Information System (DHIS) [14] was also introduced. During this period, connectivity improved in Nigeria and local capacity to deploy and maintain these systems was developed. The minimum dataset approach and the DHIS implementation were successful and continued beyond the end of the PATHS project in June 2008. In 2006, during the DHIS implementation by six states supported by the PATHS project, based on an open tender process, the DHIS was adopted by the Federal Ministry of Health as a national standard [15] for the HMIS and country-wide implementation was planned. The system is being scaled up, in phases, to all states.

2. METHODOLOGY

This study adopts a qualitative case study approach. This is in order to aptly describe the context, the observed events, actors and processes. Data for this work have been collected through direct and participant observation as well as relevant documents the authors had access to during fieldwork. Thus, this analysis is based on both primary and secondary data. Because of secondary elements in the empirical data, it is difficult to draw clear-cut distinctions between phases of the action research cycle. This work is primarily aimed at laying the foundation for the analysis of ongoing and planned study. The underlying participatory action research framework in which this work was done is a long-term project called the Health Information Systems Programme (HISP) [16, 17]. The HISP project was initiated by universities in Cape Town and Oslo in 1995, and is now present in a number of developing countries. Within each country (e.g. Nigeria) the projects are comprised of various actors in the health administration (community, sub-district, district, provincial, and national), universities, non-governmental organizations (NGOs), and funding providers. At the global level, with the Norwegian and South African nodes as the major coordinating bodies, HISP has over the last decade been engaged in the development and implementation of health information systems with emphasis on facilitating sharing of software and best-practices. In the specific case of Nigeria which is the focus of this paper, the HISP project played a major role in supporting the development of the new HMIS. The authors, working within HISP, have been involved in the development and implementation process and performed numerous field trips to many states in Nigeria, and worked closely with various stakeholders at national, state, district and primary care centre levels.

On the whole, using action research as the underlying framework allows one to take an active role in understanding an information system while being able to do lots of self-reflective inquiry. Action Research is a disciplined process of inquiry conducted by and for those taking the action. Such participatory approach assists the researcher-participant in improving and refining his/her actions [18].

3. FINDINGS

The Nigerian health management information system (HMIS) is structured in accordance with the national health policy and can be discussed as being made up of a number of components.
These components include the people working in the system, the tools they use, the data involved and the processes used to handle these data - all of these occur at the different levels of hierarchy as stipulated by the national health policy which follows the civil service system.

3.1. People

HMIS human resource is structured along the lines of the tiers of government. At the local level, the HMIS component is housed in the local monitoring and evaluation department where the local government (district) information officer works. Health staff that report to this level include community health extension workers, community health officers, medical officers of health, community nurses and a host of trained and untrained community workers. At the state and federal levels, the HMIS unit is housed in the planning, research and statistics department. At these levels, one finds more skilled information workers – including epidemiologists and public health staff. It is important to note that the HMIS unit and its enveloping health service structure is tightly coupled and embedded within the political structure. This is because they report to elected politicians who in fact make the final decisions on HMIS financing and health policy as well as decisions bordering on recruitment and appointment of staff. This has immense significance for the allocation of resources for information systems activities - decisions tend to be made by politicians who are influenced by financial considerations, special interests and external pressures, rather than evidence coming from service delivery or surveys [15]. It has been said that “the health care sector in developing countries is intrinsically political. It circles around the inherent scarcity of resources and involves a number of actors with different agendas such as donor agencies, health activists, nongovernmental organizations or government agencies” [17]. This aptly describes the Nigerian case.

In summary, the actors exist in a complex mix of cooperative and competitive behavior. These tensions when extended to the entire health system give a complex mix of cooperative and competitive behavior between actors which include health workers, local government monitoring and evaluation (M&E) officers, primary health care (PHC) department officers, local decision makers, the local traditional institutions, the local government, government ministries of health at federal and state government levels, donors, international agencies, local non-governmental organizations (NGOs), software vendors and consultants. The table below outlines some of the important human actors in the system.

<table>
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<tr>
<th>Table 1. Human actors in the Nigerian HMIS</th>
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<td><strong>Level</strong></td>
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<td>Federal</td>
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<tr>
<td>State</td>
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<tr>
<td>Local (district)</td>
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3.2. Data

The National HMIS is built in the context of the national health strategy, which currently focuses on the MDGs. That is, focus is on data that are important for achieving primary health care goals and targets and other goals based on the MDGs. This has motivated the use of a small essential dataset in the HMIS with data elements that are clearly defined and standardized. This approach is the minimum dataset approach that has been successful in the HISP projects in South Africa [19, 20]. It is based on the use of only appropriate data elements at each level of reporting – appropriateness being defined by the need for information to inform and drive action at that level. We found this approach to be successful and contributory to the harmonization of the data collection forms used at the levels of reporting (i.e. at facility, district, state and federal levels).

3.3. Processes

A process is a series of actions that are performed in order to achieve a particular result. Within the HMIS space, the processes include those that are taken in order to produce information for decision-making and action. These processes guide the day-to-day running of the Nigerian HMIS system.

The processes include data collection, processing, analysis, presentation, interpretation, use and feedback. Collection involves the gathering of data from relevant sources. These sources include routine data reports from health facilities and surveys in a wide variety of settings. Processing involves collation, the aggregation of data for processing and onward flow; and data quality checking. Quality checking normally involves ensuring that data is correct, complete and consistent.

Analysis involves the calculation of rates, ratios and proportions and other operations on the data to make it useful for action. It normally involves the generation of key performance indicators useful for monitoring and evaluating progress. The data can then be presented for discussion using different kinds of illustrations, graphs and charts. The use of the information for action is important for the information handling process.

Feedback is an ongoing process that works in the opposite direction, with the processes feeding back to the step that led to them.

3.4. Tools

Here we found and used paper forms, computer hardware and software.

3.4.1. The Paper Based System

This system is based on paper forms for collection of data at different levels. Health information handling has traditionally been practiced in Nigeria the ‘paper’ way and paper-
based records are still by far the dominant record keeping system. However, the use of data stored in this form has been a persistent problem as it is difficult to analyze to derive the information needed to drive the decision making and governance process.

However, the paper forms are well integrated into the workflow and do not need any electrical power to run, no antivirus and no special operating systems, as opposed to the computer-based system. However, there are a number of perceived problems with this system, as was revealed in surveys of health workers in Nigeria [21]. These problems include poor access to the stored information; data in paper forms are not easily presentable; take a lot of time to extract; are not durable; require too much space for storage and are generally ineffective. These are major problems the computer-based system aims to solve.

3.4.2. The Computer-Based System

The DHIS is a software application developed for public health management information systems by the international HISP group [14]. It has been continuously adapted for field conditions by participatory effort between healthcare and software professionals in several developing countries since 1994. This has resulted in the DHIS software addressing vital issues such as user friendliness, data accuracy, and the design and use of indicators based on local need. This software allows data to be transmitted to other users, both horizontally or vertically up the hierarchy.

Keeping in mind the dynamic nature of health care management, the software was designed to be extremely flexible to address changing needs at the field level over time and space. Besides serving as a tool for gathering, transmitting and storing data, the DHIS is designed especially to address data analysis and hence the use of health information. It supports functions of accurate and valid data collection, aggregation, storing, sharing, transmission, analysis, reporting, display and use of health data at and between every level of a district health system from subcentre to district and at the state level. It allows drilling down or aggregation of data at any and every level of the health system such as PHC, district, state and national levels. Essentially, it addresses the need for a national health information system.

The DHIS is constantly configured to reflect the paper-based HMIS that it interfaces with, ensuring that users of computer-based system who are familiar with the paper-based system find it easy to combine both as necessary. This is what forms the paper-computer gateway.

Since the pilot of the DHIS in Benue State, a massive scale up has happened – the neighboring Enugu state adopted it, Jigawa followed and later Ekiti, Kano and Kaduna states joined. In October 2006, the DHIS was adopted for the “new NHMIS” under the health systems development project. But today, the scaling up of the system has become a “pre-requisite and not just a luxury”. This is because, in order to make sense of data from facilities and services in a region, province, or country, more data is needed to provide a complete and more useful analysis [17]. As more data is collected and made available, more data is needed to significantly test hypotheses and calculate key performance indicators, allowing for informed decision making.

4. DISCUSSION
The Nigerian health management information system has evolved in the context of the health system and its socio-political environment. It has been affected by external influences such as donor support and technological events such as global commons-based open-source software production within HISP. Some of these are illustrated in figure 2 below.

Figure 2 is a diagram illustrating some of the numerous influences that have shaped the health management information system (HMIS) in Nigeria. The inner circle contains factors very specific to the HMIS, the outer contains those specific to the health system. Outside the outer circle are a few important ‘external’ factors discussed also in this paper. It is important to note that this last group of socio-technical factors is unbounded – to show that it is a shared open heterogeneous system in the manner of an information infrastructure as described by Hanseth [22].

There are key lessons to be learnt from this case:

1. **The system is continuously evolving:**

   The health system with its embedded information system is an ‘installed base’ consisting of an extremely heterogeneous socio-political setting with interdependent and interconnected actors and actions. According to information infrastructure (II) theory, the installed base "implies that infrastructures are considered as always already existing, they are never developed from scratch". It is composed of tightly interdependent and interrelated collections of socio-technical components [23, 24]. Essentially, it develops gradually over
time. It does this through a process involving gradual expansion, improvement and replacement of its parts. Really, no single actor is in control and the infrastructure has not been built from scratch within one project. In essence, the Nigerian health information system and its enveloping health system have continued to evolve with the socio-political system. The HMIS has not been built from scratch but has used components from health policy and the primary health care system. The HMIS has a large number of actors including people, tools, data and processes which have all evolved through time as evidenced by the change in policy as shown in figure 1. This installed base, as Edwards et al [25] have put it, consists of all the organization processes, technical infrastructure and social norms that collectively provide for the smooth operation of the system. A major component of this installed base is the political practices and governmental bureaucracy.

2. Political buy-in is crucial for success:

Political buy-in was instrumental in establishing the system. Most policy makers began to see the need for dynamic reform based on evidence. This political buy-in, in such a top-down system as is obtained in Nigeria’s governmental bureaucracy, helped to push health policy reform and the attendant HMIS development. The role of Alma Ata in shaping health policy has been described in this paper, as well as the government’s commitment to its principles and the prioritization of primary health care. This allowed more funding to come into primary health care information systems development and implementation as the government was supportive. Some of this funding has come from donor support, which has increased since the ban on funding was raised when Nigeria moved from a military dictatorship to a democratic system.

3. Democratization and political decentralization contributed to the success of the primary health care-based information system implementation:

A democratic system means that more people become involved in decision making and communities become empowered. If the health care system and the policy are decentralized, then the information system (HMIS) that drives these systems needs a concomitant decentralization to the primary levels. No wonder it has been recommended that a health information system should be designed to work at the lowest level to ensure decentralized management and coordination of the health services [26].

However, it has been argued by Soriyan et al that for any information system based on primary (decentralized) health care to be acceptable and appropriate, it must be developed based on right requirements [27]. This is applicable to the development of the district health information system (DHIS) software and its use in the setting of the Nigerian national HMIS. It started as a practical project to solve a real need and the requirements were in keeping with the primary care approach and evolved and grew with it.

4. The implementation of an open-source solution reduces total cost of ownership

By virtue of the nature of the development of the DHIS, being based on a free and open-source philosophy and a distributed international network of learning, the ownership of the system is made cheaper on the long term. This in itself drives technological innovation and advancement and can allow for ‘self-sufficiency’ by local teams using it.
5. CONCLUSION

The socio-political environment, health policy and HMIS implementation are tightly interconnected. Substantive progress has been made in strengthening the HMIS; health policy needs to respond by harmonizing multiple efforts by funders—that is, building cohesive systems, and thus, limiting fragmentation and vertical-ization, fashioned by administrative, economic or donor pressures. For a robust HMIS, a robust policy and framework needs to be present. It is important to build health policies that allow the HMIS to achieve the overarching goals of the socio-political system, with an understanding that the decentralizing socio-political structure of the country and global influences play important roles.

With continuing investments by donors in the country’s health system, there is pressure to show genuine progress towards achieving the millennium development goals. Health care departments and programs are obligated to show progress as pre-requisites for extended funding support. The resource proliferation will present opportunities and challenges in good measure. Capacity will continue to be strengthened, infrastructure will improve, integration challenges may arise and the socio-economic dynamics will continue to play a role in the system. A continuing challenge is to roll-out the system nationally by strengthening information management through improving access to, and use of reliable information for the management of health programs and services at all levels.

According to Obotaton, a manager with the WHO-hosted partnership, Health Metrics Network, a mistake that was made in the past was to focus on the mainstream health sector at the expense of other sectors; “future implementation of primary health care in Nigeria will have to address the considerably more decentralized political system, a much more dominant private sector, increasing demand for a reliable health information system and expanded roles for non-health sectors” [28]. A successful system would be one based on practical, scientifically sound, socio-politically acceptable and economically sustainable methods and technologies that make information on health-related activities accessible at different levels and/or aspects of care with the necessary level of relevance at every stage of the system’s development.

From the foregoing, an important consideration for further research would include exploring how actors can be aligned towards the goal of tilting the socio-political equation in favor of health policy that would permit more decentralized HMIS structures as well as a culture of information use. The question of how sustainable infrastructures can be best built is also an important one.

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FROM INFORMATION FOR DECISION MAKING TO INFORMATION FOR KEEPING CORE KNOWLEDGE UPDATED – HEALTH MANAGERS WHO KNOW THEIR POPULATION

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Abstract: This study pointed out how health information is gained and applied for action. Computer support for health management consists of reports of health indicators, which are supposed to be used for deciding upon changes in the health services. Qualitative case studies of low level health managers of two developing countries, on the other hand, showed that instead of checking such information when decisions are made, health managers rather tend to “know their population and other health related issues” which means knowing the different villages, communities, households or even patients in small clinics. This tacit knowledge is what they base their managerial work on. Having such a conceptualisation of their prime tacit knowledge corresponds to findings from other practices. This embedded knowledge is developed through accumulation of learning from their routine practices and their close interaction with the community. Besides, geographical information structure was implemented. This local knowledge can also be used by district and other higher health managers for different purposes.

Keywords: use of information, health workers, management information systems, learning, geographical information systems, Ethiopia, South Africa.
FROM INFORMATION FOR DECISION MAKING TO INFORMATION FOR KEEPING CORE KNOWLEDGE UPDATED – HEALTH MANAGERS WHO KNOW THEIR POPULATION

1. INTRODUCTION

There is no doubt that timely use of the reliable health information is essential to make informed decisions, set priorities, use scarce resources effectively and improve the quality of health services or track epidemics. However, a number of researchers have emphasized that health information systems (HIS) in most developing countries are inadequate in providing the needed management support (Heeks, 1998). In recent years, different strategies are designed in order to combat the problem related to HIS of developing countries. For example, computer based management information systems in the health sector have been implemented with the aims of providing “information for action,” assuming that when managers take some action, it is, or at least it should be, based on indicators which numerically show the health and health services status. Even though every health worker collects numerous data routinely, (Braa & Blobel, 2003; Heywood & Rohde, 2002), few incidences of such action based on indicators have been reported, however, and there has rather been a call for more management training to learn how to “use information.”

Nevertheless, observations that health indicators are presented and discussed in meetings (Galimoto, Hamre, Kaasbøll, & Sandvand, 2008) and frequent observations that data is presented as posters on walls, even in rural health posts in Ethiopia (Damtew & Kaasbøll, 2008) points that health information is included in health managers’ and health workers duty, possibly without being directly linked to decisions.

Studies of such work indicated that expert practitioners have generated a large bulk of tacit knowledge, which enables them to come up with best solutions, detect the “deep structure” of a problem, framing a situation through many domain-specific and general constraints, monitor their performance, choosing strategies, exploiting opportunities, and all of this with minimum effort (Chi, 2006). Expertise can be developed through prolonged participation in a community of practice (Lave & Wenger, 1991), and Nonaka (1994) points to internalisation and socialisation as necessary knowledge transformation processes. The knowledge created in such communities has been characterized as tacit and embedded (Lam, 2000).

Tacit or indigenous knowledge can be defined as the systemic body of knowledge acquired by local people through the application of experiences, informal experiments, and intimate understanding of the environment in a given culture (Rajasekaran, Martin, & Warren, 1994). Dreyfus and Dreyfus (Dreyfus & Dreyfus) point to that tacit expert knowledge is composed of a large number of cases, in contrast to the smaller set of general principles which novices have read in textbooks. Bébard and Chi (1992) maintain that experts sort problems according to the ways that they use to solve them, while novices rely on more surface features, e.g. the types of objects involved.

In line with these literatures, two cases of fieldwork were re-examined to see whether health managers had concepts for their tacit knowledge, and whether knowing such concepts could help out finding their information needs. Based on this our research question is

What is the role of tacit knowledge in the day to day practices of health managers and in the implementation of health action within the community?
2. HEALTH MANAGEMENT

Some practices are dominated by professionally educated cadres, such as nurses and doctors. Managers, janitors and home-based care takers are examples of practices where no particular education is needed, but where the information needs may be quite as high as in the work of professionals. Core knowledge areas are therefore independent of formal education.

The nurses have a somewhat more stable domain, since the patients normally stay for more than one shift (Kaasbøll, 1987). Therefore, they mostly have a “total picture of the patient,” achieved through care, medication, reporting and discussing, enabling them to react adequately to emergencies in the absence of documentation (Kaasbøll, 1987). This can point in the direction that the tacit knowledge has a core that is used in particular when the practitioner does not have documentation available. Further, this core concerns the domain of their work rather than the means and material used to achieve results or the textbook procedures and regulations. Health is more stable, and except for possible emergencies like drinking water pollution, the finest resolution for change of health status in a community is a month. Health managers could therefore refine their domain competence over a long period of time.

The domains of health managers could be 100+ indicators for 20 geographical areas over 12 months times a number of years, multiplying to tens of thousands of data. The daily number of data for some other professionals, for example, for meteorologist is smaller, but still substantial calculations and statistical analysis can be made on these data. On the other side, the health extension workers of Ethiopia, who are living in the rural areas within the community and provide essential health care, have basic knowledge about the population in their respective vicinity (Damtew & Kaasbøll, 2008).

A community of practice requires that the members work closely together on a common task. While this may be the case, for example, for engineers collaborating on constructing a bridge or an emergency team treating a patient, much work is carried out near to the community for shorter or longer periods. Hence, many practitioners take great care to keep their membership in the community as they spend most of their time with customers (Orr, 1996). The health managers work with people around large parts of the day. Normally, hardly any of these are also health managers, so the opportunity for maintaining a community of practice is limited to a monthly meeting when all colleagues in the district meet. The study in Ethiopia proved to be an exception from this rule (Damtew & Kaasbøll, 2008).

Two previous studies have addressed the health workers’ information needs, concluding that they needed information concerning patients, while the statistical data collected in the health information system were of less importance to them (Thompson, 2002; Østmo, 2007). Lippeveld et al (1997) also stressed that much of the information recorded by health workers in developing countries are not relevant to the tasks they perform.

3. METHOD

A qualitative case study was carried out in rural Ethiopia, where 47 interviews and two observations of meetings took place. Most of the studied subjects were health extension workers, who are the peripheral level health workers. Document analysis was also done in order to substantiate our findings. A similar study was carried out in rural and urban South Africa, where clinic managers and other health staff in low level managerial positions were interviewed.

The data was collected for two separate studies, so the results presented here constitute an additional analysis of the data aiming at creating hypotheses on the tacit knowledge of local
health managers and their ways of becoming knowledgeable. We adopted the interpretive approach to analyse our data, and the responses to questions concerning their knowledge, as well as, their relation to information were looked into in particular.

4. THE COMMUNITY BASED HEALTH MANAGERS’ JOBS
Health extension workers (HEWs) have one year of health training and deployed in rural communities of Ethiopia. Two female HEWs are in charge of an area with around 5000 population. HEWs provide basic health care and advice for a package of 16 health actions consisting of mainly maternal and child health, major communicable diseases and basic sanitation and hygiene practices. They are also supposed to record local health data including deaths and births. Each post manages 20 volunteer community health workers. These are members of the community who are early adapters of health actions and volunteer to practice and demonstrate do-able health actions to their relatives, friends and neighbours. Community health work needs to be well coordinated and harmonized. In this respect the HEWs would play the role of managers. The HEWs and community volunteers have basic knowledge about the population of their vicinity, including the common diseases and cultural practices that influence health actions directly or indirectly. This is not only since they have collected health data, but also it is because of their tacit knowledge that gained informally as they are living within that particular community.

The profile of Primary health care facilities in South Africa vary substantially in terms of size of the population served (5000 – 50000 people), the range of services provided, (from a core package of Primary Health Care to additional services such as X-ray, maternity and anti retro viral therapy), the hours of operation (8 -24 hour) and the number of staff varies (5 – 50 health, clerical and technical workers). Clinic managers have a minimum of 4 years professional training in general, midwifery and community nursing science with practice experience in both hospital and community settings. As we tired to point out in the following theme, our finding showed that the health managers in the rural clinics know their clients.

5. KNOWING THE POPULATION
Health managers frequently engage in conversations with other health workers and stakeholders on a range of health service topics, and most often, the documentation where health indicators are to be found were not present in one rural clinic in South Africa. When questioned on how to deal in with this, a manager said:

*We know our area; we don’t need to check it out. I have grown up here, and I have done home visits.* (Manager in a large, rural clinic, South Africa)

This quotation hints at the managers know the geographical area of their catchments’ population, and the people living there. From this point, it is possible to infer that the manager developed this knowledge through experience as he has been living there for a long time and also through a routine practice of home visiting for his clients.

Similar expressions were used by others, e.g.

*I must know my population, what is expected of me.* (Manager in a small, rural clinic, South Africa)

In addition to having worked in this clinic for more than a decade, the manager also relied on documentation including health indicators. On her wall, she had a map of her area, showing where the tuberculosis patients were living, so that the staff could go and get them if they didn’t show up for treatment, see Figure 1a.
While this was a computer drawn map marked with pencil, the HEWs in Ethiopia had drawn the map of their area themselves manually, and this map had a prominent position on the walls of their health posts, see Figure 1b.

The HEWs had given immunization targets from district health offices based on the population data from an old census. However, the HEWs had come up with other population data, which they relied upon, and they also had convinced the district managers what they had to be the correct numbers (Damtew & Kaasbøll, 2008). These numbers had been found by means of collaborating with the community volunteers, because they knew the households in their vicinity.

Based on what managers said about their knowledge and the maps which are frequently observed, we can conclude that they know their population and other relevant health data, and this is the main tacit knowledge which they rely on in their work. Knowing their population is related to the area and the villages, communities, households. In the smaller clinics, they also know individual patients who live there and have follow up for some specific diseases, such as tuberculosis.

The way of coming to this knowledge seems to be the accumulation of their learning through the routine work related to their managerial and health staff roles. They communicate with subordinates, colleagues, superiors and community volunteers, they write and read reports and correspondence, they go out to see for themselves, and they interact with the patients and dwellers directly. The formal health management information system plays a minor role in the accumulation of such type of information, whereas it is through the embedded knowledge
that gained informally in the local area. This way of coming to know is similar to what has
been observed in other professional groups (Kaasbøll, 1987; Perby, 1987).

In the model of knowledge creation in organisations, Lam (2000) uses the term “embedded”
to denote the collective, internalised knowledge. Previous literature does not describe any
structure of the embedded knowledge, while this study points to a spatial knowledge structure
into which information is internalised, in Nonaka’s (1994) sense. Dreyfus and Dreyfus (1986)
maintain that expertise is composed of an accumulation of thousands of experienced cases.
They refer recurrently to master chess players, who recognise types of positions on the board
and how the plays correspond to such a type, so spatial organisation constitutes their
knowledge structure, while each memorised game provides its own time line.

While knowing their population and other health related issues, for example the residence of
tuberculosis patients, we would also expect that health managers know their service delivery,
their staff, their budget and possibly other fields in a similar tacit fashion. The could be
compared to the chess games, which provide knowledge of possible sequence of actions
appropriate to the structure.

6. CONCLUSION AND IMPLICATIONS FOR SYSTEM DESIGN

Although preliminary, the finding of this study points to at least three qualities of the tacit
knowledge:

- the practitioners have concepts for denoting the necessary information using their tacit
  knowledge,
- the tacit knowledge is also used when the practitioner does not have documentation at
  hand, and
- the tacit knowledge concerns the domain of their work rather than the means and
  material used to achieve results or the textbook procedures and regulations.

The current health information system divides the population into the coverage area of a
health unit, so a local clinic or health post is one area. These local health units know their
population and other important health data. This knowledge is mostly developed from their
routine practices embedded in their particular vicinity. The information gained through the
tacit knowledge of these local practitioners can be an input for district and higher level
managers to design a plan and to know the population in the district and in the country at
large.

At the visited clinics and health posts, it is possible to say that, the health information system
is deficient to provide the necessary information on the villages, communities or households,
which could have been useful for boosting the knowledge of the health unit managers.
Therefore, the tacit knowledge of local health managers and the community volunteers is
important in order to substantiate the information need in the health care setting.

At the clinic level, the data structure of the health information system is according to diseases
and services, e.g. antenatal and vaccination, and this structure does not seem to tally with the
knowledge structure of health managers. A geographic structure of the information seems
appropriate also at the clinic level, due to the frequent use of maps in the visited health
facilities. In a study of use of maps in India, it was found that this was of little use due to the
locals’ unfamiliarity of maps (Walsham & Sahay, 1999), so that GIS was not recommended.
This seems contrary to the findings here, and the reason might be that location is an important
issue in health, so health workers have developed a geographical view of their population.
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The Role of ICT in the Microfinance Model of Brazilian Banks and the Use of Banking Correspondents

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Abstract: This paper aims to further the knowledge on how ICT (Information and Communication Technology) contributes to integrate commercial banks and MFIs (Microfinance Institutions) through banking correspondents (BC) technology by identifying the viable models and analyzing their potentials and limitations. Concepts of microfinance and BC are presented, as well as five cases of use of BC in Brazil. Based on the analysis of these five cases, we identify three distinct models that summarize the different forms that BC has connected commercial banks and the low-income population using technology, overcoming barriers and challenges of sustainable development as far as it contributes to the inclusion of the poor people into the bank system.

Keywords: Microfinance activity, banking correspondent, microcredit, development
The Role of ICT in the Microfinance Model of Brazilian Banks and the Use of Banking Correspondents

1. INTRODUCTION

Two major phenomena have drawn attention of the financial sector in recent years. The first one, related to the development of microfinance markets, is occurring worldwide. The interest of commercial banks in the microfinance universe, one traditionally dominated by NGOs (Non-governmental organization), has grown since the 1990’s (Alves and Soares, 2006; Latiffe, 2006; Van der Putten, 2006). This interest may be attributed to the competition in the traditional banking markets and the success and low default rates achieved by institutions specialized in microcredit.

The second phenomenon, one more specific to the Brazilian banking market, is related to the huge growth observed in the so-called banking correspondent (BC) terminals as a bank service channel. A result of the intensive use of information technology in banking in Brazil, BCs are service points set up at non-banking facilities, such as supermarkets, drugstores, lottery shops, post offices, and several other types of product and service retail shops.

Although both phenomena, microfinance and BC, are initiatives aimed at extending financing services to low-income population, it is worth noting that they have developed independently. In general, BC is associated with the initiative of traditional banks, for which microfinance still constitutes a marginal activity.

Therefore, the main objective of this paper is to further the knowledge of how ICT (Information and Communication Technology) contributes to integrate commercial banks and MFIs through the BC structure by identifying the viable models and analyzing their potentials and limitations. Delivering financial services to the poor helps to reduce poverty and, thus, to foster the development of the country.

2. BANKS, MFIs AND TECHNOLOGY

The microfinance sector initially developed from NGOs has evolved along the 1990’s with the arrival of for-profit companies, constituting a segment of microfinance institutions (MFIs) operating outside the traditional financing sector. These MFIs are characterized by focusing on the offer of a single product: microcredit, with no or very little offer of other products (savings accounts, insurances among others). The main competence of MFIs is the specialization in methodologies involving typically the substitution of real guarantees by social collaterals to control loan default, as, for example, solidarity guarantee or neighbor’s guarantee. In general, MFIs have a credit agent and are characterized by the use of technology to support their operations (Diniz, 2007; Kumar et al., 2006).

If until recently MFIs were practically exclusive in the microfinance universe, the interest and the participation of traditional financing institutions in this share of the market, particularly banks, have grown (Rhyne and Otero, 2006).
With the advantages of scale, abundant access to funding, the extension of their presence through branches and service outlets, and the control of a complex network through a sophisticated technological base, traditional banks have a potential to further and modify the low-income population financial market significantly (Diniz, 2007; Kumar et al., 2006). The recent activity of traditional banks in this market makes them newcomers in a market based on extremely low values and clients without formal guarantees.

Although the operation models are not clear yet, it seems that the resources and the limitations of commercial banks and MFIs are complementary. Banks are larger, are present all over the country, and have expertise in the use of information technology, while MFIs have the expertise necessary to access the low-income clients and master the microcredit methodologies. Furthermore, banks may also contribute to increase the variety of services offered by MFIs, with high interest entered on microcredit. BC seems to be the technological infrastructure that may integrate commercial banks and MFIs. Although MFIs have been allowed to work as correspondent institutions since 2003, few have done so (Diniz, 2007; Kumar et al., 2006).

Rhine and Otero (2006) believe that the use of information technology, an area that banks master, will result in significant changes in the way microfinance operations are carried out at present and they point to three areas where these changes will be most critical: payment systems, credit methodologies, and support operating systems.

In Brazil, this technology improvement use can be seen as the BC concept has gained new dimensions driven by the flexibilization of regulations. Since 1999, the correspondent is a non-banking institution, such as bakers', drugstores, supermarkets, and other kinds of retail shops that commonly offer financial services on behalf of a financial institution. These services include the payment of bills, receipt of government benefits, opening checking accounts, withdrawals, credit operations, and others.

It is impossible to separate the technological requirement that supports this model from the BC concept. Although the technology involved is not innovative in itself, the way it has been incorporated to the correspondent model is considered unique for its reach and scale, the quality of services offered, and the new technological platforms that make the offer of such services possible (Kumar et al., 2006, p. 10). In respect to the technological platform, POS (point of service) equipment is installed at the shops hired as correspondents. The basic POS equipment may be replaced by a personal computer (PC) and/or combined with other devices such as barcode readers and numeric keyboards, ATMs (Automated Teller Machine) etc, depending on the level of services offered by each correspondent. These terminals (POS or PC) are normally connected to the contracting bank servers through Internet dial-up lines or fast connection, GPRS (General Packet Radio Service, a mobile telephony data transmission technology), or through satellite. Data transmission may be performed on line or at set day times, depending on the complexity of the services offered by each correspondent.

Correspondents have become the main strategy for the access to banking services by low-income population. To a large extent, the marked growth of this banking channel has been enabled by the expansion of telecommunications infrastructure in Brazil, which accelerated in the second half of the 1990's, along with the fact that the Brazilian banking sector stands out in the world for the use of ICT. As a result, although the BC model is not a novelty (given the post office bank long in place in several countries), the Brazilian model is
considered entirely new in the reach, scale, and flexibility afforded by its use of technology (Kumar et al., 2006).

Moreover, all commercial relationships between the banks and the outlets are largely carried out by contractors called network integrators, which allows the banks to attain a much higher level of capillarity than that of the ATM network, for example. These network-administrating companies are responsible for the technological infrastructure maintenance and operation support, training, maintenance, and in many cases, the selection of banking correspondents. In that case BCs benefit from their technological structure because the terminals used are changed from simple POSs to thin client stations to full PCs with the use of peripherals such as printers and scanners.

3. STUDY CASES

This section presents five cases selected because they correspond to the most important bank initiatives in the microfinance area in Brazil. It was adopted a multiple cases study methodology, which is rather useful to obtain a general understanding of a given situation (Benbasat et al. 1987). Data collection included ten recorded in-depth interviews (average of 90 minutes each) with senior managers, as well as field notes taken in late 2006 and throughout 2007.

The 10 interviewees were selected because they belong to the “Dominant Coalition”. Cyert and March (1963) propose that the organizational goal are largely set by a negotiation process among members of dominant coalitions pursuing certain interests.

The interviewees were stimulated to report experiences and attitudes relevant to the issue under investigation (Walker, 1988). A brief description of each of the cases studied follows.

3.1 Banco Lemon

Founded in 2002, Banco Lemon has all its services provided through BC terminals installed in business centers, drugstores and other shops. Banco Lemon has, in 1,500 municipalities, a rather extensive network, with 6,500 correspondents, most located in the suburbs or in poor downtown neighborhoods.

Loans targeted at low-income individuals and enterprises delivered through BCs are included in Banco Lemon’s product strategy, but they still have a very marginal share.

The correspondents’ network is managed by 16 network-administering companies. The so-called network integrator is responsible for selecting, licensing and unlicensing, training and controlling the retail companies that will work as correspondents. They are also responsible for installing the POS equipment and sets up the communication link (GPRS or dial-up line) at the correspondents’ facilities.

3.2 Banco do Brasil

Banco do Brasil (BB) is one of the largest and the oldest public banking institution in Brazil, with 20 million clients. In 2003, BB created the Popular Bank of Brasil (Banco Popular do Brasil), an exclusive subsidiary with BCs to attend the low-income population. The model
adopted by BP to implement BC is based on the use of intermediates, the network integrators. BP uses BB’s technological platform and operations are concentrated at BB’s technological center.

BPB has a partnership with social organizations providing them credit lines and technology. These social organizations take the responsibility to distribute it and use their own methods of credit supply and credit management. Example of this model are the partnership between BPB and a social institution is Banco Palmas, which operates in the Northeast Region.

These entities credit supply systems were improved with the technology of a payment system that allows resources to flow in a larger volume with a larger number of transactions.

### 3.3 Banco do Nordeste do Brasil

Banco do Nordeste do Brasil (BNB) is a public development bank whose social function is to finance investments and projects with potential to benefit the economic development of Northeast Brazil. To this end, the Bank created a broad microcredit program called Crediamigo in 1988. With 825 thousand operations and R$794.2 million in credit loans, Crediamigo is currently the largest microcredit program in Brazil.

From the operating viewpoint, the program is managed through partnerships between BNB, which provides funding and methodology, and different civil society organizations of public interest (Oscip in Portuguese) trained by the Bank in the use of the methodology and who are in charge of hiring credit agents and operating the program on behalf of the Bank. There is a low use of technology in the process. The BNB is the only case studied herein that is not integrated with BCs yet.

### 3.4 Unibanco

Unibanco was founded in 1924, and in 2003 started activities in the microfinancial segment when it bought Riocred, an MFI in production microcredit since 1998. When it was merged into Unibanco, it was renamed Microinvest and became the group’s microfinancial segment. Microinvest offers production credit in low-income urban districts, mainly in São Paulo and Rio de Janeiro, through traditional credit agent methodology.

In terms of technological infrastructure, Unibanco operates two types of BCs: a single POS, which is used in small retail correspondents with a single facility and the use of the partners’ own ICT infrastructure in the case of a correspondent company with several shops and its own ICT network (retail outlets besides Fininvest, the group’s financer).

The use of BCs concentrates heavily on bill payment services. It has approximately 2,100 BC points that receive about one third of all bills and payment slips. It does not have a policy for the use of the BC network for other services or products.

### 3.5 ABN Amro Real

An international bank with a strong presence in Brazil, ABN Amro Real was purchased by the Santander Group in 2007. It has a network of approximately 1,700 BC points distributed in several regions of the country, normally in urban or low-income rural areas. At present, the
network is used only for bill and payment slips, payments and to provide production microcredit.

ABN Amro Real’s microcredit operation started in 2002 with the Bank’s initiative in the corporate social responsibility area. Although according to the interviewees the operation is sustainable and profitable, it is not expected to provide the Bank with the same level of return of commercial credit portfolios.

4. DISCUSSION

As we can notice, there are different ways to integrate commercial banks with microfinancial services through BC. Moreover, most is based on the intensive use of technology to promote social inclusion of the population from the poorest areas in Brazil, providing them access to microfinance services.

Regarding the role of banks and ICT in the expansion of MFIs, as Diniz (2007) and Kumar et al. (2006) state, in general, MFIs have a credit agent and are characterized by the use of technology to support their operations. The studied cases, excluding Banco Lemon, are examples of how BC technologies, provided by commercial banks can improve microfinance services to the poor.

On the other hand, the cases presented herein show that commercial banks could benefit themselves from the partnership with MFIs, which have the expertise necessary to access low-income clients and master the microcredit methodologies, confirming Rhyne and Otero’s theory (2006).

Regarding to the Brazilian experience and the potential of the BC technology in the expansion of MFIs, we can say there are different models of how BCs integrates MFIs and banks, as explained on the next section.

5. FINAL CONSIDERATIONS

The analysis of the five cases presented affords a map of action of the models being structured by Brazilian banks operating microfinance through the technology of BCs. As a preliminary conclusion, it is possible to identify the occurrence of three basic models, to know:

- **Model 1** – direct action: The bank provides its financial services directly, although part of the infrastructure is available through intermediaries, the network integrators. This model evidences a greater integration between BCs and microfinancial services, and banks act without the intermediation of a dedicated MFI. Banco Lemon clearly fits this model.

- **Model 2** – MFI partnerships, bank’s risk: It is the most frequent model in the banks investigated, adopted by BNB, Unibanco, and ABN Amro Real. Microfinancial services are provided by an appointed MFI that operates as a bank intermediate, providing funding and methodology for the distribution of microfinancial services, especially credit. In two cases (Unibanco and ABN Amro Real), the MFI is a bank subsidiary, and in the third one (BNB), the MFI is an external partner. Nevertheless, in all cases, the methodology and the technology is controlled by the bank, who also takes responsibility for default.
✓ Model 3: MFI partnerships, MFI’s risk: this is the model adopted by Banco do Brasil. As in model 2, the presence of the bank in the microfinancial segment is intermediated by MFIs that operate as bank correspondents. In contrast with the previous model, the methodology and risk are responsibilities of the partner MFI, and not the bank’s, but as in model 1, part of the technology infrastructure is available through intermediates.

The studied cases allow to state that, although the use of BC is still focused on payment operations, there are already experiences that suggest a greater supply of relationship services for low-income populations. Moreover, this helps to promote the development of poor regions, such as the microcredit delivery through the BC technology. It also acknowledges that this solution will greatly depend on technology and the business models earlier presented.

6. REFERENCES


TRYING TO DEVELOP INFORMATION SOCIETY IN ALBANIA – A CASE STUDY

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Abstract: Deployment of IT in developing context of Albania is lead by strategies based on political agendas which do not match well with the country's reality and lead in non-efficient actions. Important steps in e-bureaucracy are undertaken, and at the same time some typical problems emerge in these actions. The paper tries to give an overview of recent developments and related problems.

Keywords: information society, development strategy, e-government, e-education.
TRYING TO DEVELOP INFORMATION SOCIETY IN ALBANIA – A CASE STUDY

1. INTRODUCTION

In this paper we try to analyze important steps that government is doing for the deployment of IT in the public sector in Albania and some preliminary results of this process. We try to identify gaps between official politics, implementation actions and the reality. Government has shown a great interest on IT, prepared national strategies and implemented important projects. But political forces did not consider any long term strategy and each government followed its own way to reach some political objective, often neglecting the efficiency of investments and effectiveness of services.

Different aspects of deployment of ICT in the public sector in developing countries are discussed by many scholars, in particular the e-governance and e-education. Heeks (2004) for example offers a good analysis of the phenomenon of e-governance as better governance through intense use of ICT. The success and failure of deploying ICT depends in a great scale from education. Schools and universities represent the main constituency of the education system. The government is working hard in both areas – e-government and e-education. But in practice we see tendencies of politics to dominate the information revolution.

In a developing context this tendency may become problematic because of lack of necessary forces that would put some control over the politics. Chou (2006) writes that success of e-government is limited by factors as misconception, malpractices, poor capacities, structural deficiencies and lack of political will. Such phenomena may be identified in the visions and practices for the deployment of ICT in Albania. In this context we discuss the impact of politics in drafting of development strategies and their implementation, interaction and balances between different sectors, and the role of people involved in these processes.

2. METHODOLOGY

We used the information collected while working for preparation and implementation of some important projects in the country, through contacts with other people involved in similar activities, and from the media. Several theoretical aspects were taken into account for the analysis of the information, focusing on the topics of e-bureaucracy, interaction between public and private sectors, interactional expertise, manipulation of projects, and difference of rationales. In some cases a critical evaluation of theoretical models is done through matching theoretical arguments with the concrete Albanian reality.

Authors as Cordella (2007) consider the e-bureaucracy as an e-government solution. Bureaucracy is considered as a mechanism to coordinate work activities, and as a guarantor of equal and impartial actions that enforce democratic values. But Nowicka (2007), for example, considers e-bureaucracy as synonym of e-administration but with a negative overtone, devoid of democratic elements. Bureaucracy may be seen as a tool for governance, and following the concept behind the Kransberg First Law (Kransberg 1991), a tool is not a solution but a mean to build a solution. Building e-bureaucracy seems easier and there is a tendency to focus the attention in e-bureaucratic services, considering it as important component of e-governance.
E-government may be considered as composed by three components: decision and policy making, services for citizen (inc. business), and government-to-government services. Bureaucracy dominates citizen and government-to-government services. Decision and policy-making is crucial for positive orientation of development processes, and it has to do more with human interaction and lobbies. It depends on the political will of leading circles of the country (Frasheri 2002). E-bureaucracy may help citizens and speed-up communication within the government, but it remains far from "better governance".

Interaction between public and private sectors is another important element of political agendas, in particular for the public procurement and outsourcing of public services. Many authors insist in problems of public-private partnerships (see for example (Broomfield 2006), (Flinders 2005), (Grimshaw 2002)). Problems get complicated in developing context when decisions are taken to promote certain policies instead of effective implementation of the technology. Introduction of IT in schools is a typical case where public-private partnership was considered more as justification instead of a solution for the sustainability.

Usually policy-makers try to hide the mismatch between the politics and the reality. Several phenomena are identified when problematic ICT policies are presented in the public and related projects are implemented, justified with a particular use of technical language and arguments.

The concept of "interactional expertise" is defined by Collins and Evans (2007) as a part of tacit knowledge of practitioners shared by people who do not have the full set of professional skills. This may be a debatable definition; but it is an old idea expressed in popular cultures, and it may be useful to describe the involvement of non-professionals in professional decision-making tasks. We will consider the interactional expertise as part of knowledge acquired by non-professionals, making them able to speak in technical language. Such people are able to present easily technical issues following political requirements instead of technical ones, and this is useful to support decision making ideas despite technical constraints. Even experts may fall in this trap when they do not have all requested information. The other side of medal is that thinking technically too hard may lead to no solution at all.

Use of interactional expertise facilitates the manipulation of projects to match specific interests instead of real needs, resulting in low effectiveness, lack of sustainability, but probably good publicity (Frasheri 2002). Technical presentation helps to convince the audience to accept problematic ideas, especially when stakeholders are more interested in formal results instead of the real impact. A preferred way to justify problematic ideas using interactional expertise is the blind use of imported models without counting for the local reality – the difference of rationales.

Difference of rationales is an important factor for the effectiveness of IT projects (Avgerou 2000), related with differences between conditions in exporting and importing countries. Policy-makers imitate solutions suggested by specific case studies, without counting for local conditions. Imported ideas may be formally successful, but with problematic impact in the terrain. A typical instance of the phenomenon is using of ICT “in my own way” as a “golden solution” for all problems. This is a sort of cargo cult (Harris 1998) blended with the "ego" cult – "I did it".
The combination of all these phenomena gives a wrong shape to processes for implementation of ICT and pushes segments of politics to oscillate from one extreme to the other. Drafting of National Strategy for ICT is a typical case of such extremism.

3. NATIONAL STRATEGIES FOR ICT

In a global political climate of promoting ICT, compilation of national strategies seems to be a precondition for collaboration with many international actors. In 2003 Albanian government accepted and approved the national strategy for the development of ICT. The draft was prepared by international actors in collaboration with local experts. In 2005 the new government decided to revise this draft. At the same time the deployment of ICT in public services is increased considerably, and the government launched the initiative to introduce ICT and Internet in all schools of the country. Important ICT projects are implemented, but with problems in the effectiveness of solutions and the efficiency of investments.

The first document of the national strategy for ICT was compiled by a team of foreign and local experts, funded by international donors. It was presented in a national conference and discussed in separate sessions for each of its main topics. The final draft was approved by government in April 2003 and one of ministers was charged with its implementation. The draft of the strategy included the e-readiness of the country, development indicators, and the roadmap its implementation. The major drawback of this document was the e-readiness, because of missing official statistical data. One of objectives of the strategy was improvement of the state statistical service to add more ICT related data and improve future assessments.

Implementation of the strategy failed. Strategic objectives included the creation of a consultative body for the government, with representatives from different communities. This body was created, but composed by some of ministers serving as consultants of council of ministers (!). Actions defined in the roadmap were not seriously followed, except the creation of principal segments of the government network and basic Internet services, initiated and funded by international actors.

In 2005 the new government decided to revise the strategy and charged the ministry responsible for telecommunications to compile the new document; also some foreign expert was invited to help with the task, but without public consultancy. In 2007 the relevant ministry informed other institutions about the new draft in its web site, inviting for comments. Until mid 2008 there was no sign for a formal approval of the new strategy. Instead, from private contacts was learned that the working group was making some consultations, and that ICT experts from universities were not involved despite the high priority of ICT in education.

The Strategy of 2003 (ICT Strategy 2003) has 92 A4 pages and is published in both Albanian and English as book and CD; while the new Strategy of 2005-2007 (ICT Strategy 2007) has only 54 A4 pages and it is published in the Internet. The old document was well structured, clearly separating priorities, objectives and actions. The new strategy was drafted from the scratch and it is more government-oriented. It offers also some evaluation of the costs for its implementation, which was missing in the old strategy. But concepts are confused with each other – the same words are used for priorities, objectives and policies at the same time. The draft has unclear formulations and unrealistic goals, for example “collaboration to raise necessary regional basic technologies to profit from economies of scale in the region”, or “connect the base network of the country and base internet network of European Union and other countries in the region”.

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It is possible to compare the old and new strategies, focusing in main topics of both drafts. Strategic goals and plans are compared side by side in the Table 1. Differences are mainly in formulations and details of strategic topics. But they remain in paper, because the actions for implementation of key services are already in progress and without strong correlation with each other.

4. ACTIONS TO BUILD THE INFORMATION SOCIETY

It was expected that the national strategy for ICT would serve during the process of implementation of ICT. The new document is not yet completed; some of its objectives are unclear, out of the scope or unrealistic. Nevertheless the government has multiplied its actions for the deployment of ICT, preparation of legislation and creation of some structures in its own way. Projects with important ICT components are funded with about 64 million EUR, mainly from international donors (ICT Strategy 2007). The new legislation includes completion of liberalization of telecommunications market, creation of the system for public electronic procurement, rules for electronic signatures and issuing of electronic certificates,
<table>
<thead>
<tr>
<th></th>
<th>ICT in Health and Social Services</th>
<th>ICT health and social services, end-user devices for medical and social care, training</th>
<th>Computerization of public healthcare system</th>
<th>Improvement of healthcare using ICT, computerization, management systems, insurances, services on line, telemedicine</th>
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<td>6</td>
<td>Supporting Development of Locally Relevant Content and Applications</td>
<td>Internet content and web portals, software accessibility</td>
<td>Community connectivity for services country-wide</td>
<td>Public services in all country, participation in economic social political cultural life, empower local communities, decentralization</td>
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<td>7</td>
<td>Creation of a competitive, liberalized telecommunications sector</td>
<td>Privatization, competitive market, independent regulatory authority, 3rd generation mobile, incentives for new players</td>
<td>Regulatory environment for opportunities, public relations for ICT lead by government</td>
<td>Incentives for online information and services, increase of information providers with address ending in &quot;.al&quot;</td>
</tr>
<tr>
<td>8</td>
<td>Development of the ICT Sector as a Production Sector</td>
<td>Favorable climate for the high-tech sector, permanent business forum, technology parks and business incubators, education, training</td>
<td>Development of ICT infrastructure of high speed</td>
<td>Deregulation of frequencies, competitiveness, connectivity for all, national base support network, telephonic services, objects of connectivity of communities in all the country, decrease of connectivity costs, expansion of government network. ICT in private sector and agriculture, blooming bussiness sector.</td>
</tr>
<tr>
<td>9</td>
<td>Inexpensive, fast and secure ICT infrastructure throughout Albania</td>
<td>Country wide infrastructure, Academic Networks, government network, Internet in schools, public access points, advanced technologies</td>
<td>Development of ICT infrastructure of high speed</td>
<td>Information and services for all, national cohesion, connection of Albanian base network with the Internet of EU and region, collaboration to increase necessary regional base technologies to profit</td>
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Table 1. Comparison of national ICT strategies drafted in 2003 and 2007

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<th></th>
<th>Supporting Electronic Business</th>
<th>Business trade portal, Affordability of equipment, Public-Private, Training</th>
<th>Competitiveness of private usiness</th>
<th>from scale economy of the region</th>
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<td>11</td>
<td></td>
<td></td>
<td></td>
<td>Strengthen ICT industry, private-public, associations with foreign companies, foreign investments and know-how transfer, incentives for R&amp;D, e-agriculture, online procurements</td>
</tr>
<tr>
<td>12</td>
<td>Active participation in SEE¹ regional Initiatives</td>
<td>Participation in e-SEE Europe and regional projects</td>
<td>Implementation of eSEE² and bSEE³ recommendations</td>
<td>Unique informatics space for SEE, innovation and investments in research and education, information society for all</td>
</tr>
<tr>
<td>13</td>
<td>Active participation in EU Initiatives</td>
<td>eEurope+ and CEEC⁴ strategies, Participation in ICT funding of EC</td>
<td>Tools for regional and eSEE/bSEE collaboration</td>
<td>Collaboration for regional network and SEE activities, empowering SEE, EU integration and interoperability</td>
</tr>
<tr>
<td>14</td>
<td>Monitoring of Albanian ICT Development in Regional and European Context</td>
<td>Scenarios, indicators, roadmap, objectives, outputs, quantitative statistics of ICT</td>
<td>Status analysis and monitoring of ICT</td>
<td>Needs and conditions, comparative indicators, priorities and needs</td>
</tr>
</tbody>
</table>

Government created in 2007 some structures that include the National Agency for Information Society, the Agency for Electronic Certificates and the National Center for Registration of Businesses.

The idea of a National Agency for Information Society is included in ICT strategy and promoted by international actors as an all-inclusive forum with representatives from different communities (public administration, private sector, academia and civil society). Instead, a pure government institution was created. Its role is to propose strategies, coordinate and

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¹ South Eastern Europe  
² Electronic South Eastern Europe initiative  
³ Broadband South Eastern Europe initiative  
⁴ Central and Eastern European Countries
implement important projects, promote and lead implementation and deployment of ICT country-wide.

The Agency for Electronic Certificates is in process of creation. It will serve as a regulatory body, defining the rules and licensing different organizations that will deal with electronic certificates. It is not clear when services for electronic certificates may be operational.

The National Center for Registration of Businesses is designed as a one-stop-shop for registration processes. An electronic registry is created for this purpose. It is supposed that this service would facilitate registration procedures for businesses.

Public procurements may be done electronically through the site of Agency for Public Procurement. The site offers a registration process for interested companies to become users of electronic procurement service, get tender information and give offers electronically.

Offices of Civil Status have created the new electronic civil status registry, and the issuing of certificates is done faster. Government is working to prepare smart identity cards and biometric passports. The address system in urban centers is planned for completion to match with great urban changes of last 15 years.

Tax and customs offices are using ICT for a long time. Tax office offers services for companies to download tax documents through Internet. But electronic payments remain a problem because few banks offer online payment systems. Albania has adopted the Automated SYstem for Customs Data (ASYCUDA) for customs services, and this is considered as important factor for emerging e-commerce.

Government started the initiative for e-schools (E-schools 2006) to introduce ICT and Internet connectivity in all schools of the country until the end of 2008. Funding for this project is evaluated at about 25 million USD. Management of the project is done by foreign experts working in the premises of Ministry of Education and Science. Already a considerable part of schools are equipped with computer laboratories, teaching curricula are under revision, and sustainability issues are discussed.

The Italian government had proposed a project for The National Research and Education Network, but its implementation was delayed for several years. Only in 2007 both governments ratified the agreement, and the Ministry of Education and Science has created the PIU for its implementation. The preparatory work is going on, but as usual the progress is slow because of bureaucracies. The problem of the connectivity of this national network with the pan-European Research and Education Network GEANT has not yet a solution.

Government gives funds for research in the framework of the national programme for research and development in several important domains, including ICT. In the framework of this programme, relevant IT departments of main universities are involved in a regional project for the deployment of grid technologies and development of grid applications. This project complements and supports the participation of the country in the SEE_GRID initiative, funded by European Commission, for the creation of the South Eastern European Grid Infrastructure and its integration with the European Grid Infrastructure EGI.

Despite difficulties, all these actions promise a good step forward, in accord with regional and European political agendas. But the reality is more complex and problematic. These
actions support more the e-bureaucracy, which is not "better governance" by default; and projects for education have questionable effectiveness and sustainability. The analysis and comments on both policies and actions are presented in the next section.

5. CONTRADICTORY POLICIES AND ACTIONS
Politics had no balanced approach for the implementation of ICT in the country. Sometime they do formal approvals of strategies but do not care for their implementation, in other cases they run for big projects without a clear and official strategy, without coordination or any basis for sustainability. In both cases politics may neglect other running projects and relevant organizations, negating all previous efforts and gained experience. They consider only positive aspects of their ideas, which formally may be quite good, and they neglect problematic aspects or consider them simply in theoretical plans without concrete solutions.

Politics used to justify its plans and actions with a lot of technical justifications and examples from other countries, without taking fully into account the reality and the needs of the country. Examples are used as precedence cases for justification instead of understanding possible risks and problems, and without counting differences between two realities – i.e. the difference of rationales. Our supposition is that technical argumentation is done by people who do not understand the technology and its impacts – the case of interactional expertise, or by people who want to manipulate and lead projects towards some specific goals that may not match real needs. The enthusiasm of policy-makers is result of blending of the cargo cult mentality – the fixed idea that computers will solve problems by default, with the hidden goal of manipulation of projects and processes. This complex of phenomena underlies in the ways different initiatives and projects are implemented.

In the domain of research, the government carried out a radical reorganization of the public research system that led to the downgrading and integration of research institutes within universities in Tirana They planned that reform without consultations with the research community, without an implementation plan and not accounting for the final cost. In this turmoil the Institute of Informatics and Applied Mathematics – created in 1971 and seen by the public as a symbol of informatics in the country remained for several months neither dead nor alive, until at the end of 2007 when it was integrated as center of research within the Faculty of Information Technology.

Simultaneously with the dissolving of the Institute of Informatics, government created the National Agency for Information Society. Formally that was a positive step. In practice its creation was difficult because of missing qualified staff and lack of collaboration with the research and education community. But the old institute was created to serve the requests of public administration, it would play very well the role of that agency with little internal reorganization, and creation from the scratch of a new organization was not necessary. It seems that politics was more interested to erase what was already built and to say that "they did it" from the scratch.

All this reform was justified with some partial models from western countries – “research is done in universities” (western research centers were not counted). Western partial models were considered as the key for the success of the research system; and political, economical and social factors that shape that success were totally ignored.

In the direction of e-governance, the government put lot of efforts in big, important and problematic projects, as described in the previous section. Three cases are presented as
examples how e-bureaucracy may complicate things instead of easing them, and showing how politics sticks on popular ideas while neglects the coordination of projects and the quality of services.

Creation of the National Center of Registration and of the electronic registry for businesses was considered as very important to simplify registration processes, following the logic of “one-stop-shop”. In practice a real confusion was created because by law all businesses had to deposit there their yearly financial balances – the same procedure they have to do in tax offices, and make sure that all their data was correct. They supported the wrong idea that “the computer solves the problems”, and there was no coordination between projects and offices.

The other problem was missing of procedures to solve cases of errors on electronic databases, and justification for the errors of administration because "the computer did it". It happened with the Energetic Corporation, they use an electronic database to store bills for all clients, and in order to "fight corruption" they do not permit any modification of this database even in case of evident errors. Reading of energy counters is done manually. It happened in a public institution when the worker read wrongly the counter and the wrong value was inserted in the database, on which basis a huge bill was issued. The error was identified, but it was "in the computer" and the solution was to send bills of zero value for two years to the client, until the actual reading of the counter reached the wrong value in the database. For two years the client used electricity without paying it, and at the end it had the same huge bill to pay.

Public procurement is considered as one of the sources of corruption of public administration. Use of ICT is considered by many political agendas as a good solution for this purpose. In such context the preparation of electronic procurement procedures was considered a big step forward. Nevertheless, procurement itself is a complex process. ICT may improve the transparency and speed up the process. But there are many other crucial factors as terms of references, the size of tender, and the ability to follow contractual obligations. Neutrality of terms of reference may force people to accept known bad solutions. Size of tenders is related with experiments of governments to concentrate all procurements of the administration in one hand. As result, premises for lobbies, risks for failures, delays for many months, monopolization of the market, degradation of services, and shadowing of local companies, all these increase proportionally. Electronic certificates are not used and the integrity of the database formally is questionable.

In education, the government is investing for the huge project of introducing ICT in schools. The main objective is quite good and, if fully realized, it would improve considerably the teaching. Government instances neglected the suggestion to implement the initiative gradually through pilot projects and learn by doing, they decided on the basis of pure political arguments. Missing of necessary conditions in different parts of the country – technicians, local funding, electricity shortcuts – all is considered only in a theoretical plan. Distribution of equipment is delayed for many months even for stupid reasons. While a lot of money is spent for the equipment, conditions for their correct usage and the long term sustainability of the project are still in discussion.

At the same time public universities are lacking behind. Government considered as important the connection of the academic community with the pan-European research and education network GEANT. People from government, being ignorant of related projects in the country, asked directly the European Commission for help to connect Albania with the GEANT. At the same time ICT departments from universities had tried to achieve this objective and they
participated in the regional initiative SEEREN for GEANT connectivity in the Balkans area. Participation in this initiative requested a co-financing from local funds for leasing of international lines, a total of 50 k€. Government instances did not give the requested local fund and the participation in the project remained pure formal. The interest expressed by the government was something impulsive – said and forgotten.

Always in this framework, the project-idea SEELIGHT was launched in Balkans area, with objective to assure optical fibers for a long term period up to 15 years, which would solve the problem in regional scale. Leasing of international telecommunications lines has high cost in the area and does not permit national networks, having a limited budget, to get gigabit links. The project is funded in framework of the Hellenic Plan for the Economic Reconstruction of the Balkans, and relevant ministries from each country must negotiate for participation. Involvement in SEELIGHT requires a co-financing of 550 k€ from local sources. Relevant people in government have verbally agreed to give this funding and arrange formalities for participation, nevertheless years are passing without any concrete step.

In all cases crucial but unsolved problems remains – effectiveness and sustainability of implemented systems. Public institutions suffer from the lack of good IT technicians because of low salaries and negligence of decision-making. In some other cases IT people are charged with many tasks and as result the maintenance may become the lowest priority. Public-private partnership is seen as a solution for sustainability. Typical case is the initiative of government to introduce ICT and Internet in all schools of the country. The initiative is a good one, with condition to have necessary support for sustainability – maintenance of equipment and continuation of Internet connectivity. The idea was to promote public-private partnerships between schools and local companies as a solution for the sustainability, but nothing concrete to attract the private was planned.

6. CONCLUSIONS

Government is trying to follow agendas of international forums as eSEE and Stability Pact. But it is necessary to understand their weak points and not to wait for problems to re-emerge after wasting lot of time and efforts, and to rediscover that "we cannot solve institutional problems using computers" [eSEE 2003]. Politics works to build up things in its own way without considering the reality. This is reflected in attitudes toward strategies and ways of their drafting, distorted balances and lack of collaboration between sectors, exaggerated impact of non-experts in technical decision making.

For a small country the good coordination of all local resources is of vital importance. A strategy for implementation and deployment of ICT country-wide would be a tool to organize the collaboration between different actors and to exploit capacities of research community and of universities. Missing of this chance may lead to serious consequences slowing down the development and creating unexpected situations.

Learning from other countries is a “must” in order to avoid errors and get hints to solve local problems. But the impact of projects will be uncertain if alien experiences are blindly applied. At the same time neglecting alien experiences will lead to repetition of errors and uncertain results.

Much attention for the e-bureaucracy will not make the governance better, in a country that needs to reform itself radically. To increase the effectiveness of public administration it is
necessary to work with people in all levels, making them to feel the responsibility of their public actions. This is an issue of human interaction and not of the technology.

An important resource for development is left out because of little institutional collaboration between government and universities. It is important for universities to integrate their work with each other, but first of all they must contribute for the country dealing with local problems. In a developing country the government practically plays the role of a champion, leading the process of implementation of ICT beside the private sector. When collaboration with universities is low, pseudo-expertise and cargo cult becomes dominant for the immediate pleasure of politics but with long term consequences.

International actors and local politicians must take into account the complex of negative phenomena identified in the process of implementation of ICT in developing context. This will improve the impact of ICT. It is not easy, and easier ways are not always the best ones. The process of deployment of ICT has a long way to go, and it is necessary to analyze and compare continuously the actions of political decision making and their impact in the terrain, in order to improve the understanding of political impact and the ways of evolution of politics itself in ICT-related national and international plans.

7. REFERENCES AND CITATIONS


ICT for Mesh-Economy: Case-Study of an Urban Slum

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Abstract: The paper submits ethnography of ICT immersions in ‘information poor contexts’ through exploring socio-economic networks of a heterogeneous, low-income community in Mumbai. Here, ICT usages are embedded in two main social processes; 1) grass-root demand for communication 2) a mesh economy of formal and informal networks. We present findings from a contextual study of ICT enabled businesses in a rapidly up-scaling suburban slum amongst its low-income communities. We believe ICTs embedded in resource-stressed survival economies evolve and adapt to fit with existing economic behavior enmeshed in a range of formal and non-formal practices. We observed that here the formal/non-formal dichotomy is transcended, rendering economic distinctions irrelevant at the ground level of business networking processes. We ask if ICT’s, firstly, by the kind of technology they are, have specific potential to aid dissolution of these formal/non-formal distinctions for survival economies. Secondly, by facilitating small businesses, do they come to bear a special status in promoting survival, sustenance and overall development of the small business community.

Keywords: Ethnography, ICT for development, Communication ecology, Non-formal economy, Small business, Urban slum, Mumbai

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ICT for Mesh-Economy: Case-Study of an Urban Slum

1. INTRODUCTION

In the last decade greater affordability of ICTs has transformed communication networks at every economic level. It is widely published in research and action literature that ICTs form a major component in accelerating development with the mobile phone occupying primary status in aiding development goals. The paper is informed by ICT usages in small survival economies in an urban slum/low-income community. We focus on the mobile phone and PC for an ICT-centered understanding of small businesses, what ICT usages facilitate and their role in sustaining important survival networks.

We report from an ongoing ethnographic study since February 2008 of a suburban low-income neighborhood in Mumbai focusing on usages of the mobile phone and the PC in small and diverse business outfits. Our broad research goal is to delineate social networks in the context of business practices among self-owned, small shops that use mobile phones and/or PCs.

We discovered two trajectories guiding business survival; Firstly, social networking revolved around tapping local demand for communication, secondly, social networks for business meshed with existing economic networks comprising of formal and non-formal practices. These revealed ICT usages for small business dealings in a survival economy, enmeshing and dissolving the formal/non-formal distinctions of economic landscapes. At one end of the economic divide are the small vendors and service providers of ICTs and at the other end are licensed corporates and private players, each sustaining and requiring the other to complete an economic transaction. We call this the mesh-economy, a term we coin to support research-based arguments. Based on these findings we argue that ICTs, viewed as ‘privileged’ technology, aid in the dissolution of formal/non-formal economic frontiers and provide scaffolding survival strategies for small businesses. We provide description and analysis of the nature of small ICT-related business foregrounding socio-economic contexts, networks and support structures of sales and services.

2. METHODOLOGY

Our research field, since February 2008, is three sq Kms of human habitat in west suburban Mumbai called Behram Baug with 10,000 households and a population of 50,000. Behram Baug is inhabited by a heterogeneous population comprising of upper middle to low-income classes and a slum quarter. The latter, our ethnographic focus and study, comprises a multitude of survival economies in the form of small shops, cottage industries, servicing stores and a self-employed human labour force offering diverse economic services. We used a variety of qualitative methods comprising open-interviews, observations of community life and base-line surveys of business outfits. So far, we have completed four months of field observations recording broad delineations of history, demographics and political administration of the community and random selections of 20 mobile phone stores, eight shops that depend on PC/PCs for work and 10 profiles of self-employed persons (Table1).

We undertook semi-structured and open-ended interviews with shop owners to allow us define ICT usages supporting everyday business dealings/networks. We profiled ten of the self-employed subjects from a convenience sample. Through open interviews we assembled data to note the variety of communicative resources and social networks supporting their
livelihoods. We looked closely at social communication networks (both human and ICT-based), their embedding and contexts of use in the specifics of a heterogeneous community living at the urban fringe of development and progress. Given the on-going nature of research and for the purposes of this paper we use data specific to the 20 mobile stores to illumine arguments.

Table 1

<table>
<thead>
<tr>
<th>Shop</th>
<th>#</th>
<th>Type of business</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Mobile store</td>
<td>18</td>
<td>Tiny Top-ups, Pre-paid cards, handsets, accessories</td>
<td>Open interviews with store owners and field Observations in and around the store</td>
</tr>
<tr>
<td>Mobile store PC using</td>
<td>2</td>
<td>Bill payments, handset repair</td>
<td></td>
</tr>
<tr>
<td>PC using store</td>
<td>6</td>
<td>e-ticketing, Photography, lottery</td>
<td></td>
</tr>
<tr>
<td>Self-employed using mobile phones for livelihood</td>
<td>10</td>
<td>Domestic help, casual factory labour, taxi driver</td>
<td></td>
</tr>
</tbody>
</table>

*The paper focuses on findings from the 20 mobile stores

3. LITERATURE REVIEW

We use and research three concepts to organize and analyse data from field research; 1. ICT for development 2. Communication ecology and 3. Non-formal economy, in the contexts of small business social networks. Research began from the viewpoint of ICTs for effective development and social progress needed to evolve a capacity to understand social contexts of communication in resource-challenged and ICT poor communities. ICT for development literature have highlighted the perils of assuming unilateral gain from deploying technology that cannot promote community participation (Heeks 1999, Cleaver 2001, Bailur 2007), empowerment in the face of ICT usages (Proenza 2001, Kaushik & Singh 2003, Colle 2005, Brewer et al 2006) and long-term sustainability of ICT community projects (Roman & Colle 2002, Gurstein 2005, Heeks 2007). One way to address these issues is through in-depth study and holistic analysis of community processes before or after a purported ICT intervention. Our study is a step in this direction by using the concept of communication ecology to foreground operative communicative networks in the field of study.

Borrowing from the area of communication research we use the term to refer to ‘the context in which communication processes occurs’ (Foth & Hearn 2007). These processes describe people communicating with others through extended social networks including face-to-face and a mix of media and communication technologies (Tacchi 2006). The concept enables researchers to take a holistic approach towards understanding an array of social contexts in which human communication occurs despite a research focus on ICTs. While maintaining focus, it allows inclusion of multiple communication devices and extends inquiry into social contexts that govern the act of communication itself. Thus, communication ecologies are not simply technologies or communication acts but a range of human activities and clusters that facilitate them (Slater et al 2002, Tacchi et al 2003). Though ICTs are creating new formats of networking, the essential pre-ICT face-to-face communication behaviour continues to influence the variety of communication contexts especially in resource-poor human settlements (Malony 2006).
Explorations of the communication ecology among small businesses in Behram Baug point to a multitude of everyday networks at play. These businesses survived on regular daily interactions with several agencies. These shops, stores and servicing centres were embedded in the larger non-formal economy of not only the neighborhood but the sprawling metropolis of Mumbai. Researching them meant investigating a ‘mesh-economy’ of several legal/ill-legal, formal/non-formal businesses and related social networks. A broad definition of non-formal (or informal) economy includes household enterprises that are self-accounted with family or casual employees or the formal sector employing casual or intermittent labor all of which work under varying conditions of (un)regulation (Peattie, 1980, Agarwala 2005). A more recent definition of non-formal economy refers to a group of economic activities that have legal ends, but employ ill-legal means (Lugo & Simpson 2008) They are activities that do not intrinsically have a criminal content, but must be carried out illicitly, even though they are arguably legal and desirable activities. The existence of non-formal economy has been linked to the lack of property rights and the overall bureaucratic obstacles restricting individual entrepreneurial activity (Lugo&Simpson 2008). The term informal economy was coined by social anthropologist Keith Hart in 1971 during his field work in Western Africa (Hart 1973). It denotes survival economies of the poor whose individual economic transactions do not ever rise to the taxable limit and occupies a zone of commercial exchange, mainly by offering their labor. In countries like India, it makes for a range of goods and services affordable to the large number of low-income and poor populations. Mumbai offers a unique location to explore our research subject. It not only hosts an extraordinarily vibrant and organic commercial culture but a thriving non-formal economy intersecting with the more formal counterparts at various thresholds of contact. The informal sector, arguably, accounts for 68% of Mumbai’s commerce. We apply the three concepts to organize research findings and draw linkages between ICTs and small business.

4. FINDINGS

We take inspiration from Galperin and Bar (2006) who explore the role that could be played by microtelcos—small-scale telecom operators that combine local entrepreneurship, innovative business models, and low-cost technologies to offer ICT services in rural areas. But our field, though poor, is urban and showed similar play of creative entrepreneurial skill and business organization. Behram Baugh’s habitat is a mixed neighborhood of upper and lower middle-class and poor communities. Its epicenter is a bustling slum community comprising 10,000 households, hosting a service economy of small shops, cottage industries, street vendors, skilled and unskilled contract laborers and domestic helpers. Due to Mumbai’s skyrocketing land prices much of it is being gentrified into up market apartments, offices and shopping centres. Today, the slum geography is gradually eroding and making way for up-market malls, offices, apartments that ironically boosts its service economy. We confined our research to the slum neighborhood where we are investigating small business and self-employed services. We choose data from 20 out of the 55-60 neighborhood mobile phone sales and servicing outfits to forward and highlight three major arguments-

1. All local stores, even the smallest, may have formal partnerships with big mobile phone companies but their local business processes are mired in non-formal agreements
2. A sound knowledge of local communication needs shape everyday business deals
3. There is reasonable expansion and diversification of business leading to ‘organic’ immersion of technology.

The last argument will be expanded in more detail in the section under discussion and
conclusion.

**a) The Business of Non-formality**

We discuss the depth of non-formality in the business culture of Behram Baug by evaluating the presence of technology (hardware), skills, labour, organization and housekeeping in unregulated and informal practices (Table 2). The table encapsulates ethnographic data providing specific examples of non-formality in business practices.

<table>
<thead>
<tr>
<th>Non-formal practice</th>
<th>Number of stores n=20 stores</th>
<th>Source/Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sourcing Hardware</td>
<td>17- keep grey market goods</td>
<td>Traditional grey markets, dealer networks, local contacts</td>
</tr>
<tr>
<td>Staff Skill Training</td>
<td>20- employees learn from uncertified sources</td>
<td>on the job, friends PC, uncertified training centres in the city</td>
</tr>
<tr>
<td>Human Resource(labour)</td>
<td>20- sourced through kindred and social networks</td>
<td>Direct kin from native place, friends brother, neighborhood contact,</td>
</tr>
<tr>
<td>House-keeping</td>
<td>20- irregular/ invisible</td>
<td>Own-accounted, manual/paper book-keeping, No billing (bill on customer demand)</td>
</tr>
</tbody>
</table>

The five categories represent capital and critical infrastructural input and channels of sourcing needed to run any business with a technology component. In the mobile store, all of these were predominantly sourced through social networks, rarely through a certified formal channel (e.g. banks, employment agencies, branded markets).

Most of the leading mobile phone product and service providers are represented in shops lining the two main commercial streets cutting across the slum, in the form of posters, banners, fliers, and even audio jingles/announcements. These sell new and second hand phones, SIM cards, top-ups, scratch cards, phone accessories, repair and maintenance services and software updates. There are five dedicated mobile stores (almost resembling Nokia priority stores) selling a variety of phones which are available at ‘white rates’ complete with bills and warranty cards, to smaller ‘made-in-China’ phones that have ‘less-than-a-year life’ and no warranty\(^1\). There are nearly 50 odd stores that sell a range of small ‘talk-time top-ups’, some as small as 25 cents, that house a small collection of handsets, largely acquired from the ‘grey’, unregulated, markets of Mumbai. A shopkeeper said, “I keep handsets more as ready advertisement for the shop’s business and they attract local youth keen to try out new features and experiment with them…. This can work out to an eventual sale”. All that a small shop needs is a space, eight by eight feet and a mobile phone to contact the local sales and distribution staff of various mobile phone companies. Recharge

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\(^1\) A basic hand set can be procured for US$10 while as second-hand Nokia colour handset can be bought for as less as US $25, four times less than the market price.
coupons, SIM cards etc are available on credit. The store keeper earns a percentage that varies from 8-10% of the amount sold – the rates vary depending on the types of talk time and/or connection sold and the arrangement between local vendors and company agents. This was negotiable despite standard procedures the companies adopt. On an average, a small top-up selling store can make a take-home profit of US $ 200 per month.

Around 16 of small stores had attached mobile phone services to existing business, only four dedicating business to mobile phone slats and services. Four offered public telephony though a land line and call-booths, six offered photocopying services, one handled railway ticket bookings, one was a bakery, one had rented space from a small restaurant to run watch repair and maintenance services, two sold stationary, one was a travel agent, one a photo studio, the smallest one attached a maintenance service for household items like stoves/grinders and two had small stores selling general-purpose items. Many of these ran several businesses under one license and authorization for mobile service dealership, in many cases, were unclear. There were several anomalies in book keeping, billing and accounts. We observed that many client transactions go unbilled. Even shop-floors/spaces are tucked away in nooks and services of existing business outfit. Homes double up as storage spaces and office space. The public streets are spaces for client exchanges and services. The watch-repairer and mobile service provider sits in a front corner of a fast-food restaurant. His contract with the restaurateur is an undercover agreement of sharing income! The ring of the more privileged building spaces and residential complexes is serviced by the slum economy in areas such as domestic and household services, couriers, office services outsourced to smaller vendors (Xeroxes, photo studio etc.) and mobile phone services (top-ups, SIM cards and even second-hand sets),

With regard to the relationship between the big companies and small shop owner, the former’s sales and distribution agents visit these stores every day. A store keeper never has to call his suppliers. Once the site of the store is communicated to these agents, the store keeper has to incur zero costs other than rent, and a mobile phone handset! He is provided with promotional material about the various schemes. He is also sent SMSs about the various new schemes as and when they are launched – these are then backed with sales and distribution visits. He is also provided demo cards to make electronic transfers and given additional incentives of rock-bottom rates for his personal use. A store keeper says, “...this is perhaps the best business given the minimal investment and effort it demands.... there can be no competition between the 50 odd shops here because the margins are very narrow and in a sense nobody steps on another and everyone gets a piece of the pie...”.

Most of the store employees are sourced from the owners native kin groups, usually sourced from the native place (the place where the owner originally hailed). In this way a small community of kindred begins to take root in the neighborhood. Shops using demo cards, electronic re-charges and software updates use a PC and needed a PC skilled employee for operations. Many a time, existing employees are encouraged to learn work-related PC-skills from a network of friends who have prior experience of handling computers or run a PC-based business (like digital photo studios, PC assembling units, small computer skill training institutes). Many local lads tutor themselves on the job with the help of agents representing the telephone company. In some cases, shop owners themselves undertook PC-training or dipped into the neighborhood pool of PC skilled youth and appointed them as employees.

None of the stores had a visible process of house-keeping sales and accounts. We observed precious few of the clients asking for or receiving a bill. Money transactions with mobile
phone companies are standardized and visible but discounts and profit-cuts are wrenched out of regular procedures and are negotiable. These however accrue small but valuable profits to the local vendor.

b) Communication for location

A businessman servicing a mobile phone market in Behram Baugh is mindful of a working-class migrant population in need of a constant communication channel to call back home. Hence, free life-time in-coming, small re-charges and top-up coupons are killer packages bringing a steady inflow of income. The small business outfits, cottage industries and stores have a single dedicated mobile phone number that are used for both official and private reasons and move between employees. These are often lifetime validity connections, and may be tied up with offers like free talk time with the head-of-the-unit or a senior employee’s number. Smaller wage earners share mobile phones among their groups of co-residents. The biggest draw is the cheap handset and connection costs. All members of the unit contribute to recharging the single handset, or each other’s talk time in case of multiples handsets. Phone expenses and charges were pooled and the amount a person contributed was proportional to their financial ability. Most prefer unbilled and pre-paid transactions for 4 reasons: 1. Billing criteria demand procedural transparency 2. Obtaining postpaid connections often require considerable paperwork 3. Client addresses are impermanent 4. Pre-paid connections constantly beeped about depleting talk-time and helped self-regulate mobile phone conversations and re-charge expenditure.

The mobile store develops or expects little client-loyalty. Socio-economic distinctions among customers matter little to store owners. The upper-income clients in the neighborhood visit the stores for their convenience and to avail of the range of cheap offers unavailable in their fancy counterparts, the malls and flagship stores. The slum section draws the greatest interest in new schemes of the small talk-time coupons, top-ups and low-end SIM cards. These yield the highest margins for the store. Store keepers claim little potential to develop a dedicated customer base. As one of them put it, “It rains talk-time top-ups everywhere. A lot depends on store-visibility and word of mouth networks. We need to be vigilant and dynamic in stocking our wares”. There is still opportunity for a dedicated though infrequent customer base if one deals in used handsets and handset maintenance. If the store is known to provide good service and has a good network to rotate interesting handsets, few dedicated clients turn regulars. Word of mouth and goodwill is the only source of advertisement.

Finally the local demand for un-warranted goods at affordable rates makes for business viability. Here, un-warranted could mean not just ‘used’ handsets or the ‘made-in china’ variety but fake and stolen goods. The big stores keep away from these to maintain a legal face up-front. A stronger reason would be the lack of any good business-sense in storing ‘grey’ products. A fancy store mentioned, “… it actually damages store image to keep these handsets and makes no business sense either – the margins are not worth the loss of respectable business.” Some of the big stores and all small stores were united in their

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2 A connection is got for as low as US$ 3 with a month’s validity. Top-ups are less than 3cents and can be topped up with talk time as and when one wants to make a call or SMS. A lifetime validity card can e had for as little as US$12. Another popular strategy is to own two stated numbers from a single service provider with no calling charge. The fastest moving top ups are 10 rupee coupons. A 50 rupee customer is called a “good customer” and asks for easy recharge. Most of the small shops sold talk time with easy-recharge facility. Though demo cards allowing electronic talk time transfer was widely available clients preferred to buy top-up coupon and recharge manually!
approach to ‘grey’ market products. Another big store owner said “…That there is a huge demand for rotating handsets, and a strong clientele, investigating at regular intervals and looking for up gradation or just a change of their older handsets. They can be had cheap and, if the client is a known person, we even give away for credit. Young people of Behram Baug are a huge market for “China Phones” – that have the kind of features that are “unimaginable”! They work for some 6 months – but then the prices are a dream…” A small store keeper said that people actually call up and demand for particular handsets /specific models to be kept apart if he managed to get hold of them.

The third argument of linking expansion and diversification of business and the local nature of technology immersion will be detailed in the following section.

5. DISCUSSION

Information-centered research and understanding of ICTs in small enterprises view them as a viable route out of poverty through increased and more diversified income streams (Donner 2007, Duncombe 2006, Molla & Heeks 2007). Taking forward our argument of expansion and diversification of ICT enabled business and ‘organic’ immersion of technology, firstly, we began to think of a mixed or mesh economy as dissolving formal/non-formal economic distinctions at the ground level of business organization and transaction. (This point is strong in the ethnography). They function as continuous, inter-dependent and enmeshed spectrum; the small vendors and service providers at one end and the licensed big players at the other; each requiring the other to complete any business transaction. Small businesses do not fully possess the opportunity or resources to grow into a full-fledged organization with certification and legal papers (Moyi 2003). They depend on local/ neighborhood mesh economy and their communication channels, including face to face, neighborhood level conversations, as well as local and national conversations building relationships for ongoing economic transactions. Support structures for the economically-challenged end of the spectrum are local community structures and human and familial capital procured from the native home. As we noted in the findings section, much of the employee pool operating a store usually belongs to an ethnic group of migrants in search of livelihoods in Mumbai, usually hailing from the same native village or small town. As migrants, many of them lack resources and accessibility to large market networks for small-scale entrepreneurial activity. These drive them to associate with existing informal networks and, with time, evolve into small self-owned businesses. The mobile phone, in turn, provides the only communication channel to connect to the place of origin for extended support and renewing social contact.

The mesh-economy relies on street level activities and daily transactions among individuals with shifting impermanent addresses, who still are reliable clients and business partners. The mobile phone services are the backbone of mesh economies and explain its huge adoption rates. It allows for the individual / shared user with no fixed or permanent geographic identity to have one capable of translating communication into transactions. The mobile phone is a clear connector of spaces and creator of social networks across socio-geographic boundaries. Armed with a mobile phone, small scale entrepreneurship and street level economic activities begin to acquire the status to merge with mainstream commerce and transform existing capacities to transact.

We wish to reiterate that technology does not relinquish and replace existing channels of communication and social networking. On the contrary, through en-meshing with existing channels, it equips and energizes these towards broader and deeper business co-ordinates.
ICT usages through their dissociation from a purely spatial and stationary communication channels liberate the marginalized and uprooted trader, especially in a magnetic megapolis like Mumbai, to transact and migrate towards more stability in business relations.

6. Conclusion:

Our research investigation is still in progress requiring deeper data-synthesis and analytical frameworks to re-work initial findings into compelling arguments. We are nevertheless confident to argue that ICTs, by the very nature of the technology it is, has inbuilt facility for dissolving the formal non formal dichotomies. However, does the fact of its special technological relationship with legitimacy, piracy and non-formal economies facilitate inter-dependence? We feel that it can, if ICTs in general and mobile phones in particular, overlay existing networks of the mesh economy by promoting the use of shared computers, organizing camps, encouraging legally sharable software at neighborhood level neighborhood or group level. Using the mesh economy framework we find potential networks of relationships built productively on both sides of the spectrum; probably the only time when the formal multi-national service provider and the local kiosk top-up/talk time seller are visibly engaged in a semi-formal relation to sell mobile phones and services. The privileged side can further help legitimize the unprivileged side by subsidizing costs of space, becoming pro-active with local government authorities, providing legitimate identities to local vendors, fostering more accountable networks in addition to whatever the existing relationships accomplish. This certainly allows for mutual benefit, greater brand penetration at a neighborhood level and subsidizing costs promoting marketing activities for local enterprises.

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Nimmi Rangaswamy
THE INFORMATIONAL CHALLENGE IS ACHIEVING MATERNAL MORTALITY GOAL UNDER MDG 5: AN ANALYSIS FROM INDIA

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Abstract: India had the largest number of maternal deaths in the world. There is gross under-reporting and non-reporting of these maternal deaths, and even where data is available, they are incomplete and inaccurate most of the time. There are a number of challenges with respect to information practices, reporting, information use and information management. In this paper, we seek to understand the informational challenge in achieving maternal mortality goal under MDG5. This paper also examines how various contextual elements shape the nature of informational challenges relating to the identification and reporting of maternal deaths, and the formulation of interventions to address this very serious and current challenge that the Indian public health system is experiencing.
THE INFORMATIONAL CHALLENGE IS ACHIEVING MATERNAL MORTALITY GOAL UNDER MDG 5: AN ANALYSIS FROM INDIA

1. INTRODUCTION

Behind every death in pregnancy and childbirth is a personal tragedy. That tragedy can be understood and approached in many different ways. It is a biological or medical event. It is a health system malfunction. Sometimes it is a family or community responsibility. When multiplied many times over – nearly once every minute – then it is also a social injustice of massive proportions. When framed by its social profile... then it is also a collective badge of shame.

Freedman, 2001

As the introductory quote indicates, while there may be different recorded reasons for maternal mortality, the underlying reasons of why they occur reflect a health system’s malfunction. A key component of a health system’s functioning relates to the information systems supporting the programs relating to maternal health. The aim of this paper is to examine some of these informational challenges and how they may be addressed in the context of the Indian situation.

The Millennium Development Goals (MDGs) were adopted by 191 countries as a framework for a number of developmental activities at the UN Millennium Summit in September 2000. These goals constitute a global set of human development objectives ranging from eradication of poverty and hunger to developing global partnerships, to be achieved by 2015. Eight specific goals have been set, with over 20 targets and over 60 indicators, of which three concern health: to reduce child mortality, to improve maternal health, and to combat HIV/AIDS, malaria and other major diseases. We are now more than halfway towards the target date – 2015 – by which the MDGs are to be achieved. The specific goals under MDG for improving maternal health are to: (1) Reduce maternal mortality rate; and (2) Increase proportion of births attended by skilled health personnel.

The Tenth Revision of the International Classification of Diseases (ICD-10) defines a maternal death as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration of the pregnancy, or from any cause related to, or aggravated by pregnancy or its management, but not from accidental or incidental causes.1

Maternal mortality in 2005: Estimates developed by WHO, UNICEF and UNFPA and the World Bank (2007:15) reports that India had the largest number of maternal deaths (117,000), followed by Nigeria (59,000), the Democratic Republic of the Congo (32,000), Afghanistan (26,000), Ethiopia (22,000) Bangladesh (21,000), Indonesia (19,000), Pakistan (15,000),

1 According to ICD-10, maternal deaths should be divided into two groups:
- Direct obstetric deaths are those resulting from obstetric complications of the pregnant state (pregnancy, labour and the puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.
- Indirect obstetric deaths are those resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but was aggravated by physiological effects of pregnancy.
Niger (14,000), the United Republic of Tanzania (13,000), and Angola (11,000). These 11 countries comprised 65% of the global maternal deaths in 2005. By the broad MDG regions, Maternal Mortality Rate in 2005 was highest in developing regions (at 450 maternal deaths per 100,000 live births), in stark contrast to developed regions (at 9) and countries of the Commonwealth of independent states (at 51). Among the developing regions, sub-Saharan Africa had the highest MMR (at 900) in 2005, followed by South Asia (490), Oceania (430), South-Eastern Asia (300), Western Asia (160), Northern Africa (160), Latin America and the Caribbean (130), and Eastern Asia (50).

In 2005, the World Health Organisation published its annual report titled *Make Every Mother and Child Count* which presented an expert analysis of the obstacles to progress in maternal, neo-natal and child health, and presented a series of comprehensive recommendations aimed at overcoming them. It estimates that complications during pregnancy and childbirth are a leading cause of death among women of reproductive age in developing countries, killing over half a million women in 2000 and causing disability and suffering among many millions more (2005:18). Maternal deaths continue unabated, and are of ten sudden, unreported deaths that occur during pregnancy itself (some 68,000), as a consequence of unsafe abortions, during childbirth, or shortly after the baby has been born. The report notes that unwanted pregnancies are estimated at 87 million per year globally. There remains a huge unmet need for investment in contraception, information and education to prevent unwanted pregnancies. The fact that about 46 million women per year resort to induced abortion and that 18 million do so in unsafe circumstances constitutes, the report suggests, a major public health problem. It is possible, the report argues, to avoid all of the 68,000 deaths that occur every year, as well as the disabilities and suffering that go with unsafe abortions. Over half of maternal deaths occur during the post-partum period, the report notes.

According to *India Health Report* (2003), children below five years and women in the reproductive age group make up 36.2 per cent of the population of India. In terms of survival and well-being, they constitute the most vulnerable group in society. Though reliable national and state estimates of maternal mortality are unavailable, the existing estimates reflect the relative neglect of women’s health in India. The SRS (Sample Registration Survey) and RGI (Registrar General of India) estimates for maternal mortality for 2001-2003 are 301. There are huge regional differences within States as well as within districts. Hence it is difficult to even arrive at estimates of infant and maternal deaths. As part of its commitment to working towards the MDGs, India has set the following targets:

| Goal 5: Improve Maternal Health: Reduce the 1990 maternal mortality rate by three-quarters |
|-----------------------------------------------|-----------------|-----------------|---------------------|----------------------|
| Maternal Mortality Rate (per 1,000 live births) | 1990 5.4 | 2000 4.4 | (2002-2012) 2 by 2007 1 by 2012 | Millennium Target for 2015 1 |
| Source: NFHS |

1.1 MATERNAL DEATHS: CHALLENGES REPORTED

Most maternal deaths in India are caused by complications such as hemorrhage (29%), anemia (19%), sepsis (16%), obstructed labour (10%), unsafe abortion (9%) and hypertensive disorders of pregnancy (8%), all of which are preventable (Mathai, 2005:624). Murthy and
Barua (2004) carried out a study to explore some of the non-medical factors responsible for the persistently high maternal mortality in India. They reported that most deaths occurred at home and during the postnatal period. Most ‘death cases’ belonged to high-risk age groups, had high parity (3+), were socially disadvantaged, had not received pre-natal care and advice to go to hospital as compared to women with complications. Consequently, they either had not gone to hospital or had gone too late. Delay in care was also because of lack of transport facilities, inappropriate referrals or poor emergency preparedness of referral facilities. The authors argued that about half the deaths could have been avoided if the health system had been alert and accessible. The critical determinants of avoidable deaths were families’ awareness about complications, emergency transport and preparedness of referral facilities. The study highlighted the need for health workers to stress on health education, care during the third trimester and post-natal period, and referral to appropriate and accessible facilities, even bypassing the hierarchical referral system if necessary.

While the above challenges have been discussed by many, what is not often talked about are the informational challenges. For example, the availability of information to the medical officer on the geographical spread of pregnancies and the nearest referral center for emergency care can help in taking more effective decisions on providing timely outreach services to the pregnant mothers. A key WHO (2005) recommendation is to improve the information basis on which health management decisions are made. In this vein, the research aims of this paper are:

1. To understand the informational challenge in achieving the maternal mortality goals under MDG5; and,
2. Discuss the various initiatives that can be undertaken to overcome it.

In the next section, we discuss various informational challenges more generally for public health systems management and specifically related to maternal deaths at different levels of the health system in India, including national, state and sub-district. We draw upon a sociological perspective of “context-process” interaction for the same.

2.1 CONTEXT PROCESS INTERACTION

The context-process framework developed for information systems by Walsham (1993) inspired by Anthony Gidden’s Structuration Theory (1984) focuses on the mutual interaction between the processes of information production, generation and use, and the context within which this phenomenon is situated. The underlying principle here is that the context may both enable or constrain the processes of interest. For example, Sahay and Walsham (1996) have adopted such an approach to analyze the implementation process of Geographical Information Systems within the forestry sector in India. They identified contextual influences such as systems of bureaucracy and the high status of technology in society to contribute to the use of a compartmentalized and top down approach to implementation. However, over time, as processes of implementation got more entrenched, shifts in approaches could be discerned with the adoption of more participatory and inter-disciplinary techniques reflecting a shift in the contextual influences.

In this paper, the focus is on understanding the nature of informational challenges related to the phenomenon of maternal deaths, and how may this be addressed by strengthening the underlying information systems. The phenomenon of maternal deaths typically takes place in the context of communities or in health institutions, and information about that death which is collected there or in the facility slowly flows through different levels of the health facilities,
the district, state, national and international levels such as the WHO that may be monitoring the progress on the MDGs. A key problem here is that, often, the information fails to flow. Forming the context around the phenomenon of maternal death and supporting information systems are the facilities of Basic Emergency Obstetric Care (BEmOC) and Comprehensive Emergency Obstetric Care (CEmOC) available to the community, incentives for institutional deliveries, the effectiveness of antenatal services and of course, the information systems that record the deaths, and support its flow to the various actors in the health system.

The Indian health system has a multi-level context, including the national, state, district and sub-district levels. While health is a state subject, there are various nationally administered programs such as for Reproductive Child Health that while getting their budgets from Delhi, are implemented by the states. Another relevant actor in this scenario has been the establishment in 2005 of the National Rural Health Mission that has its key agenda to adopt a health systems approach to strengthen public health delivery. The health systems approach involves strengthening infrastructure, reforming health information systems, reinforcing the community based health force, enhancing schemes for improving institutional delivery among others. Some of these contextual influences are summarized in the table below.

Table1: Multi level contextual influences

<table>
<thead>
<tr>
<th>Context</th>
<th>Elements of Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the national level</td>
<td>• India being signatory of the Millennium Development Goals declaration.</td>
</tr>
<tr>
<td></td>
<td>• A key agenda of the National Rural Health Mission (NRHM) to strengthen community based systems.</td>
</tr>
<tr>
<td></td>
<td>• NRHM agenda to provide budgets for the upgrading of primary health centers to provide basic emergency management obstetric care services.</td>
</tr>
<tr>
<td></td>
<td>• On going processes of reforms of the HMIS at the national level.</td>
</tr>
<tr>
<td>At the state level</td>
<td>• Various ongoing programs to implement schemes for enhancing institutional deliveries, increasing training for Skilled Birth Attendants.</td>
</tr>
<tr>
<td></td>
<td>• Dedicated budgets for strengthening Basic and Comprehensive Management Obstetric Care services</td>
</tr>
<tr>
<td></td>
<td>• Many states employing emergency ambulance services to strengthen referral transport.</td>
</tr>
<tr>
<td>At the district and sub-district levels</td>
<td>• Various states have recruited community level workers (one for every 1000 population) to strengthen various</td>
</tr>
</tbody>
</table>
maternal health related processes such as motivating mothers to go for institutional deliveries, improving Ante Natal Care, strengthening post natal care etc.

- Redesign of the recording formats including the use of line listing for maternal deaths

In this paper, we seek to examine how the above identified contextual elements shape the nature of informational challenges relating to the identification and reporting of maternal deaths, and the formulation of interventions to address this serious and current challenge that the Indian public health system is experiencing.

3 Research Methods

The empirical component of this study is based on an ethnographic approach (Myers, 1999, Harvey and Myers, 1995:24, Suchman 1994) with a focus on developing in situ observations and descriptions of informational related processes on various aspects of health services delivery. The field study was undertaken in Hyderabad and in two districts, Chittoor and Nalgonda which involved many visits to different health centres, observations at the district offices and State offices. Further detailed interviews and focus groups were conducted with the health staff, project implementers and managers. Frequent field visits and participant observations were vital in order to grasp the phenomenon and trace various processes around the health environment, work practices, relations of use of technology in local sites of practice. As a participant observer considerable time, over 10 months, was spent observing the health staff, shadowing a health assistant to the community, spending a day with a doctor, attending many official meetings and training sessions, and generally ‘hanging around’ the health centres. Towards the end of the field study, focus group interviews were also arranged. Repeat visits made it possible to hear views from different participants on the same issues and how these change over time.

The ethnographic fieldwork was situated within a larger action research programme popularly called as the Health Information Systems Programme (HISP) initiated by the Department of Informatics, University of Oslo in 1994 and now ongoing in several countries in the South including India (see Braa et al 2004 for more details). The stated goals of HISP are to develop an open source and not-for-profit District-based Health Information Software (DHIS), conduct capacity building programs for the health staff, and strengthen processes of information use on priority areas such as the monitoring of maternal health. In India, HISP was started in December 2000 in Andhra Pradesh and over time has been scaled into a national level initiative. However, for purposes of this paper, we focus on the empirical work carried out in Andhra Pradesh during the period 2000-2005. Further, we also draw upon some empirical work carried out in 2008 at the national level by one of the authors of this paper, where the focus has been to redesign the national health information systems.

4 CASE STUDY

4.1 NATIONAL RURAL HEALTH MISSION

The case study narrative involves description at two levels: one, attempts at the national level to reform of the health information systems, including making it more responsive to the issue
of maternal health; two, a more micro level description of how a maternal death protocol was implemented in the community level in the state of Andhra Pradesh.

As mentioned earlier the NRHM has been tasked by the government to bring in architectural corrections in various health systems areas including related to health information systems. While these efforts were wide ranging, two sets of issues are relevant to this analysis. The first concerns the introduction of parameters to monitor whether a particular health facility is providing the six signal functions as a part of the Basic Emergency Obstetric Care Services (BEmOC): 1) Parenteral a dministration of Antibiotic; 2) Parenteral adm inistration of Anticonvulsants; 3) Parenteral administration of Oxytocics; 4) Assisted Vaginal delivery; 5) Manual removal of Placenta; 6) Removal of retained products of conception. After detailed negotiations with the various stakeholders, the following three treatments of complicated pregnancies was included in the health information system: antibiotics, antihypertensive/Magsulph i njections a nd O xytocics. Comprehensive Emergency Obstetric Care Services (CEmOC) should provide all the above three services along with the following services round the clock through out the year: (1) A vailability of blood and blood t ransfusion facility; and (2) Facility for Cesarian s ection for de livery of foetus i n emergency cases.

Initially, there was reluctance to include the above parameters based on the argument that we already know that most facilities are not in a position to provide these 6 (BEOCS) signal functions. The counter argument raised was that this is exactly why we need to monitor them so that we know which facilities are being made capable of doing so. Finally, through negotiations it was agreed that three of the key functions would be included. The second issue concerns the recording of maternal deaths. Previously, deaths were recorded as specific data elements, with specific items for number of deaths, and then separate items relating to number of deaths by different causes. In addition to the basic problem of maternal deaths in general being not reported, the existing recording system was ineffective to track particular cases of deaths and relating them to causes. As a part of the reform process, it was argued that we should record maternal deaths through a system of ‘line listing’ where a particular line would contain name of the deceased, when and where the death has taken place, the probable cause of death and whether or not the maternal death audit had taken place. Since a facility typically reported one to two deaths in a month, the line listing system replaced more than 100 data elements to a few lines in the line listing. Secondly, this system gave richer data on the particulars of the death, location, causes and about its audit. After a fair amount of negotiations and discussions, this system of line listing recording has been accepted and is in the process of being rolled out.

While the above examples are of reforms that are now in the process of being implemented, it is at this point not possible to empirically argue how this will influence the management of maternal deaths. However, we now provide an example of a particular system for recording maternal deaths being implemented in the state of Andhra Pradesh.

4.2 MATERNAL AND INFANT DEATH PROTOCOL IN ANDHRA PRADESH

With a population of 76 million, Andhra Pradesh is the fifth largest State in India. With about 73 per cent of its population living in its 28,123 villages, it is predominantly a rural, agrarian and under-developed. A key concern of the State Health Department has been that although there has been a significant improvement in population stabilization, there had not been
concomitant improvement in reproductive and child health status. The state reported maternal
mortality rates in 2002 at 341 per 100,000 live births respectively. Only about half of the
women in the state deliver at health facilities, and routine data on causes of maternal deaths
are largely unavailable and unreliable.

The State government in 2002 issued a protocol stating that 75% of maternal deaths are
preventable, and advocated an approach to analyze every such event, so as to determine the
direct and indirect obstetric causes, diseases and socio-economic causes of such deaths, and to
suggest corrective and preventive measures in the future, such as: “a maternal death protocol and
an infant death protocol be adopted for prompt reporting, investigation and action for these
deaths.” Towards implementation, the protocol suggested the formation of committees at the State
and district levels, and also of a three-member investigation team to audit every maternal or
infant death. The protocol further noted that “the occurrence of a maternal/infant death should be
reported within 24 hours by telephone or telegram or fax” and that the investigation be completed
within 15 days of an occurrence and a report filed to the district and state-level committees for
follow-up action. A year after this protocol was implemented, it was realized that auditing every
case of infant and maternal death by this team was not feasible. To further decentralize this
process, in the next amended order the onus of investigating each maternal or infant death was
left to the medical officer of every health centre who should submit the audit report to the district
officials within seven days. This stipulation was a key driver for the State to conceptualize the
design of a Mortality Information System (MoIS) which would require data entry of all maternal
audit case sheets at the district level through a web based system.

4.2.1. INFANT AND MATERNAL MORTALITY INFORMATION SYSTEM AT THE
STATE LEVEL

The department felt that it was necessary to understand the socio-economic along with
the medical factors leading to infant and maternal deaths. It stated that the rationale for the
MoIS project in order to control infant and maternal mortality the first step is to record all
cases. In February 2004, the State invited HISP India to develop and implement the computer
based MOIS. A special officer who was actively involved in commissioning the project said:

The government has decided that every case of infant and maternal death will have to be
audited by the medical officer of the primary health centre concerned. That audit report will
contain the details of the death. The HISP team should get those reports, develop an
information system and feed the data at the district level so that it will be possible to analyse
the data at the State level.

Here, the special officer emphasised that for the programme planners and service providers,
understanding the causes of these deaths as well as in-depth investigations at the facility level
is crucial. Accordingly, HISP developed a web enabled MoIS to record maternal and infant
case investigation sheets. These sheets were very comprehensive, including containing various
causes of death, obstetric history (for example, complications during previous pregnancy, whether fully immunized or not) and illnesses, and also other details such as place of delivery, distance travelled from house to institution, mode of transport, time taken to reach place of delivery, access to health professionals, nutritional status, poverty and other socio-economic indicators such as annual income of the family, type of housing, education level of parents and their occupation. The audit forms were to be sent by the doctors from the health centres to the district offices. The implementation represented a highly “top-down” approach, as the data elements and signs were conceived at the Commissioners’ office. After a quick pilot where the prototype was demonstrated, rapidly the
MoIS was scaled to all 23 district offices of the state. A team was put in place by HISP, with each team member in charge of two districts each to train the members on the filling of the case sheets, conducting comparative analysis and in the generation of reports. A screen shot of the application is provided below.

Figure: Maternal mortality input screen

Under-reporting and non-reporting of infant and maternal deaths was a major constraint to the implementation of the system. Often the entry was the responsibility of the field staff rather than the doctor as the protocol stipulated. Even in cases when the doctors audited and sent audit forms, many of data elements were incomplete. The project, which was initially intended to run for six months, was scaled down to four months, because of the upcoming State elections. When the ruling party was voted out, there was change in the bureaucracy leading to the termination of the HISP contract in May 2004. Data entry and uploading of the data on the website however continued for sometime, gradually tapering down and then eventually stopping. As with most ICT projects this was also champion-centric, and with the change of bureaucracy, the project sponsor was moved contributing to the drying up of support. A recent visit to the website confirmed the non use of the web system.
4.3 AT SUB DISTRICT LEVEL: PROTOCOL VERSUS PRACTICALITIES

There were a number of challenges during the implementation of this protocol, particularly with respect to the changing of information practices, reporting and information use. There was gross under-reporting and non-reporting of these maternal and infant deaths, and details obtained were incomplete and inaccurate. One doctor said:

*A health worker has 10-20 villages in her jurisdiction. She has a tour schedule for 20 days and she is expected to be at her sub-centre for 10 days. So, she can probably visit a village only once or may be twice in a month. In between her tour days she also has to work at health camps. So she might not go to that village. When she next time goes to the villages she will come to know about these deaths. But, there is also a huge possibility of her missing them out. Hence there is non-reporting and under-reporting of deaths.*

While this is one challenge at the grassroots level, the doctor further said that even when deaths are reported, it is extremely difficult to implement the protocol and audit each and every death:

*If there are 2 or 3 doctors at the Primary Health Centre, then one can go on rounds to audit these maternal deaths. I am alone here. If I go to the villages to investigate each case, who will treat out-patients here at the health centre? I will have to treat out-patients from 9 am to 12 am. Then go to the villages. Villagers leave early in the morning and come back only in the evening. Even if I go to the villages chances are that I will not be able to meet them. Some villages are very far. The other reason is I do not have a vehicle at this health centre. It is quite difficult to get to these villages using local transport.*

In general, doctors preferred to spend time treating patients over conducting and documenting verbal autopsies. A district health officer added that:

*Firstly, most of these maternal deaths and infant deaths do not take place at the Primary Health Centres, and usually do so at a private healthcare institution. The primary health staff do not go to the private institutions regularly and record details of maternal or infant deaths. She may come to know of these deaths probably after two or three months or whenever she goes to that village. Since she does not go to that private institution regularly she may miss recording them. Private institutions are not much bothered about maintaining accurate records on deaths. Even if the primary health staff try and follow up this, private practitioners are not bothered to provide her all the medical details. And most importantly, if the private institutions do not maintain births and death registers correctly there is no legislation to check it. There is neither incentive nor punishment. This is one major factor.*

Health workers also often do not report as they fear action by district authorities for ‘dereliction of duty’. If deaths are reported they have to be audited. If an audit is carried out, the grading of the facility falls. For this reason, such reports are rarely made as one health worker said: “If I report all maternal deaths they are chances that I will be suspended.” So, reporting a death involved disincentives for both the individual and the facility.
5. ANALYSIS: THE INFORMATION CHALLENGES

Information related challenges have been outlined at various contextual levels from the national to that of the health facility at the community level. At the national level, there are challenges in the very design of the health information system, including what data is collected, the mechanism of collection, and the process of its flow. For example, the national level requirements are for monitoring related data rather than evaluating and policy impact analysis related indicators. Also, the programme driven style of data collection, analysis and reporting impedes upon a health systems kind of analysis inherently required for addressing a multi-faceted problem like maternal deaths.

At the sub-district level, medical certification of causes of death is usually not feasible since many deaths occur without any prior medical attendance. Thus, there is a dependence on a system of lay reporting of cause of death, using what is called a verbal autopsy. In theory, verbal autopsy has to be conducted by doctors and/or health staff by visiting the community and asking questions to members of the family and community questions about the events leading to the death of the mother. The doctor who conducts that autopsy is then expected to assess the accessibility and quality of the healthcare received by the deceased. Auditing every maternal death has serious practical difficulties due to various reasons including the severe shortage of health staff who are overburdened providing care to the live patients. The time and effort needed to audit such deaths, a absenteeism of doctors in rural areas, geographical distances, poor logistic and transport support all contribute to the inadequate collection of data on deaths.

Further, there are systemic challenges such as the disincentives the system provides to the health workers and facilities for reporting deaths. The information system can be described as poor given that a huge amount of data is collected, but less than 5 percent of it is used for the generation of indicators. Further, the system of maternal deaths audits is not institutionalized and rarely is action taken by the state and national authorities on their non-conduct.

There is a need to approach the problem of information collection with a stronger community level focus, including an informal analysis of the information relating to the death event. An approach to this could be to tap into the networks of dais, anganawadi workers and health assistants. The top-down and formal facility based approach adopted by the health department to gather information tends to be inadequate, and also extremely time and effort intensive. The existing system of reprimand and punishment associated with the reporting of adverse events serves as a clear disincentive to report maternal deaths. Addressing this requires a shift in the prevailing information culture where data is valued for its contribution to local action, rather than seen as a tool for control and reprimand. With such fundamental problems in the context of information systems for monitoring maternal deaths, attempts to track MDG 5 remains a very complex problem.

Attaran (2005) argues that many of the most important MDGs, including those to reduce malaria, maternal mortality, or tuberculosis, suffer from a worrying lack of scientifically valid data. While progress on each of these goals is portrayed in time-limited and measurable

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2 Community mid-wives
3 Community social workers
terms, often the subject matter is so immeasurable without appropriate reference benchmarks. This problem is further compounded by the poor culture existing in the health system around the generation and use of indicators.

6. CONCLUSION

As discussed in this paper, while it is important to have goals in place like the MDGs to track progress on key health challenges, achieving them requires attention to health systems related parameters and processes, including related to information. This involves appropriate design of the health information systems, procedures for data collection, and the processes around how this data is validated, analyzed, circulated and used. To make the health information system effective, adequate support needs to be provided to those responsible to implement on issues of logistics, infrastructure, resources, and manpower. Incentives need to be built into the system that rewards diligence on reporting, which is contrary to the situation that currently exists. Strengthening the context of the information collection, production and use, will help to address some of the existing informational processes related challenges.

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Challenges and Approaches in Moving from Data to Information to Knowledge: Case Study from the Gujarat State Health System India

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Abstract: In the domain of Health Information Systems (HIS) in developing countries, huge amounts of data being collected by the public health systems and very limited amount of that actually gets translated into “Information for Action”. Converting raw data into comparable frame of references and putting this information effectively into practice, and learning from this experience represents the translation of data to information to knowledge. While in theory, this translation from data to information to knowledge may appear simple and linear exercise, in practice it is extremely difficult to achieve. This process of translation from data to information to knowledge involves addressing various social, technical, institutional challenges. This paper seeks to empirically analyze some these existing challenges inherent in this translation process, and how they may be addressed. Empirically we draw upon experiences of the design, development and implementation of HIS with in the public setting of Gujarat health department.

Keywords: Data, Information, Knowledge, Gujarat State
Challenges and Approaches in Moving from Data to Information to Knowledge: Case Study from the Gujarat State Health System India

1. INTRODUCTION:

Research in the domain of Health Information Systems (HIS) in developing countries has repeatedly lamented that while huge amounts of data is being collected by the public health systems, very limited amount of that actually gets translated into “Information for Action” [Braa et al 2004]. Two important components are involved in this translation: “information” and “action.” Information implies taking raw data and putting it into a frame of reference or context. For example: Number of children given BCG vaccination represents raw data measuring number of BCG antigens administered within a particular health facility and time period. This data in itself is without a comparable frame of reference, for example in relation to how many children were needed to be given this particular service. As a result, this data is not “actionable”, as it cannot be compared with performance in another health facility or time period. This comparison done through “indicators” arrived at by comparing the raw data in relation to the target population of children under one year who were to be given BCG vaccination in the above example. This coverage indicator (BCG vaccination given / Target populations) can be compared and evaluated with other facilities/periods, and also with expected performance. A health manager can use these indicator to take relevant “action” such as improving outreach, strengthening supply of required stocks or increasing level of education and awareness related to importance of immunization. Putting this information effectively into practice, and learning from this experience represents the translation of information to knowledge. In this way, knowledge helps us to conduct our existing practices better and also introduce new practices.

While in theory, this translation from data to information to knowledge may appear simple and linear exercise, in practice it is extremely difficult to achieve. A Health Metrics Network (HMN) study categorized HIS into three groups. At the lowest level, we have HIS that are basically sufficient to do the routine data processing activities of registration and report generation. At the next higher level are the systems that show some examples of use of information such as the graphing of indicators and they being pasted at the wall of the health facilities. At level 1, a re HIS which primarily process data, information is produced and level 3 systems involve knowledge. The HMN report based on a seven country study reported that only Thailand was at level 3 while most others (for example: India, Ethiopia, Tanzania) at level 1. Level 1 or “data led” systems don’t of ten move to “action led” or level 2/3 systems (Sandiford et al, 1992). For various reasons such as the fragmentation of systems both manual or computer based [Chilundo 2005]. Heywood and Rhode (undated) describes the “chicken and egg” problem where because data is poor it not used as information, and the more it is not used the poorer the quality of data remains.

This process of translation from data to information to knowledge involves addressing various social, technical, institutional challenges. For example, lack of appropriate tool to process raw data into easily usable format for managers can inhibit translation the HIS to support information. Further, managers must have the capacity to analyze, interpret and use data. In an institutional context support such practices of use. This paper seeks to empirically analyze some existing social, technical, institutional challenges inherent in this translation process, and how they may be addressed. Empirically we draw upon experiences of the design, development and implementation of HIS with in the public setting of Gujarat health department. Learning from this experience can provide useful insights to other states in India.
and also other developing countries. Further this analysis can also provide some feedback to the Gujarat health department on how to move even further down this information to knowledge transformation.

The rest of the paper is organized as follows: In the next section, we discuss some relevant literature on data, information, and knowledge and there inter relationship. Following this we present the background and the research methodologies and then the case study itself with the focus on describing the process around the use of information for action. We then analyze the case study with an attempt to abstract the learning in terms of challenges and approaches in moving from data to information to knowledge. Finally we present some discussions and conclusions on this topic.

2. THEORETICAL FRAMEWORK: Data, Information and Knowledge.

The question of “what is knowledge” has been articulated variously, for example as “abstract, universal, impartial and rational,” in ancient Western philosophy (Coakes 2004, p. 408). Knowledge viewed in such a perspective reflects a commodity emphasizing that it exists prior to and independent of the knowing subject. This view is in contrast to the practice-based lens that assumes knowledge is created and distributed in the act of appropriation (Walsham 2001, Yakhlef 2002). Such a contrary viewpoint emphasize knowledge as being socially constructed, context specific, largely tacit (Polanyi 1967) and situated in practice (von Krogh 2002; Suchman 2002. This viewpoint is contrary to Nonaka (1991) and Nonaka & Takeuchi (1995) argument that tacit knowledge may be captured and converted into explicit, sharable form in organizational contexts (Thompson & Walsham 2004).

Arguments have also been made for a more human-centred approach (Walsham 2001), which emphasizes acknowledgement of the distributed and multiple nature of knowledge (Blackler et al. 2000). Nicholson and Sahay (2004), in the context of offshoring of software development, argued how aspects of knowledge drawn upon by individuals for successful implementation of such projects was deeply embedded, and could not be seamlessly circulated across time, space and cultural boundaries. The author gave example of the explicit parts of knowledge that could be relatively easily coded and transferred across countries, but its tacit components were not easily sharable, for example the different subjection understanding of time in a cultural context.

Practice-based conceptualizations of knowledge sharing is based on understand how people follow work routines in everyday organizational life, imbibe key learnings, and how knowledge is negotiated and shared. Gerardi (2000) discusses this concept through the example of a carpenter hammering a nail, which brings forth the relationship between subject, object, the context and knowledge. She emphasizes an emergent idea of practice of people who have knowledge in their heads which is appropriated and transmitted in everyday life.

In the context of public health systems, the subject of this study, we are intended in examining the practices around health information systems. At the level of data, the practices involve how health workers collect data, record it in registers, and then report it in the designated forms and periodicities. At the level of information, the practice concern how the collected data is processed into indicators, converted into graphs and charts, and analyzed and interpreted. At the level of knowledge, practices concern how the processed information is discussed and acted upon to improve public health system.
The focus of the paper is on studying the various practices around knowledge creation and use within the public health systems in Gujarat state in India. A practice based view is drawn upon for the analysis to understand the relation between users, the different forms of knowledge in play, and the context within which knowledge is negotiated, appropriated and shared.

3. RESEARCH METHODS:

Both the authors of this paper have been engaged in the design, development and implementation of HIS over the last decade in India. Specifically, in Gujarat the efforts have been ongoing since 2005, starting with 1 district, then 5 districts, and finally at the state level going downwards to the districts and sub-district. In this paper, our primary focus is on the third phase where we started at the state level, trying to build the capacity and tools to conduct analysis (converting data to information), and then follow the practices that try to facilitate the informational processes thorough which this information is converted to knowledge.

The research has been inspired by the “networks of action (research)” approach advocated by Braa et al (2004) for the development of sustainable and scalable HIS in developing countries. The basic principle underlying this approach has been the need to enable practices that support the creation of networks in which people can learn together, and share experiences and learning within the network. With respect to our case, the focus was on trying to build tools to conduct health information analysis, support the development of capacity to use these tools, present the importance of using health information, and also spreading the capacity and experiences of such analysis from the state to the lower levels of districts and sub-districts.

The focus has been on conducting a detailed analysis of the state data on two key parameters: one, data quality and, two, the health status of the state and district levels based on the data collected. For this analysis, data already collected by the state from the months of April to August 2007 in Excel formats was imported into D HIS 2 (the HIS software being implemented in the state), which was analyzed on the above two parameters. For example, we could see the % of data elements being reported as “0” or blanks, which allowed interpretations around the non-use of data elements.

Prior to the data analysis, a situation analysis was conducted to understand the prevailing organizational structure, and also informal working relationships within the organizational set-up. More specifically, we focused on understanding the existing data flows, and the various data input-output formats in use. This helped to identify redundancies in data elements, duplications in data entry procedures, and present these findings to the concerned stakeholders through discussions and consultations. This process was aimed at the development of a “minimum data set,” and then subsequently to the “essential data set” by seeking to link data collection with its use in the generation of indicators. This provided the basis for building a blueprint for how data can be converted into information required for action.

During the course of the research, both the authors have overtime literally participated in hundreds of meetings, discussions, and presentations with the health functionaries at various levels. Meetings at times were formal to present an overview of the project, or an evaluation. More of these were informal meetings to discuss briefly project status, or to inform...
administrators of the problems being experienced (for example, hardware problems in the field which were not being rectified in time). In addition, there were formal presentations to the state administrators or national level program managers on approaches to HMIS design and use. Various other forms of data collection were used including that of the e-mail and mobile phone. Extensive communication over email took place between the authors with and the other HISP team members, or developers in Oslo and also with the Gujarat State HIS team members. These exchanges helped to understand project progress, troubleshooting, dealing with administrative issues, support software development processes by conveying new requirements or seeking clarifications on new development. Mobile phone based conversations played a key role in data gathering especially between ourselves and other HISP team members, and also with State officials. During phone conversations, information was exchanged, problems discussed, solutions proposed, and also important decisions taken. Further, various kinds of secondary data were collected such as State health statistics reports and performance of different health programs.

4. CASE STUDY:

The case study is set in Gujarat state, situated on the west coast of India. The public health care system in the State consists of primary, secondary and tertiary level institutions, including at the primary level 7274 sub-centres, 1055 Primary Health Centres (PHCs) and 259 Community Health Centres (CHCs), district and sub-district hospitals at the secondary level and specialized hospitals and medical colleges at the tertiary level. While health is primarily a State subject, Gujarat like other states also implements various national programmes including for TB, Malaria, Leprosy, Blindness Control, and Vector-Borne Diseases. With respect to the HIS, the implementation is managed by Director, Monitoring and Evaluation, and in addition to the state specific analysis, there are various other national reporting needs that the state has to comply with.

Responsible for implementing the HIS in the state is the Health Information Systems Program (HISP), India, a node in the broader global research and development network initiated by the University of Oslo in 1994, and now ongoing in various countries in Africa (Ethiopia, South Africa, Tanzania, Malawi, Botswana, Nigeria et c) and Asia (India and Vietnam). HISP India is a not-for-profit organization which aims to develop sustainable computer-based HIS for public health systems at the state and also at the national level. A key focus of their efforts is to support the “use of information for local action” especially at the state, district and sub-district levels. A key tool in this process is the Free and Open Source Software called DHIS (District Health Information Software – Version 2) which in addition to the tools for routine data processing and reporting also provides flexible tools for data analysis and presentation such as through the generation of charts, graphs, and maps. While building the tool is a relatively easy technical task, the harder challenge is the building of capacity and culture of the health department in the use of these tools, and the integration of information generated into action taking processes such as planning and monitoring.

Case narrative:

Gujarat State health department approached HISP India after obtaining information about the NGO’s experience and achievements in strengthening HMIS in three Indian states through their website (www.hispindia.org). Following the initial presentation meeting which was chaired by the Commissioner of Health, a government order was issued to HISP India to pilot...
the HMIS initiative in one of the district. After successful evaluation of the project after 3 months, the project was extended first to 5 districts which took place over 6 months, and then after a 5 month break was reinstated at the state level. A key driver of the reinstated was the design and development of a dashboard monitoring system (DMS) to monitor critical indicators (for maternal and child health and family planning) through the use of graphs, charts and maps to monitor these indicators. These DMS also allowed the stakeholders to compare the routine health data against state and national targets, survey figures and also the Millennium Development Goals (MDGs). The development of the critical indicators involved an extensive process of discussions with various health program managers to identify and freeze the indicators. The process also included the mapping of the data sources for the calculation of each indicator. Another significant development concerned the integration of a Geographical Information Systems (GIS) module with the DHIS 2 allowing the users to view all the indicators on maps, which served as a very effective tool for monitoring health performance across geographical areas requiring intervention.

At the time of reinitiation, the Commissioner of Health asked HISP India to restart the project as he could not get the desired analysis from the other software applications that were tried in interim. For this, the state provided five months data from 25 districts in an excel format (called Form 9) in which the district reported monthly to the state. It is important to note that this format contained 34 sections, 1128 data elements and 34 indicators. HISP India imported this excel sheet data into the DHIS2 software along with data from multiple other sources (like survey data, population data, targets, and other baseline data) to enable data comparison and triangulation. Further, the 94 critical indicators identified by the State were also included into the dashboard to enable analysis. These 94 indicators were further categorized into 6 groups: Maternal Health (26); Child Health (26); Family Planning (9); Program Support (8); Access; and Impact indicators (9). Along with these indicators, the database was populated with 20 data validation rules (for data quality analysis) formulated through discussions with various health program experts in the state. Now the indicators were ready to be viewed by graphs/charts and maps.

On October 13 2007, HISP India presented its analysis to the State officials based on the above data. Key aspects of the analysis are now presented.

**Data Input Coverage:**
Each district was expected to report monthly on 1128 data elements, corresponding to 67500 data entry points for 25 districts over five months. Table 1 below summarizes the “zero analysis” results showing that nearly 46.91% (31667) of the data values were zero. Nearly 80 data elements (7% of total routine data elements) had zero values for all the 25 districts for five months. Table 2 shows the number of data elements that were consistently reported as zero values in each district over the five months.
<table>
<thead>
<tr>
<th>Sl. NO</th>
<th>District Name</th>
<th>No of Zeros</th>
<th>Total Entry</th>
<th>% of Zero</th>
<th>Sl. NO</th>
<th>District Name</th>
<th>No of Zeros</th>
<th>Total Entry</th>
<th>% of Zero</th>
</tr>
</thead>
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<tr>
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<td>KUTCH</td>
<td>2454</td>
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<td>43.63</td>
<td>26</td>
<td>VADODARA</td>
<td>3166</td>
<td>67500</td>
<td>46.91</td>
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Table 1: District wise % of zero values

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>District Name</th>
<th>No of Data Elements</th>
<th>%</th>
<th>Sl. No</th>
<th>District Name</th>
<th>No of Data Elements</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ahmadabad</td>
<td>456</td>
<td>40.5</td>
<td>3</td>
<td>KUTCH</td>
<td>346</td>
<td>30.7</td>
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<tr>
<td>2</td>
<td>AMRELI</td>
<td>353</td>
<td>31.4</td>
<td>6</td>
<td>MEHSANA</td>
<td>395</td>
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</tr>
<tr>
<td>3</td>
<td>ANAND</td>
<td>459</td>
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<td>15</td>
<td>NARMADA</td>
<td>377</td>
<td>33.5</td>
</tr>
<tr>
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<td>371</td>
<td>33.0</td>
<td>16</td>
<td>NAVSARI</td>
<td>455</td>
<td>40.4</td>
</tr>
<tr>
<td>5</td>
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<td>401</td>
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<td>PANCHAMAHAL</td>
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<tr>
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<td>31.5</td>
<td>18</td>
<td>PATAN</td>
<td>450</td>
<td>40</td>
</tr>
<tr>
<td>7</td>
<td>DAHOD</td>
<td>339</td>
<td>30.1</td>
<td>19</td>
<td>PORBANDAR</td>
<td>527</td>
<td>46.8</td>
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<tr>
<td>8</td>
<td>DANG</td>
<td>553</td>
<td>49.1</td>
<td>20</td>
<td>RAJKOT</td>
<td>413</td>
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<td>24</td>
<td>VADODARA</td>
<td>418</td>
<td>37.1</td>
</tr>
</tbody>
</table>

Table 2: District wise % of data element with zero values for 5 months
Dashboard Indicators:

Out of 97 critical dashboard indicators, only 47 indicators could be processed and calculated due to the non-availability of required data elements. Only 60 data elements (5.32% of total) were being used for the calculation of the 47 indicators indicating a high degree of mismatch between the data collected and their conversion to information. Table 3 shows the data elements used per indicator category.

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Indicator</th>
<th>Calculated based on data available.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Health</td>
<td>26</td>
<td>17</td>
</tr>
<tr>
<td>Child Health</td>
<td>26</td>
<td>20</td>
</tr>
<tr>
<td>Family Planning</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Program Support</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Access</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>Impact</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>94</td>
<td>47</td>
</tr>
</tbody>
</table>

Table 3: Group wise distribution of calculated indicators

GIS based analysis: Translation of data to information:

The 47 indicators that could be calculated from the existing data were then mapped using the GIS to identify how different districts were faring on indicators for different time periods. An example of this transformation from data to information is provided below first in a map and then in tables.

![Figure 1: % of Institutional Delivery From Apr-Aug 07](image-url)
Figure 2: District wise achievement of % of institutional Delivery Apr – Aug 07 w.r.t map colour

Figure 3: District wise achievement of % of institutional delivery Apr- Aug produced by DHIS2

<table>
<thead>
<tr>
<th>Indicator Name</th>
<th>Apr-07</th>
<th>May-07</th>
<th>Jun-07</th>
<th>Jul-07</th>
<th>Aug-07</th>
<th>Averages</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Mamta day sessions held</td>
<td>110.7</td>
<td>107.6</td>
<td>107.5</td>
<td>107.7</td>
<td>105.2</td>
<td>107.7</td>
</tr>
<tr>
<td>% Polio Dosage at Birth</td>
<td>32.8</td>
<td>30.0</td>
<td>35.0</td>
<td>31.9</td>
<td>29.1</td>
<td>31.8</td>
</tr>
<tr>
<td>% BCG Vaccination</td>
<td>88.6</td>
<td>75.8</td>
<td>112.1</td>
<td>109.9</td>
<td>106.1</td>
<td>98.5</td>
</tr>
<tr>
<td>% DPT3 Vaccination</td>
<td>111.7</td>
<td>108.8</td>
<td>102.1</td>
<td>104.2</td>
<td>100.5</td>
<td>105.5</td>
</tr>
<tr>
<td>% Polio3 Vaccination</td>
<td>106.2</td>
<td>93.7</td>
<td>100.6</td>
<td>97.8</td>
<td>93.3</td>
<td>98.3</td>
</tr>
<tr>
<td>% Vitamin-A Doses</td>
<td>111.2</td>
<td>103.7</td>
<td>105.8</td>
<td>102.1</td>
<td>106.8</td>
<td>8</td>
</tr>
<tr>
<td>% Fully Immunized Children</td>
<td>48.0</td>
<td>51.1</td>
<td>57.5</td>
<td>60.8</td>
<td>62.1</td>
<td>55.9</td>
</tr>
<tr>
<td>% DT-5 Vaccination</td>
<td>1.0</td>
<td>1.4</td>
<td>1.9</td>
<td>6.1</td>
<td>14.7</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Table 4: Period wise distribution of Indicators for Gujarat State
The above Figure 4 describes the use of different denominators in calculating the indicator relating to % of fully immunized children. The first bar takes as the denominator “expected live births” and the second “reported live births”. This variation in values of same indicators due to different denominators used clearly reflects the nature of public health related knowledge that is required by the user in the appropriate use (or misuse) of indicators.

Based on the above analysis, some key recommendations were presented to enable the transition from data to information:

1) Need to examine each of the indicators, what the data says, and link with actions of intervention.
2) With the existing data elements being captured, many other useful indicators can be calculated for example: % of Post N atal Care third check up in 6 to 10 days to Total deliveries registered.
3) Given that only 5.32% of data elements are being used for calculation of indicators, and nearly 50% of indicators cannot be calculated, there is the need to review the present data with the underlying principle of “collecting only that data that contributes to improving action”
4) As many existing indicators do not conform to standard definitions (WHO sources for example), due to have spelling errors and are wrongly phrases, there is an urgent need for standardization and there presentation in a standard dictionary.

We now provide some examples on the need for standardization and data triangulation:

I) Standardization need
As per WHO (World Health Organization) definition % of BCG drop outs to Measles = Total children given BCG – Total children given Measles divided by Total Children given BCG. The formula used by the State for the same indicator uses a different denominator than above which is: Total children give BCG. Using these different formulae yields different results as
depicted in the graph below, with the state definition presenting a much more positive picture than that calculated using the WHO definition.

**Figure 5: % of BCG drop out against Measles WHO definition Vs. State definition**

**Data Triangulation need: Comparison of performance with targets:**

Another interesting analysis (see Figure 5) shows the achievement for a district against the workload, for example BCG doses given. The first bar represents the monthly achievement and the second bar (blue) represents the cumulative achievement and the yellow line shows the cumulative targets. By projecting the annual workload against the cumulative achievement, the manager can assess the performance of that district and identify action areas.
4) Data Triangulation need: Comparison of routine and survey data:
The National Family Health Survey (NFHS) is a large-scale, multi-round survey conducted in a representative sample of households throughout India. Three rounds of the survey have been conducted since the first one in 1992-93. The survey provides state and national health information on key health parameters. Mutual comparison of routine and survey data (shown in Figure 6 below) provides an indication of the veracity of the routine system (seen to be reasonably accurate with respect to institutional deliveries).

Figure 6: Comparing NFHS data with routine data for % Institutional Delivery

5. Discussions and conclusions
While understanding the nature of data related problems and the kinds of data-indicator mismatches that exist in the data-information translation, a key challenge concerns “what can we do about it?” In this regards, the usefulness of a simple and practical approach called SDA (Symptom, Diagnosis and Action) was developed. This identification of the problem is termed as ‘Symptom,’ through eyeballing raw data by a person with public health knowledge and experience to detect abnormalities. Further interrogation of data leads to a ‘Diagnosis’ of the problem to identify causes achieved through drilling down to facilities or periods or with different data categories. Diagnosis leads to the development of ‘Action’ to correct the problem through policy implications and establishing protocols for action. Some examples are now provided.

Figure 7 clearly shows the abnormality in the % of total sterilization at the state level for the month of July 2007 where the sterilization rate is 84.32% as compared to the 5% average of other months. This could be termed as the ‘Symptom’ of a problem. Figures 8 and 9 shows the ‘Diagnosis’ of the problem, where by drilling down shows the abnormality in one district (Vadodara) and one specific data element (Male Sterilization). Resulting ‘Action’ could be in the form of developing policies and rules such as related to who has the authority to make changes when violations are identified, how these changes made are reflected back in the original database, what action has to be taken to ensure that such problems do not repeat. More systemic corrections could be in the form of creation of standards in definition, formats, procedures and a comprehensive data dictionary.
Technological tools such as the DMS and the GIS can help in the easy conversion of data to information, but to move to the next level of knowledge is relatively more complex endeavour. Information can be seen as a necessary condition in the translation process, but is...
surely not sufficient. This translation, as the “practice based view of knowledge” has argued requires the inculcation of relevant practices. In the context of the case, the Commissioner Health has tried to move in this direction where he personally oversees review meetings in which indicators are discussed and action points are identified. However, this remains a largely formal exercise, while processes of knowing need to be embedded in everyday practices and routines. To enable the cultivation of such practices, there needs to be a culture in which information based action is valued and promoted both through formal and informal means. Without this, as is in the case above, the HIS can only enable the translation to information and not beyond. The need then is to cultivate “networks of knowledge” rather than the “hierarchies of knowledge” that currently exists.

REFERENCES:


Abstract: Health Information System (HIS) integration is an extensive exercise that goes beyond the installation of the hardware and software. In this research article I discuss the project implementation for the integration of HIS in Zanzibar, Tanzania. The study reveals that, while technical aspects of HIS integration posed a little challenge, institutionalisation of the new HIS across health programmes which are the main actors, the district and zonal offices, as well as the HMIS Unit itself is a problem of great concern. Theoretically, I draw upon the new institutionalism to analyse the institutional forces, and specifically power relations in the institutionalisation of the new HIS. The study reveals institutional differences from the management bureaucracy of the new HIS, where a newly established HMIS Unit is put on top of HIS bureaucracy replacing the historically superior health programmes. However, the unit fails to acquire supportive power sources such as finance, human and material resources, and consequently lacked legitimacy to preside over the new responsibility, posing a clear challenge to the ‘actual’ integration, where apart from the integration of the artefacts, programmes remained far from this integration in terms of routine and resource allocation, calling for a compromise on the role of main actors – from centralisation to coordination.

Keywords: Health information systems, integration, institutionalization, power, legitimacy.
1. INTRODUCTION

One of the key human development indicators is the health status of the people of any particular society. The United Nations identifies eight development goals to be achieved by all countries by 2015 (United Nations 2008; www.undp.org accessed on February 2, 2009) three of them are directly related to health and well being. The challenge of the developing countries is to achieve those goals plus country specific goals all aimed at improving the health status of the target population, thereby optimizing the available resources. Certainly, this necessitates for the need of a proper Health Information System (HIS), as emphasized by the Health Metrics Network (HMN):

It is not the case that countries with insufficient resources should forgo good health information. Indeed, they are the ones that can least afford to be without it (HMN 2008 p.6).

However, the countries are marked with a long history of fragmented information systems serving their healthcare sector. A principal reason mostly cited (Lippeveld 2001; Braa et al. 2004; Aanestad et al. 2005; Chilundo and Aanestad 2005) is the nature of service provision. Healthcare service provision is vertically organised into programmes engaged in providing service for specific diseases (e.g. malaria, Tuberculosis), specialized services (e.g. family planning, immunization), and the general sector management issues (e.g. drugs, human resources). The subsystems used in these fragments often overlap each other in terms of the data collected, and more interesting they use the same staffs, who in the end of the day are at the centre of problems – high workloads (Chilundo and Aanestad 2005), scarce resources (Mosse 2004) and less motivation (Lippeveld 2001; Sheikh 2005). Furthermore, the systems serve only to the respective programme needs, basically at the national levels and to their funding agencies.

Widespread efforts to loosen the tension are hitting the IS research (Lippeveld et al. 1992; Rubona 2001; Braa and Hedberg 2002; Braa et al. 2004; Lungo and Igira 2008), though with a considerable number of reports on either full or partial failure (Heeks 2002). The reform efforts consider integration of the various Health Information Systems (HIS) as the new doctrine, in the HMN comments:

It will also be important to emphasize the integration of data from different sources at national and sub national levels (HMN 2008 p.18).

The integration efforts have a sole purpose of providing a comprehensive health data to all managers at all levels of the healthcare sector. Data between health programmes, health districts and health facilities can be shared, and comparable analysis can be made to compare performance between districts and health facilities within a particular district (HMN 2008). Consequently, shared efforts and reduced data collection burden to health workers will improve data quality and reduce data administration costs. Despite this visionary reform, HIS integration efforts face serious challenges; legacy systems, as the existing computerised information systems are often typically old and non-changeable for several reasons, and do not support data sharing between different systems, and the fragmented reporting and other work routines (Aanestad et al. 2005). But more often, even if the integration of the tools is
made possible, the institutionalization of the new system becomes a matter of discussion (Sahay et al. 2007).

In this research article I discuss the process of implementing a computer-based integrated HIS for the Zanzibar healthcare sector. While the process to integrate previously working paper-based HIS, thereby developing a new system comprising of normalised data collection tools and a software data warehouse that is used for data storage and analysis is a success, at least in its modest sense, institutionalising the system into the operating healthcare organizational bureaucracy (programmes, district and zonal management as well as the HMIS Unit\(^1\)), remains a challenge.

Inspired by new Institutionalism, I explore the institutional forces and specifically power relationship between the HMIS Unit and the operating ‘vertical’ health programmes around which the newly established HIS operates. The research has identified institutional differences that are not in favour of the organisational structures around the new HIS. The HMIS Unit has been given too many responsibilities but never won the legitimacy to preside over the new structures lacking necessary power to persuade other actors to pursue the new HIS and to institutionalise into their daily routines. I thus, argue for the changing role of the HMIS Unit, from being principal data collector and distributor, to primarily coordinate data flow to all actors. My research is based on Action Research project involved in the development of HIS in several developing countries in Africa and Asia called Health Information System Programme (HISP).

The rest of the paper is organized as follows. In section 2, literature review is presented followed by research settings and methodology in section 3. Case description follows in section 4, and lastly in section 5, I present an analytical discussion and conclusion.

\section{LITERATURE REVIEW AND THEORETICAL FOCUS}

\subsection{Related literature on integration}

Kumar and Hillegersberg (2000 p.23) assert that “integration has been the Holy Grail of MIS since the early days of computers in organizations”. Within the healthcare sector, the ambitions for integration are backed by the prevailing fragmentation of information systems across the healthcare sector, both in the developed (see for example, Ellingsen and Monteiro (2003); Monteiro (2003) on Electronic Patient Records (EPR) implementation in Norway) and developing (see for example, Aanestad et al. (2005); Chilundo and Aanestad (2005) on HIS integration) countries.

In MSN Encarta online dictionary, integration is described as “a combination of parts or objects that work together well” (MSN 2007). In software engineering, it refers to combining two or more software systems, subsystems, or components, each of which is functioning properly (i.e. satisfying their requirements within their environments), in order to satisfy the combined requirements within the newly formed environment. It also includes incorporating new function or technology into existing software system, which may have been functioning properly in the field for a significant period in order to satisfy broader requirements (Isazade 2004). In the domain of HIS, both the situation apply; that is, integrating Information

\footnote{Health Management Information Systems (HMIS) Unit is a central unit that is responsible for all the HIS related activities in Zanzibar.}
Systems (IS) of different health programmes in the beginning of the HIS integration efforts, and also incorporating the new functions or systems that arise as a result of the evolving healthcare sector.

When different HIS are integrated it is not necessarily important that a single system, a software environment and architecture are chosen. What is important is that the “exchange of data and organizational processes, according to the merged organization needs, are possible and efficient” (Giacomazzi et al. 1997 p. 290). Technically, this can be achieved by selecting proper approach and implementing right standards and techniques that suits best for the systems and environment under integration. However the notion of integration goes beyond the hardware and software installations. “The task straddles engineering design (of whole systems, as well as of components and their interfaces) and business organization and management [...]. Thus,] Engineering meets economics, and often politics as well” (Alexander 2004 p.160) in order to articulate interests, building alliances among the important actors and struggling over outcomes (Chilundo and Aanestad 2005). This interconnectedness between the technical and political and institutional conditions shaping IS integration (Sahay et al. 2007), draws attention to study the institutional forces that shape the HIS integration in Zanzibar.

In the next two sub sections, I present a theoretical ground that I use to analyse the process of HIS integration in Zanzibar. I use institutional theory to highlight the gap identified and that need to be addressed in the integration process, notably institutional differences, arising from the non-technical aspects of integration. I also bring about a discussion on power and how it affects HIS institutionalisation process.

2.2 Institutions and institutionalization process

“Institutions are social structures that have attained a high degree of resilience. [They] are composed of cultural-cognitive, normative, and regulative elements that, together with associated activities and resources, provide stability and meaning to social life” (Scott 2001 p.48). The cognitive elements, which were introduced in the new institutionalism, include widely held beliefs and taken-for-granted assumptions that provide a framework for everyday routines. The normative elements incorporate habits and informally sanctioned social obligations, while regulative elements shape individual actions based on rules and regulations. Institutions are transported by various carriers (Jepperson 1991) – cultures, structures and routines (Scott 2001). Since institutions are social structures that have attained certain state, it pertains that institutionalization is the process to attain such state. Institutionalization thus, “denotes a distinct social property or state” (Jepperson 1991 p.144). It is a process through which “a social order or pattern becomes accepted as a social ‘fact’” (Avgerou 2000 p.3).

Within IS research, Institutional theory is becoming overwhelmingly important. Orlikowski and Barley (2001) insist on the use of the theory in order to gain insight on how “regulative processes, normative systems and cultural frameworks shape the design and use of technological solutions” p. 153. HIS integration, just like any other IS innovation can be conceptualised as a double effect process. On one hand, it involves a process to institutionalize the newly introduced solutions, the process that dictates the need on the flexibility of the introduced solution in both the technology and mechanism for introducing it. On the other hand, the process interferes with the existing system, and hence dictating de-institutionalization of the established organizational structures and practices (Avgerou 2000). Thus, the theory will help to build a deeper understanding of the HIS integration process.
through exploring the social, economic and political situation around the healthcare bureaucracy in Zanzibar and how the power relationship between the different actors influences the HIS integration process, and how the new HIS is established as an obligatory passage point (Humes and Reinhard 2007) within the healthcare bureaucracy.

2.3 Institutionalisation and power

According to Max Weber, “power is the chance of a man or a number of men to realise their own will in a social action even against resistance of others who are participating in the action” (Weber 1978 p.926). Thus, power in addition to other mechanisms, supports institutionalisation through the process where actors, either individuals or groups influence others in the process to diffuse an innovation. In any instance of institutionalisation, the exercise of power affects pace – the time it takes for an innovation to diffuse throughout the field, and stability – the time during which the innovation remains diffused and legitimate (Lawrence et al. 2001). This pace and stability of institutionalisation depends on the dimensions of power exercised. First, the mode of power, if it is episodic – the relatively discrete, strategic acts of mobilisation initiated by self interested actors, or systemic – the mode of power injected and that works through the routine, ongoing practices of organizations, often not appearing as power. Second, whether the institutionalisation agent treats the target of power as subject or object (ibid p.629-30).

In the domain of IS development, Silva and Backhouse (2003) argue that the “exercise of power is necessary to institutionalise an information system, which, once in place, becomes itself a source of power” (Silva and Backhouse 2003 cited in Humes and Reinhard 2007 p.3). On their work of the study of implementing a computerized Integrated System for State Financial Administration (SIAFEM) in Brazilian State of Sao Paulo, Humes and Reinhard (2007) also emphasise the use of power for the institutionalization process. In that project, they state, “Initially, coercive power [by the governor] was used to impose the system. Later on, it was expanded and sustained by powerful actors that made use of institutional discourses to develop new systems [to cater for their departmental needs]” (ibid p.10, emphasis added).

Since the exercise of power as institutionalisation mechanism, takes place between actors within the same field, it pertains that institutionalisation agents are those actors which are capable of exercising the power. There are several sources of power, including financial, technological, educational, informational, reputational, traditional, cultural, natural, physical or social order (Zimmermann et al. 2008). Furthermore, according to Lawrence et al. (2001), the more efficient power-based institutionalisation mechanisms, that is, the ones that have fast pace and high stability are the one that depends on domination as its supporting mechanism, or the one that use domination supplemented by force, all of which are highly dependent on availability of resources by the institutionalising agent. To sum up, resources and authority brings about legitimacy to certain actors who will then be able to exercise power to institutionalise an IS innovation.

3. RESEARCH SETTINGS AND METHODOLOGY

The empirical materials are drawn from the Zanzibar healthcare system. Zanzibar is a country that is part of the United Republic of Tanzania, semi-autonomous in various internal affairs including health. The country comprises two major islands (Unguja and Pemba) together with several islets, covering an area of approximately 2,600 sq km with a population of
1,155,065\(^2\). Zanzibar, just like other developing countries, is marred by health related
problems including high Maternal Mortality Rate, Infant Mortality Rate, as well as high
disease burden (MOHSW 2008). Various programmes operate in the healthcare service
provision, some specialising in specific disease (Zanzibar Malaria Control Programme –
ZMCP and TB Programme), and some in specialised services (Reproductive and Child
Health, Nutrition, Zanzibar AIDS Control Programme – ZACP and the Expanded Programme
for Immunization – EPI).

Healthcare administration is organised into four levels; health facility, district, zonal and
national levels. HIS is also organised into the same levels. In addition to service provision,
health facilities are the primary data collector using registers and tally sheets that are
summarised into monthly reports in the end of the month. Districts are in the second level,
and are the general overseers of all health facilities within their respective districts, including
collecting filled in forms, distributing medical and other material resources as well as
supervising the health facilities. It is at the district level where data are electronically
captured into the software system before transmitted to the higher levels. There are ten health
districts each corresponding to one administrative district, four in Pemba and six in Unguja.
Zones are just above the district level, and are responsible for all administrative activities of
their respective districts. There are two health zones corresponding to each island. At the
national level are the health programmes and the ministry headquarter where the HMIS Unit
exists.

The study is based on the author’s participation in an action research project to develop HIS
in Zanzibar, as part of global HIS development framework termed HISP. HISP is a global
research and development network initiated by the University of Oslo in 1994, and now
ongoing in various countries in Africa (South Africa, Tanzania, Mozambique, Ethiopia,
Malawi, Botswana, Nigeria, etc) and Asia (India and Vietnam) (Braa et al. 2007). The author
has been participating in the project from the early negotiations (2004), through project
inception (August 2005) to date. Throughout this period I have participated in the process to
develop HIS including revision of data collection tools, software adaptation and
customization, user training and support, and project planning and administration.

This study entails interpretive (Walsham 1993) study within the action research (Baskerville
1999) framework. Interpretive research assumes that our knowledge of reality is gained only
through social constructions such as language, consciousness, shared meanings, documents,
tools and other artefacts. It thus, tends to develop a deeper insights into IS development and
management since it helps the researchers to understand human thought and action in social
and organizational contexts (Klein and Myers 1999). My participation in the project entails
an action research principle; aiming at improving the HIS at the same time developing a
theoretical understanding (Baskerville 1999). Applicability of action research in IS studies
has been highlighted by (Baskerville and Wood-Harper 1998), arguing that a deep
understanding of IS is build when attempts are alongside made to change the social situations
underlying and the practices underlying the IS.

Data have been collected and analysed using qualitative methods. These include a number of
meetings and discussions with several health workers and managers of different levels,
including staff at the public health facilities who are involved in data collection; district and
zonal health managers involved in the report collection from the health facilities, data entry
and analysis at district and zonal offices; and programme data managers and HMIS Unit staff

\(^2\) Population estimate for 2007 based on the 2002 Tanzania Population and Household Census
at the national level. While the health facility staff and district managers were met during supervision and technical support activities at their work places, discussion with the zonal and programme managers were primarily during routine quarterly feedback meetings, and at data cleaning and data use workshops, where district managers also participate, as well as during technical support visits. Discussions with the HMIS Unit staff were held during regular meetings conducted between HISP staff and the unit, as well as during day-to-day activities. I also had time to analyse various software used by the programmes (Malaria and EPI) and documents such as monthly and quarterly routine reports and policy documents. The data has been analysed using principles of the hermeneutic circle as outlined in (Klein and Myers 1999).

4. CASE DESCRIPTION

4.1 Zanzibar Health Information System – past and present

Zanzibar Health Information System can be described in two eras; first, the pre-integration period in 2004 and backward, and second, the integration era – 2004 to date.

4.1.1 Pre-integration era (2004 and backward)

This period present a fragmented HIS, driven by the operating ‘vertical’ health programmes based on their needs and requirements. Each health programme operated a totally independent HIS with most programmes collecting redundant data but using the same human resources – the health facility and district staff. The situation can be explained in terms of its integration from health facility to district level where all health facilities report to their respective district, and fragmentation where programmes, zonal office and other offices at the national level collected data on individual basis, a chaotic situation which made some of them receiving data routinely and others on more ad hoc manner. Figure 1 depicts the situation.

Fig 1: The fragmentation problem of old HIS in Zanzibar. Source: Fieldwork
In recognition of the situation, the Ministry of Health and Social Welfare (MOHSW) was keen to find solution to the prevailing problem, and as a starting point it established Health Management Information System Unit (HMIS Unit) merging the then Statistics Unit, Epidemiology Unit and Research Unit to undertake the overall responsibility of data collection, supply of data collection tools and information dissemination to the other stakeholders. The HMIS Unit was intended to serve as the national data warehouse, and the programmes were meant to receive data from the HMIS Unit. The second point was to review the existing data collection tools from different programmes and design new tools with a sole purpose of reducing data redundancy and facilitating data sharing. Efforts to design new registers, monthly, quarterly and annually aggregated data reporting templates were initiated, but a full scale implementation did not take place until August 2005 when HISP was contracted to undertake the development process. The project was funded by DANIDA under Health Sector Programme Support (HSPS) II.

With approximately ten years of experience from the same kind of projects in different countries, HISP approached the development in two strategic points. One, to continue with the revision of the existing forms, as it had been the ministry attempt, but with focus on minimum indicator and datasets that are essential for the healthcare system planning, monitoring and evaluation; and two, to implement a data warehouse software that will be used to capture the collected data and that serves as analysis tool for managers at different levels of healthcare administration. District Health Information Software (DHIS) was adopted and adapted to the Zanzibar healthcare context. DHIS 1.4 is a Microsoft Access based application, and uses Microsoft Excel pivot tables at a presentation layer in addition to the built in report formats. While HISP followed a slightly different and more advanced approach to the development, management-wise they adopted the same strategy – power shift from the programmes to the HMIS Unit.

The new integrated HIS was intended to serve the larger community promoting decentralised information use, as well as implementing a centralised data warehouse at the HMIS Unit (Sheikh and Titlestad 2008). To undertake the process, main actors were identified, which in the technical support of HISP, are responsible for the routine data collection, analysis and dissemination of information, as well as information use at their respective management levels. These include the HMIS Unit, the zonal and district offices, health programmes, and the health facilities at the bottom of the bureaucracy. At the centre of the whole process is the HMIS Unit that is the general overseer of the new HIS including ensuring proper data flow from the lower (health facility and district) levels and ensure timely dissemination of data to health programmes. The unit is also responsible for supply of data collection tools to the health facilities, training and supervision to the facilities and the districts, and it was aimed at taking overall responsibility of technical support to all DHIS implementation nodes including districts, zones and programmes; a key challenge to this being its capacity in terms of human, financial and other material resources.

The implementation of the new HIS enjoyed two advantages. First, the un-anonymous agreement to continue with the revision of the data collection tools and the design of the tools organised into essential datasets reflecting requirements of all programmes. Second, the chosen software, DHIS offered all the required features for the automation of the new HIS, and as added advantages it uses the existing platform (Microsoft Windows and Office), and furthermore it had no competitors. In addition, there was no immediate requirement to integrate with other system used by any of the programmes, raising a hope of full DHIS
takeover. In this case, the discussion of the computer legacy systems was not considerable, and thus the only technical challenge was to adapt the DHIS software to fit with the Zanzibar context, something that the HISP team managed to do.

Training of the DHIS followed by user support was planned and conducted but initially an emphasis was put in the district offices realising their pivotal importance in the smooth operation of the system. The district offices are the first level where data are electronically captured. Districts also serve the most important task of fetching the paper-based forms from the respective health facilities. Later on, selected officers from programmes and zonal offices were trained to be able to work with the data exports from the districts. IT technical staff from the HMIS Unit (in the beginning were two but later on, one joined ZACP) were receiving hands on training through joint operations between HISP and HMIS Unit with the sole intention of knowledge transfer. However, the staff showed little interest as a result of too much work around them, and hence making the unit non-reliable for the overall management and support of the system.

Despite this problem, the data started to flow routinely, from the health facilities to the district and to the HMIS Unit, but in a very close support and follow up by HISP. During this process, however three major problems arose. First, the new information flow left the Zonal Offices orphaned. Second, the new information flow could not guarantee proper data flow to the programmes. Data flow to the programmes was rather on ad-hoc manner where programmes received untimely data and only upon request. Third, some of the district officers who received training refused to work with the system and the HMIS Unit had little action to them lacking administrative authority to act upon them, Zonal offices that are formally superior to the districts felt marginalised, and hence were reluctant to act upon the district officers throwing blames to HISP and HMIS Unit. As an alternative solution, HISP identified other interested people within the districts and gave them in-service training.

The unreliable data flow to programmes persuaded them to struggle for alternatives. EPI for example, decided to fetch the data from the districts, but encouraged the use of DHIS by asking custom report\(^3\) printouts from DHIS that were used to generate district overviews in Microsoft Excel. These data were then sent to the EPI regional office in Nairobi. The disadvantage of this was data inconsistency with the HMIS Unit since the programme could not run for the updates in the districts. An obvious result was shown on the preparation of the 2007 annual health bulletin where data brought by EPI differed from that of the HMIS Unit (See Fig 2), virtually from the same system – DHIS. Other programmes like ZACP went back to their original systems, as it was emphasised by the programme data manager “we can only rely on your system once we get all the data we want”, while others (Malaria, Nutrition, and RCH) could wait for the good luck or remind the HMIS Unit when they are in urgent need of the data.

\(^3\) Special reports that are identical to paper-based monthly report, but aggregated at health facility, district, zonal or national level based on someone’s need.
Apart from this, programmes are hardly aligned to the new system, being result of the new structure that limits their power and freedom they enjoyed before the integration initiatives, and from their management and financial schemes that are still in the vertical manners. The HMIS Unit has been relying on financial assistance from DANIDA for all the HIS activities. Even the training programmes that programmes used to conduct are not scheduled through the new HIS scheme, rather the programmes either do not conduct training or they conduct training on their specific parts and not the HIS as a whole. Overall, the new HIS is far away from being institutionalised into the programmes, which in principle are the main data users since they are the key players in the healthcare service provision.

4.2.1 New approach meeting the old

Considering the threat to the HIS failure, a compromise solution was proposed, where the programmes are meant to fetch data from the districts in parallel, as an e-mail copy of the HMIS Unit (Fig 3). This is intended to have two effects; one, programmes will be able to get timely data, and two, since the programmes are the principal users of the data, it is assumed that they might have immediate quality checks and give feedback on at least any anomaly identified. This will help to improve the data quality, activate the programme involvements and at the same time maintain consistency, since any data update at the districts will be e-mailed to all. The programme will also feel more responsible and perhaps re-shift their resources towards the new HIS.
Two programmes, which showed much interest in the proposed solution (Malaria and EPI), were selected for implementation. However, both Malaria and EPI used Microsoft Excel applications supplied by their donors for data capturing. HISP staff developed a gateway solution where data from DHIS (through already prepared Microsoft Excel pivot table templates) could be easily transferred to those applications. While Malaria programme fetch data at the health facility level, EPI required data in districts aggregation. With this linkage the programmes get live updates every month. While elements of improvements in timeliness can be clearly traced, it is too early to talk about improvement in data quality.

5. DISCUSSION AND CONCLUSION
The HIS integration in Zanzibar has shown remarkable success in, at least, data collection, but institutionalising it into the healthcare organisational bureaucracy is still a challenge. The success witnessed cannot be standing apart from the existence of the contracted HISP consultants both local and international. As the case depicts, the process of HIS implementation has involved integrating information systems of the various health programmes, at least on the data collection tools and efforts. However the data related routines fall short of integration, signalling failure to the institutionalisation of the new HIS.

As HIS integration involves both technical and institutional aspects (Alexander 2004; Chilundo and Aanestad 2005; Sahay et al. 2007), it is certain that the technical solution will only survive if the related institutional environment is in favour of the solution. The institutional environment comprises actors (in our case health programmes and other offices) where the HMIS Unit seeks support and legitimacy (Finkelstein, 1992). With the new structure where the HMIS Unit takes charge, this support and legitimacy is crucial to deinstitutionalise the old routines where each programme collected their own data using their own system in their own resources, and institutionalise the new integrated and shared system,
without much sacrifice on the advantages those actors enjoyed, e.g. programmes getting timely data.

However the HMIS Unit never won that support and legitimacy. Various institutional forces opposed the process. Historically, programmes have been enjoying financial and other resources supported by donor agencies, and hence owning power over the district and health facilities staff, not from administrative authority, but through various incentives and promotional activities such as seminars and training, and hence maintaining legitimacy to them. These programmes, also based on the resources they possessed were able to get timely data or at least whenever they wanted the data since they can fetch them directly from districts or health facilities, responding to any informational requirements from their donors, to whom support and legitimacy is also sought. In this situation, programmes find it difficult to be tolerant to any situation that risks their secured legitimacy. A very clear example comes from the EPI attempt to fetch the data from the districts rather than waiting for the delaying HMIS Unit. To maintain their legitimacy to their resource providers, who want them to report by the 10th of every month, the programme bypassed the new routine that seemed to risk their reputation. Consequently, this affects the whole system.

Another institutional force agitating the institutionalisation of the new HIS comes from the HMIS Unit itself. While the previously working information systems of the programmes enjoyed the respective programme’s resources, neither the HMIS Unit has acquired enough resources nor has it managed to negotiate resource sharing from the programmes. Since the unit was established, it has been financially relying on DANIDA to support its routine activities such as forms printing, training and payment to the consulting staff. Lack of transport, small number of qualified staff and too many responsibilities to the available staff makes the unit unreliable for timely data dissemination, quality checks and proper supervision. Another inhibiting factor is that the unit lack administrative authority over any of the actors, even the health facility. According to the existing organisational structure, it is zonal offices that have administrative authority over districts and health facilities, and the unit has no authority to question, for example, if the district managers refused to send data. Zonal offices could do, enjoying administrative authority over them, but in a very bad luck they were orphaned – in most of the time the districts reported directly to the HMIS Unit.

Whether authoritative or resource-based, it is the discussion of whether the HMIS unit, as the institutionalisation agent of the new HIS possessed enough power to overcome the opposing institutional forces that hinder the institutionalisation of the new HIS. This power is very important in mobilising all actors from the old system of fragmented HIS to the new integrated and shared HIS. Lacking sufficient financial, human and material resources, which are among key sources of power (Zimmermann et al. 2008) the HMIS Unit fails to preside over the new HIS, and it is only through a compromise with other actors who were considered legitimate (and still maintain their legitimacy) in the previous system, the new system can be institutionalised and sustained.

I thus argue that, one of the possible barriers to a ‘true’ integration of HIS in Zanzibar is the organisation of the management structure around the new HIS. The HMIS Unit was given too much responsibilities without the necessary power to exercise those responsibilities in terms of human, financial and infrastructural resources as well as legal authority to, for example, push or at least persuade the lower level staff who do not abide to the HIS activities. The zonal administration has the authority to promote, demote or punish any staff within their zones. Programmes on the other hand, are resources sufficient, and hence by combining administrative authorities of the zonal offices and resources and reputation of the
programmes, the HMIS Unit can attain power to overcome the hurdles to build its legitimacy to other HIS actors at the lower levels (district and health facility).

At the national level, the prevailing institutional differences between the old and the new signal an obvious challenge to the HIS integration exercise. The new management structure swerves the old established and very natural routines that programmes who, at the national level, are the principal data users, at least on its modest sense, to wait for the un-experienced, under-resourced and not well established HMIS Unit and which in principle has no power and authority to use data apart from preparing reports such as health bulletin, to provide them with the data collected from the district. The result is, as it has been discussed, untimely and under reporting to the programmes as well as data inconsistency; the worst case being programmes reverting to their old systems.

Overall, the HMIS Unit suffered legitimacy on the broad process of HIS integration, and so institutionalisation of the new HIS. This institutional reform was neither possible nor desirable, considering the nature of the healthcare service provision. In contrast the promoted institution of parallel reporting to HMIS Unit and programmes is intended to reverse the process to be more natural where data users (programmes) will have more responsibilities, such as timely quality checks and consequently this will help to improve the sense of ownership, which according to Zimmermann et al. (2008) will not only help to institutionalize the HIS, but also enjoy higher institutional stability, and also promote further expansion (Humes and Reinhard 2007).

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Towards a Framework of Cooperation Issues in Base of the Pyramid Projects

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Abstract: Interest in the notion that there is an untapped market with significant buying power hidden at the base of the economic pyramid (BOP) has enjoyed increased attention over the last few years. The discourse on this matter is lively and abounds with opposing opinions. Although this discourse is acknowledged in this paper, it is argued that benefits can be derived for all parties if one considers partner cooperation issues (or problems) in a structured way. Partner cooperation in the case of this research refers to the cooperation between multinational information technology companies and local partners in African countries.

This area is of interest because of (frequently high) expectations that information and communication technologies (ICTs) can make a contribution toward development goals in BOP markets. However this is not always achieved and, as has been found by several researchers, this unfavorable outcome is, amongst other things caused by cooperation problems between partners.

The basic argument of this paper is that successful contribution of ICT to development goals is partly dependent on the nature of the cooperation between partners. Thus if there is a need to assess the contribution of ICTs, then one need to look further than just the basic quantitative measures and include cooperation issues as criteria for success.

The purpose of the research reported in this paper was therefore to take one step closer towards a framework of cooperation issues in so-called BOP projects, specifically in the ICT arena, with the ultimate aim of developing a way to assess factors that may present a risk to the success of these projects. This framework could serve as the foundation for further research into developing a diagnostic instrument for this purpose.

The research was conducted in 10 BOP projects involving multinational ICT companies, which were studied as separate case studies. Qualitative data was collected using the case study method and the data was analyzed for emerging patterns. It was found that problems with partner cooperation revolve around six core categories. These are explained in this paper. It is suggested that further research can serve to interrogate the proposed framework.

Keywords: Base of the Pyramid, partnership cooperation problems, information and communication technology, multi-national companies
TOWARDS A FRAMEWORK OF COOPERATION ISSUES IN BASE OF THE PYRAMID PROJECTS

1. INTRODUCTION

There has been a steady increase in interest in the so-called base of the economic pyramid. Prahalad and Hart (2002) describe the Bottom of the Pyramid (BOP) as that segment of the world population with an annual per capita income of less than $1500. Their work was followed by a myriad of publications on this and related topics. In recent research the boundary of the BOP segment has changed by definition to include all with an annual per capita income of less than $3000 (WRI, 2007).

The basic argument held by Prahalad and Hart (2002) is that the available market in this segment of the world population is so big that multinational companies (MNCs) can make significant profits if they can manage to tap into this market.

Whether these claims are realistic is a matter for debate, as will be seen later in the paper, but it could be argued that projects with these aims in mind could be more successful if the problems related to cooperation between the different role-players are better understood. Subsequently it could be argued that if one needs to assess the contribution of these projects, it may well be reasonable to assess the health of the relationship between partners as well. This paper reports on a project of which the aim was to create a provisional framework of cooperation issues in information and communication (ICT) related BOP projects.

The term “Bottom of the Pyramid” is used widely to refer to this segment of the world population, but some researchers have moved away from that use, towards terms such as “Bulk of the Population”, arguing that estimates of the number of people belonging to this group is more than the bottom of the world’s income pyramid; rather, it represents the majority of it (BRINQ, 2008). Other terms have also appeared such as "Business for/with the Majority", “Sustainable markets” or ”pro poor markets”. For the purpose of this paper the term Base of the Pyramid (BOP) will be used, as there is some disagreement about the number of people involved as for instance suggested by (Karnani, 2007).

This BOP market promises to have certain demands for ICT products and services. Although relatively small compared with other demands, the market for information and communication technologies is estimated to be $51 billion but probably twice as much, $100 billion per year, as a result of rapid growth (WRI, 2007).

The Organization for Economic Co-operation and Development (OECD) defines the ICT sector as ICT economic activities (industries) where production, goods and services are primarily intended to fulfill or enable the function of information processing and communication by electronic means, including transmission and display (OECD, 2007). For the purpose of this paper this definition is used to identify case studies of multinational ICT companies (ICT MNCs).

A specific issue of interest in this area is the nature of the relationship and interaction between ICT MNC and local partners. This has been investigated by several researchers, for instance Das and Teng (2001); Kramer et al. (2007); Seelos and Mair (2007) and (Simanis et
al., 2008a), and it is acknowledged that the success of such projects is dependent on the health of the relationship between partners.

The argument then follows that if there are cooperation problems in any BOP project, that the nature and level of contribution that ICT can make towards development goals would be affected. It is therefore reasonable to argue that if one wants to monitor and assess the contribution of ICT towards the achievement of development goals, then it would be prudent to also include some form of diagnostic attention to the nature of cooperation between partners. This is especially necessary if one considers the Millennium Development Goals (MDGs) as published by the United Nations (2008) and particularly Goal 8 (namely to: “Develop a global partnership for development”), Target 8.F (namely to: “In cooperation with the private sector, make available the benefits of new technologies, especially information and communications”).

However it has to be noted that currently the indicators for monitoring progress of the MDGs are stated purely in quantitative terms (see United Nations, 2008), and that it is probably more reasonable to suggest that there are additional, more qualitative issues that one might need to consider. In the case of this paper the argument is that a healthy relationship between partners in itself indicates, at the very least, more sustainable benefits than merely, for instance, the indication that 70 out of 100 people have a telephone (an example of one of the indicators mentioned for Goal 8, Target 8.F by the United Nations, 2008). Phone sharing, for instance seems to be common practice in African countries and therefore it might be more important to know whether people have access to (mobile) phones than whether they own a phone (James and Versteeg, 2007).

2. RESEARCH QUESTION
A variety of cooperation issues that might need consideration have already been identified by researchers such as Das and Teng (2001); Kramer et al. (2007); Seelos and Mair (2007) and (Simanis et al., 2008a). However there seems to be need for a more holistic frame of reference for studying and diagnosing these issues. The basic research question for the research that is reported in the paper was therefore:
- What are the difficulties that ICT MNCs experience in their cooperation with partners in their efforts to reach the BOP market;
- And more specifically, how could these observed issues be categorized?

Such a categorization could serve as the foundation for the development of a diagnostic instrument that will help create a better understanding of cooperation issues in BOP projects.

For clarification purposes it needs to be mentioned that in this research project the relationships that ICT MNCs have with local partners was identified as always including a local for-profit organization and sometimes also including local non-profit organizations who act as intermediaries. In one case the local partner was the local branch of the IT MNC but the command structure of the MNC provided autonomy for the local national branch. Figure 1 clarifies this explanation. The relationships marked with stars indicate the area of interest for this research, namely the relationship between ICT MNCs and local partners, albeit non-profit or for-profit organizations.
In order to find answers to these questions the research project followed a general exploratory research design consisting of an in-depth study of the literature, followed by data collection and analysis using qualitative research methods. The result is a provisional frame of reference that could serve as the basis for further research.

The next section of this paper details some existing research work that has been done in this area, as reported in the literature, with specific reference to cooperation issues that may have an impact on the success of BOP projects.

3. LITERATURE REVIEW

There has been some interest in the area of partner cooperation in BOP projects with research that focused on a variety of issues.

London and Hart (2004), for instance, conducted an exploratory analysis, covering in total 24 cases across the Americas, Africa and Asia and 4 additional cases of MNCs which were extremely active in BOP markets across the world. The findings show that successful ventures include (proactively) developing relationships with non-traditional partners, both profit as well as non-profit organizations. The results also show the importance of ‘social embeddedness’, which refers to the ability to create competitive advantage based on a deep understanding of, and integration with the local environment.

Jenkins (2007), draws on the results of eight industry-specific projects and identifies four key strategies that companies use to expand economic opportunity. These strategies are: creating inclusive business models, developing human capital, building institutional capacity, and shaping public policy. She suggests that the business community and large firms have both the capabilities and the strategic business reasons to play a major role in creating economic opportunity. Jenkins (2007) goes on to identify the importance of collaborative action in achieving systemic impact and scale by the business and development communities. The findings show that collaboration allows parties to share knowledge and information, pools scarce or diverse assets and resources, access new sources of innovation, create economies of scale and enhance the legitimacy of the parties’ own individual activities.

Das and Teng (2001) on the other hand regard trust is an important factor of successful partnerships. They argue that fostering trust is the main challenge of non-commercial stakeholder partnerships in low-income markets because it leads to effective cooperation.

Building on the findings of their study using three cases, two from Bangladesh and one from India, Seelos and Mair (2007) recommend the monitoring of the dynamics of the environment
and/or the development of the partner’s overall model and strategic objectives. They argue that this helps to recognize and address emerging threats to the sustainability of the alliance.

More than 9 cases in the field of ICT companies were examined by Kramer et al. (2007). Their findings show that collaboration helps ICT companies address two fundamental challenges to inclusive business models. The first is establishing and strengthening the value proposition. The second challenge is business model innovation and implementation. ICT companies have enormous potential to leverage their collaborative capabilities to expand economic opportunity more widely in developing countries.

The report of UNDP (2008) showcases 50 case studies by researchers in developing and developed countries. These studies demonstrate the successful pursuit of both revenues and social impact by companies. The outcome results in a series of strategies that private businesses have successfully used to overcome the most common obstacles to doing business with the poor. In the field of cooperation this includes strategies such as leveraging the strengths of the poor, engaging with the poor to increase the labour and management pool as well as expand local knowledge, and combining capabilities and resources with other organizations (both profit and non-profit).

Simanis et al. (2008b) produced the 2nd edition to the BOP Protocol. The Protocol is a new business innovation process, developed specifically for the BOP by a group of academics and practitioners. It summarizes the findings and analysis of over three years of in-field studies from two projects in Kenya and India.

They assert that if the enterprise-based approach to poverty alleviation is to flourish in the future, it is imperative that we now move rapidly to a “second-generation” of corporate BOP strategies.

The protocol advises to initiate direct, personal relationships facilitated by non-governmental organizations (NGOs). “Second generation BOP strategy requires an embedded process of co-invention and business co-creation that brings corporations into close, personal business partnership with BOP communities” (Simanis et al., 2008a). Successful cooperation with BOP communities is identified as a key ingredient for project success.

Although the literature reveals much attention to these kinds of issues and several lists of strategies and guidelines, there seems to be little effort to effectively explore these issues in a structured way using some frame of reference about cooperation issues in the MNC/Local Partner relationships, particularly in the ICT arena.

The following section describes the research process in a project of which the aim was to move towards such a frame of reference.

4. RESEARCH PROCESS

4.1. Research Method

As a research method, the case study is used in many situations to contribute knowledge of group, organizational, social, political, and related phenomena. It has been a common research strategy in social and political science, but has found usage in business and economics where for instance the structure of a given industry is investigated. As Yin (2003) states “…the case study method allows investigators to retain the holistic and meaningful characteristics of real-life events…”.
Each individual case study consists of a "whole" study, in which facts are gathered from various sources and conclusions drawn on those facts. For this research the use of multiple case studies is preferred in order to be able to generalize and raise solid evidence.

4.2. Sources of evidence and data collection

The targeted organizations consisted of either ICT MNCs or internationally operating NGOs who closely collaborated with an ICT MNC in its projects. In order to obtain a consistent group of participating organizations and projects they were selected on the basis that they were operating into and within Africa.

The second selection criterion was that the MNC or NGO was involved in a project aim at the BOP market. The third criterion was that it should be an ICT related project; in practice that meant that MNC should be an ICT MNC or that the NGO collaborated with the ICT MNC.

In order to get access to these organizations some conferences and seminars were attended to get in touch with representatives of the target group. Two of the respondents were approached after being introduced via acquaintances, i.e. “snowball sampling” (Heckathorn, 2002).

The result was the identification of (and access to) 10 separate projects involving a variety of organizations and partners that could participate in the investigation. Within each project a variety of sources were used for data collection

Yin (2003) identified at least six sources of evidence in case studies:
- Documents
- Archival records
- Interviews
- Direct observation
- Participant-observation
- Physical artifacts

A combination of different sources can provide more reliable data, and for the purpose of the research reported in this paper the focus has been on the first three mentioned. The first two sources provided secondary data, whilst the interviews served as sources for primary data.

The kind of documents that were used as sources for secondary data included existing case reports, administrative documents, and multimedia online resources. In the interest of triangulation the documents served to confirm the evidence from other sources.

Archival documents included service records, organizational records, lists of names, survey data, and other such records. Desktop research provided background material and furthermore provided means of crosschecking information.

Interviews are one of the most important sources of case study information (Yin, 2003). They may propose solutions or provide insight into events. They may also confirm evidence obtained from other sources (Tellis, 1997).

Semi-structured interviews were used for the purpose of this study and key respondents were asked to comment about certain events and issues. The discussions revolved around the topic
of problems related to cooperation with partners and issues and success factors related to this. All the respondents gave permission for recording the interview. These included 8 interviews with senior members of ICT MNCs and NGOs. The interviewees were either directly active in the described projects or were seeing to its outcome.

As Yin (2003) recommends, a case study protocol was used, which included an overview of the project, field procedures, question list and guidelines for the report.

Table 1 lists the projects, the participating companies as well as some details about the projects they were involved. In addition the sources of primary data that was used in each project are listed in the last column.

<table>
<thead>
<tr>
<th>Project</th>
<th>Company involved</th>
<th>Case description</th>
<th>Type of partner</th>
<th>Primary Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-Pesa</td>
<td>Multinational and local mobile provider</td>
<td>Mobile payments &amp; banking</td>
<td>Societal partner</td>
<td>Interview with sr. manager of company involved.</td>
</tr>
<tr>
<td>Village Phone in Uganda</td>
<td>Bank &amp; mobile telecoms company</td>
<td>Rural shared telephone facility</td>
<td>NGO and local for profit partner</td>
<td></td>
</tr>
<tr>
<td>Village Connection</td>
<td>Mobile telecoms company</td>
<td>Rural local phone network local for profit partner</td>
<td>Interview with sr. manager of company involved.</td>
<td></td>
</tr>
<tr>
<td>Unlimited Potential</td>
<td>Software company</td>
<td>Broad range of ICT activities aimed at emerging markets and particularly the BOP market.</td>
<td>NGO, civil society</td>
<td>Interview with manager of company involved.</td>
</tr>
<tr>
<td>Public-private partnerships - Tapping into innovation</td>
<td>Several ICT MNCs</td>
<td>IT consultancy activities in developing countries.</td>
<td>Civil society organisation</td>
<td>Interview with manager of IICD involved with projects.</td>
</tr>
<tr>
<td>Public-private partnerships - ICT &amp; media</td>
<td>Several ICT MNCs</td>
<td>IT consultancy activities in developing countries.</td>
<td>NGO</td>
<td>Interview with NGO officer involved with projects.</td>
</tr>
<tr>
<td>i-Community in South Africa</td>
<td>Hardware company</td>
<td>Telecenter.</td>
<td>NGO and some local private partners.</td>
<td></td>
</tr>
<tr>
<td>World ahead (e.g. Classmate PC)</td>
<td>Hardware company</td>
<td>Sustainable technology for users in developing countries.</td>
<td>Local government</td>
<td>Interview with sr. manager of company involved.</td>
</tr>
<tr>
<td>Digital Bridge</td>
<td>Hardware company</td>
<td>Bringing connectivity to the unconnected.</td>
<td>NGO</td>
<td>Interview with sr. manager of company involved.</td>
</tr>
<tr>
<td>Communication for all</td>
<td>Mobile telecoms company</td>
<td>Bringing communication to all.</td>
<td>NGO</td>
<td>Interview with sr. manager of company involved.</td>
</tr>
</tbody>
</table>

Table 1: Participating companies and their projects.

4.3 Data analysis
For analyzing case study evidence Yin (2003) suggests three strategies for general use: one is to rely on theoretical propositions of the study, and then to analyze the evidence based on those propositions. A second is to use rival explanations by setting up a framework based on these rival explanations. The third technique is to develop a case description, which would be a descriptive framework around which the case study is organized.

For the purpose of this research multiple cases were described and cross-analyzed, effectively following, in part, the suggestions by Yin (2003) of a more specific analysis technique called cross-case synthesis. However for this project word tables, as suggested by Yin (2003), were not used, but rather the basic coding techniques of grounded theory as suggested by Glaser and Straus (1967) and Glaser (1978).
The reason is that the use of constant comparative analysis, for instance, lends itself much more towards the creation of frameworks such as the one being presented in this paper. It has to be noted however that the framework suggested here was not created only from data collected in the field, but was also guided by propositions in existing literature as can be seen in the next section that present the findings and a discussion of the proposed framework. The result should therefore not be regarded as a grounded theory. Nevertheless it can be suggested that the resulting framework does enjoy a close link with data that was collected in the field and is therefore ‘grounded’ in data to some extent.

The analysis process consisted, in simplistic terms, of a search for patterns in the data; recurring issues, in other words. These were categorized into groups and these categories developed and became more robust as the analysis continued.

The next section illustrates these categories and provides support for the emerging framework.

5. FINDINGS AND DISCUSSION
The data reveals several issues that could be categorized as follows:
- Driving force issues
- Skill issues
- Input-Output issues
- Socio-cultural Issues
- Systems issues
- Trust Issues

Each of these is explained in the following sections. Where possible examples of evidence from the data are offered that helps to illustrate the issues. In each case there are also references to instances in the research literature where these issues are confirmed.

5.1. Driving Force Issues
Driving Force issues refers to problems that occur as a result of misaligned fundamental driving forces that shape the goals, purposes and process of BOP projects, both from the perspective of the ICT MNC as well as that of local partners.

The data reveals that problems arise when the goal and purpose of the project are different for each partner, and when these differences are not acknowledged. “If there is not a sustainable [business] model and mutual benefits, the project will fail.” one of the respondents told us.

Another driving force is that which involves the different foci on results versus process by different partners. A respondent stated: “[western] consultants are very result orientated, whereas in developing countries there is more focus on the process. …How to explain this to a [western] consultant?”. In support of this Kumar, et al (2005) highlight the difficulties this creates and mention how projects can fail as a result of a mismatch in this regard.

At the same time the data also reveals that another more covert driving force could also lead to cooperation problems namely the tendency of ICT MNCs to be technocratic or technology driven in situations where small business driven projects may rather be more successful. One respondent said: “IT consultants, often male consultants, are technology driven. IT will
become a target instead of the means for an aim “. This tendency is also suggested by Chio (2005).

Another, fairly debilitating, issue for projects that is revealed by the data is that of failing to get local input before investments are made. This is a critical driving force that often gets neglected. In the literature Gurstein (2005) laments the over-emphasis in research on "top-down, closed access and 'expert' driven" (p. 3) research in the ICT4D area. Ranganathan (2005) adds that actual ICT implementation (in this case within the educational sphere) itself suffers the same fate and that a bottom-up approach that build on indigenous knowledge provides much more sustainability. Simanis et al. (2008b) confirms this and their BOP protocol provided guidelines in this regard. However establishment of cooperation and mutual understanding takes time as was found in the data. This time factor has to be taken into account when starting a project and has been acknowledged by Simanis et al. (2008a).

Furthermore the data reveals that as expectations and aims tend to shift through time, failing to maintain continuous communication with the partners can cause further misalignment problems. This confirms Seelos and Mair's (2007) argument, which effectively implies that failure to continuously monitor the relationship could add to difficulties in the cooperation.

5.2. Skill issues
The data reveals that ICT MNCs tend to have unrealistic expectations about local skills and knowledge on a variety of topics ranging from IT skills and knowledge to managerial skills and knowledge. The word 'unrealistic' is used here because ICT MNCs tend to either over-estimate or under-estimate the knowledge and skills levels, as this phrase of one the respondents illustrates: “You have this underestimating of knowledge...we have forgotten that there already exists some knowledge... [of ICT] ”

In addition it emerged that ICT MNCs struggle to deal with the diversity in skill levels found at the local environment. An example is the Nokia project for shared telephony in Uganda where it was found that skill and knowledge levels vary greatly from one individual or partner to the next. The difficulty that ICT MNCs seem to experience is that of becoming and staying aware of this variety of resources as well as tapping into and cultivating these resources.

Prahalad (2005), Simanis et al. (2008a) and Jenkins (2007) highlight the importance of this kind of collaboration and sharing of skills and knowledge.

5.3. Input-Output Issues
Input-Output issues refer to difficulties that may arise as a result of unequal investments by partners in projects, as well as unequal gains by partners from their projects.

The data reveals in some cases that the partnership exhibits unequal risk sharing. Very often one party has the burden of all financial investments. Local entrepreneurs most often do not have the means to bear a high investment. When local entrepreneurs do not find their own financing and ICT MNCs have to be the majority investor, the nature of the cooperation transforms from a partnership to employer-employee relationship.

The fact that there is unequal risk sharing may not be new; in fact it may well be argued that almost all BOP projects are characterized as such, even with the knowledge and agreement of both partners. However a matter for concern may be the impact that this inequality could
have on cooperation in terms of aspects such as misaligned driving forces. The reality is that those who take the most risk are more careful with a project than those who take less risk.

In addition certain outputs of projects might be cause for problem. Matson (2006) highlights problems in business partnerships related to intellectual property and patents. This may be true for profit-profit relationships, but even more so in profit-nonprofit settings as encountered between ICT MNCs and NGOs. In these partnership new products and services may arise which have a potential market value. The sharing of revenues and protection of investments is an aspect common to ICT MNCs but unfamiliar terrain for their nonprofit partners. “If ‘Company X’ helps to grow ICT development and the local ecosystem then there needs to be protection of intellectual property”, a senior manager stated.

It would seem that all partners are not always explicitly aware of their mutual interest and potential mutual gains. It is not stated that “selling to the poor” is the foremost aim of ICT MNCs, but it is an aspect which arises in sustainable business (Prahalad, 2005, Simanis et al., 2008b), and it brings the need for agreement upon the spinoff of ventures on the surface. Trust will be a relevant factor in this (Das and Teng, 2001).

5.4. Socio-cultural Issues

A natural difficulty that organisations experience when making investments in developing areas are those related to social aspects of the partnership. In particular there are those obvious difficulties related to cultural differences. The data reveals that one or more partners seem to experience difficulty at some point in the relationship in understanding the behaviour of partners, and developing an understanding of the local environment. One respondent said that IT MNCs in general want to act fast, whereas the local partner has a different, slower, pace, which causes some friction while adjusting to a common rhythm. Some respondents touched the differences in operation culture between profit and nonprofit organizations and the difficulties it brings in cooperation, although one respondent stated: “Working with an NGO is much easier than working with the UN”.

These difficulties were also highlighted by London and Hart (2004) as discussed earlier, and they refer to the issue of social embeddedness.

One such social issue is that of culture shock, which refers to general feelings such as frustration and anxiety that people experience while living and working in a different country (Oberg, 1960). “IT Consultants of IT are not always mentally prepared for the challenge they face on site”, a respondent said. Business people from ICT MNCs seem to experience business culture shock when having to spend time in the local environment, an issue that has enjoyed some attention from Marx (2001). She suggests that business people experience problems in something that is called the culture shock triangle; referring to three problem areas namely: an emotional side, a thinking side and a social side.

There has been some interest in the phases that people go through when adjusting to a new environment (Ward et al., 1998). The generally accepted explanation has for many years been the U-curve theory, originally suggested by Lysgaard in 1955 according to Ward, et. al. (1998). The explanation is that cultural adjustment is a process that starts with an initial phase characterized by positive perceptions and experience (referred to as the "honeymoon" phase), followed by a phase where the situation is experienced more negatively, and ending with final phase where adjustment has taken place. Ward et al. (1998) however propose that problems with adjustment are actually greater at the entry point and tend to decrease over
time. This effectively implies that approaches to cultural adjustment programmes for individuals in BOP projects may need to be revisited.

5.5. Systems issues
Systems integration proves to be an issue as the data revealed. Although partners expect that some form of integration is required it seems that problems are often more than expected. One example is that of the Vodafone project in Kenya where the integration of systems with the local partner's back-office was a noteworthy obstacle. Butt et. al. (2008) suggests that these problems are common confirming the findings of this study.

In addition it seems that it may also happen that the actual usage of implemented systems tends to be different from the intended usage. This may result in redundant systems. An example comes once again from the Vodafone project in Kenya, where the original intention was micro financing, but in reality users only utilized the system to make person-to-person payments, effectively making the installed micro-loan systems redundant (Hughes and Lonie, 2007).

5.6. Trust Issues
The data reveals that for establishing a solid partnership a fair amount of mutual trust is needed.. One of the respondents said “It starts with mutual understanding: the local partner has to understand what the IT MNC wants and vice versa. Trust is essential…” This is confirmed by Das and Teng (2001).

The data reveals in certain cases instances of partners (on both sides of the relationship) that promise more than what could be delivered. A respondent said: “Sometimes IT consultants promise more than can be delivered or they expect that local partner will do more”. This could clearly impact on the trust relationship between partners.

An interesting observation is what seems to be a high level of eagerness on the side of the local partner to report in a favorable or positive way to the ICT MNC or sometimes the NGO acting as an intermediary party. “The local partner has the tendency to tell you what you want to hear”, a respondent stated; “…this ‘willingness to please’ led to dissemination of misinformation. A possible motive was the eagerness to keep the partnership going…”

It is possible to borrow a term from the social sciences research field namely that of "social desirability bias" which refers to the tendency of research subjects to behave in a way that they think may be perceived as favorable by the researcher (Randall et al., 1993). However in the case of BOP projects a more suitable term may be "business desirability bias".

Table 2 illustrates clearly how the categories that were identified in this research are supported in the literature.

<table>
<thead>
<tr>
<th>Category of Issue</th>
<th>Examples of Relevant Theoretical Perspectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driving force issues</td>
<td>• Different foci on results versus process (Kumar et al., 2005)</td>
</tr>
<tr>
<td></td>
<td>• Technocratic approach of MNCs (Chio, 2005)</td>
</tr>
<tr>
<td></td>
<td>• Over-emphasis on &quot;top-down, closed access and 'expert' driven&quot; research (Gurstein, 2005)</td>
</tr>
<tr>
<td></td>
<td>• Bottom-up approach that builds on indigenous knowledge (Simanis et al., 2008b)</td>
</tr>
<tr>
<td></td>
<td>• Failure to continuously monitor the relationship (Seelos and Mair, 2007)</td>
</tr>
</tbody>
</table>
Table 2: Examples of Relevant Theoretical Perspectives for the identified Categories of Issues.

<table>
<thead>
<tr>
<th>Skill issues</th>
<th>• Becoming and staying aware of the variety of resources, e.g. Prahalad (2005), Simanis et al. (2008a) and Jenkins (2007)</th>
</tr>
</thead>
</table>
| Input-Output issues                                                          | • Sustainable business (Prahalad, 2005, Simanis et al., 2008b)  
• Business partnerships related to intellectual property and patents (Matson, 2006) |
| Socio-cultural Issues                                                        | • Social embeddedness (London and Hart, 2004)  
• Culture shock (Oberg, 1960, Marx, 2001)  
• U-curve theory e.g. Lysgaard and (Ward et al., 1998) |
| Systems issues                                                               | • Integration of systems (Butt et al., 2008) |
| Trust Issues                                                                 | • Trust as a relevant factor (Das and Teng, 2001).  
• "Social desirability bias" (Randall et al., 1993) |

6. CONCLUSION & RECOMMENDATIONS FOR FURTHER RESEARCH

The categories of problems identified and described in the preceding section were created through analysis of data collected from a variety of sources, with the purpose of creating a basic and provisional frame of reference.

Certain limitations of this research need to be acknowledged. A fairly small sample or projects were used and these projects were only those that specifically involved local for-profit organizations. The question of whether these findings can be generalized to other BOP projects or even other development projects can only be answered through further research.

Clearly this frame of reference also requires some work, in particular confirmation of the patterns (or core categories) that were identified. To this end further research on the stability of these core categories is required. In particular it might be useful to conduct further qualitative research in which these categories could be further investigated with the aim of obtaining richer descriptions of these issues, and, perhaps, to adjust the existing categories for better fit with newly collected data.

Once a more robust framework is established further research can be conducted to verify the elements of the framework. For this purpose some quantitative research may be appropriate.

Finally further research may be required in order to investigate the relevance of contextual issues, such as the nature of partnerships, and their impact on project success. It could for instance be argued that certain types of partnerships (such as ICT MNCs with non-profit partners) experience different problems than others (such as ICT MNCs with profit partners).

Ultimately the framework suggested there would serve as the foundation for the development of a diagnostic instrument to help study the nature of cooperation issues in this field. It would in addition add an extra dimension of assessing the contribution of ICTs to development goals.

Notwithstanding the provisional nature of the framework, it can well be argued that it provides a relatively clear and sober perspective on issues that may be of concern to ICT MNCs and their partners in BOP projects. At the very least players in this area would do well to prepare themselves for these kinds of projects by analyzing the potential pitfalls using this
framework as a guide and to mitigate them by incorporating best practices form the field and known theoretical solutions.

7. REFERENCES AND CITATIONS

ICT AND RELIGIOUS TRADITION: THE CASE OF MOUNT ATHOS

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Abstract: ICT is understood to be closely associated with the shaping of late modernity. It constitutes one of its fundamental and distinctive features and is a product of its socio-economic institutions. Yet, it is increasingly taken up by traditional communities. The core question of this paper is whether the encounter of ICT with cultures that have not embraced the values and ways of life of modernity gives rise to alternative perceptions and enactments of socio-technical ensembles. Do traditional communities disentangle the ICT artefact from the institutional context of modernity and appropriate it in their own culture and social order? Is there a potential fusion of ICT with non-modern cultures that leads to transformative effects of either the endogenous culture or the taken-for-granted ‘modern’ meaning of ICT value? Or is the take up of ICT, loaded with the meanings and values it inherited in its context of modernity, just eroding traditional culture and bringing them closer to modernity?

We address this question by exploring the meanings and consequences of ICT in the community of monasteries on Mount Athos that was established in Byzantine times and remained largely isolated from most institutions of modernity. This is an early stage in what we intend to make longitudinal research, and our finding are inconclusive. We found a mix of attitudes and ICT-related practices among the monks and different attitudes towards the information processing/storage and communication functions of ICT. But overall, adoption of ICT is increasing on Mount Athos and we identify reasons which potential changes are under way and which merit further research. However even at our current stage of research it is apparent that these changes are intrinsically different in our modern consumerist society and are largely shaped and constrained by Christian religion.

Keywords: globalization, ICT for development, liquid modernity, tradition, Mount Athos
ICT AND RELIGIOUS TRADITION: THE CASE OF MOUNT ATHOS

1. INTRODUCTION

An endlessly array of ICT artefacts have become a fundamental feature of contemporary modernity. Continuous ICT-enabled innovation in all types of organizations has been simultaneously a product and a key constituent part of the three most dominant institutions of society at the beginning of the 21st century, namely scientific R&D, free market economy, and the military. Consequently, ICT innovation is deeply implicated in shaping the twin concepts of ‘development’ and ‘globalization’ influencing a particular orientation of social change widely seen as universally improving human life conditions.

To be sure, ‘development’ and ‘globalization’ and the development through globalization are both being contested in the arenas of political activism and academic debate. Perhaps more importantly, some of the most basic principles of rational economic behaviour and science-informed action that are understood to characterize modernity seem to be circumvented in everyday life conduct across the globe. One of the paradoxes of late modernity is the continuation, if not the revival, of religious communities which maintain a strong sense of identity based on traditional values and beliefs that in many ways are at odds with the rationalities of modern science and economics. Do such communities perceive it to be incompatible to their way of life, or embrace it? If the latter, as anecdotal stories and images circulated by the media suggest, do they appropriate the potential of the material properties of the technology and reconstitute its functionality, or adopt more or less intact the socio-technical performativity of its original context? Does the introduction of ICT affect the spiritual character that is prominent in traditional religious communities?

The motivation for writing this paper for the IFIP WG9.4 conference stemmed from a discussion at an earlier IFIP conference on ICT policy in Pretoria, South Africa in September 2008, which involved many participants from the preceding IFIP WG9.4 workshop at the same venue. The discussion concerned the question of the existence of alternative perceptions and knowledge regarding ICT and society. Several participants claimed that different societies foster significantly different ways of thinking about the value of ICT and the way it is associated with socio-economic change. Moreover, it was suggested that such differences may stem from differences of culture.

The research we present in this paper explores these questions in a study of the traditional and isolated Christian Orthodox community of Mount Athos. We believe that because of the rather extreme traditional character of this community and its distinctive religious culture, its study can be a revealing example of the fusion of traditional life and ICT as a technology of modernity par excellence, thus providing fertile ground for the exploration of alternative perceptions of ICT and society.

The next section of this paper traces relevant theoretical ideas regarding ICT and the shaping of modern society. It draws mainly from theorists of modernity and cultural change. Then, we present the background of the religious community of Mount Athos, describe the way we conducted our research, and provide a short description of the technology uses we observed. In the following section we discuss the perceptions and uses of ICT, and their discernible consequences for the community. In the conclusions we summarise our main observations and identify further required research. Although, the contact of this community with ICT was rather limited and too short in duration, we did not find the crystallization of any distinctive alternative meanings and transformational courses of action. We did discern...
challenges and contradictions that need to be further studied in order to explore the way a traditional community makes sense of ICT, appropriates them, and positions itself in the modern world.

2. MODERNITY AND ICT

Modernity can be viewed as a principal theoretical construct in evaluating and interpreting cultural and social formations (Misa et al., 2003). Authors use the term with varying but overlapping meanings (Weber, 1958; Giddens, 1990; Bauman, 2000; Appadurai, 2005; Beck, 2008). A common approach is to view modernity as a historical project beginning in ancient Greece, transcending Christian times of Western societies and fulfilling its elf with the Enlightenment (Foucault, 1984; Habermas, 1992; Nissen, 1998; Misa et al., 2003). Much of this literature makes a distinction between traditional and modern societies. In a nutshell, in the former people conduct their affairs by adhering to ancestral values and social behaviour patterns of taken-for-granted validity. In the latter, people exercise reason to make choices according to the circumstances they face and, in effect, they give shape to their own biographies (Giddens, 1991).

Most analysts tend to agree that technological progress and advances in arts and science in general are among the most important aspects of what they call ‘modernity’. Technology and modernity are seen as mutually defining each other (Adam, 1992); each one fundamentally and inevitably involves the other; ‘technology is a truly distinctive feature of modernity’ (Misa et al., 2003). Before modernity, time and space were treated as inseparable and inherently interconnected, localised activities (Harvey, 1990; Giddens, 1990). Modern technological advances in the sphere of communication, computer technologies and technologies of travel are argued to have compressed time and as a result communities and individuals have started to lose their identity in this ‘boundary less space’ where geography is nowhere (Bauman and Vecchi, 2004). Giddens conveys this view with the metaphor of phantasmagory:

‘In conditions of modernity, place becomes increasingly phantasmagoric: that is to say, locales are thoroughly penetrated by and shaped in terms of social influences quite distant from them.’ (Giddens, 1990: 19)

In particular, analyses of contemporary conditions of modernity elaborate on the transformative effects of ICT as a technology contributing to the flow of information, to mobility and to continuous innovation in all domains of human activity. Taking these ideas further, Bauman presents the contemporary ‘modern’ condition – which he calls ‘liquid modernity’ – as one characterized by its speed of change: the modern world has become obsessed with novelty (Bauman and Tester, 2001). This condition of modernity differs not only from traditional societies, but also from modernity that has been searching for and adhered to universal rational truths. In liquid modernity people constantly search for new solutions, as there is no longer an available guidebook for them to follow (Bauman, 2000). In the contemporary consumer society everything is characterized as new and unfamiliar; different food, fashions and people that we meet change our attitudes towards the ‘strangers’.

‘Ideally, nothing should be embraced by a consumer firmly, nothing should command a commitment till death do us part, no needs should be seen as fully satisfied, no desires considered ultimate.’ (Bauman, 2000: 89)

The liquid phase of modernity can be characterized as the era ‘of disembedding without re-embedding’, where ‘nothing but transience is durable’ (Bauman, 1998), new values and rules have to be continually accepted as constant social change becomes integral to any society.
Local customs are diminished both in the search for discovery of ultimate truth through the rationality of science of solid modernity and the search for novelty of liquid modernity. A question, therefore, arises from these theoretical perceptions of modernity is what happens to culture, if we take culture to mean forms of community life that encompass institutional conduct, structures, and modes of organization (Hand 2008). Do the cultural processes of globalization imply the preservation, lessening or disappearance of distinctive cultures as the identity of social groups?

A debate on this question is found in the literature on globalization. Early views of homogenization, or ‘Americanization’ of culture in the context of the discourse of globalization, gave way to more nuanced views of ‘indigenization’ Hannerz (1987), glocalization, as a combination of contradictory globalization and localization (Robertson, 1992; Bauman, 2003), and hybridization (Appadurai, 2005). Homogenizing processes, such as transnational business, worldwide spread of consumer products and clothing styles, advertising techniques and language hegemonies, are entangled with the export of particular local cultural features through immigration, travel or influence by neighbouring societies. Appadurai brings several examples of indigenization, such as the way Western pop style music is mixed with local ‘colour’ and acquires different meanings in different places of the world. A much more complex picture of cultural variation emerges from his discussion of the cultural reproduction occurring in small groups of Diasporas, deterritorialized communities and displaced populations. The reproduction of cultural features of their original community context is mixed with the cultural influences of their new ‘home’ and international media. At the same time they also influence both, their original communities, fuelling their dreams and fears, and the new ‘homes’, exposing them to their cultural particularities. Such views suggest that multiple forms of modernity are created at the meeting points of different values and aesthetic criteria with technological development (Feenberg, 1995) and the word consists of hybridized rather than recalcitrant distinctive cultures (Appadurai, 2005; Delanty and Rumford, 2005; Delanty, 2006; Lull 2000, 2007).

Yet, in contrast to this view, there is also a trend towards ‘fundamentalism’, meaning ‘the strict maintenance of the ancient or fundamental doctrines of any religion or ideology’ according to A Concise Oxford English Dictionary. Religion is a major cultural determinant, and a strong identifier in global as well as regional geopolitical conflicts. Our research sets out to explore the way the technologies that underpin liquid modernity and the widely observed hybridization of cultures are accommodated in fundamentalist religious communities. In the following section we present our case study of a religious community that has preserved its particular version of Christianity (the Orthodox Church) and its Byzantine heritage for over a millennium.

3. **OVERVIEW OF THE CASE STUDY**

Mount Athos, or in Greek Aghion Oros (Άγιο Όρος) which translates as Holy Mountain, is an autonomous state under Greek sovereignty and home to 20 Christian Orthodox monasteries. Spiritually the monasteries come under the jurisdiction of the Ecumenical Patriarchate of Constantinople and monks come from across the world, but mostly from Balkan and Eastern European countries that follow the Eastern Orthodox Church: Russia, Bulgaria, Ukraine, Romania, Serbia. Mount Athos was formally founded as a monastic community in the 10th century, under the rule of the first abbot. Since then, it has maintained its unique way of life, governed by a set of rules and customs that are strictly observed by the monks. Today, it remains a centre of spiritual and cultural renewal, attracting visitors from all over the world who come to experience its serene atmosphere and ancient traditions.

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1 17 monasteries are predominantly ethnically Greek one is Serbians, one is Bulgarian, and one Russian. There are also smaller clusters (cloisters and sketes) of Romanian, Bulgarian and Russian monks.
community more than a thousand years ago in 963. The peninsula protrudes into the Aegean Sea for some 60 km at a width of 10 km. Its beautiful slopes reach up to 2,033 m and it is not easy to get to some of the monasteries. The monastic community is both geographically and institutionally well protected. Access to Athos is only by sea and special permission is needed to go there. The number of visitors is limited to 100 per day. It is an all-male community and no female visitors are allowed.

In The Middle Ages, from the 10th century onwards, Mount Athos as well as many other monastic communities could be described as a cradle of innovation; new inventions were made within the monastic walls - most of them in the field of agriculture and construction. Many innovative practices were also willingly adopted. Monasteries on Athos always had the latest technology of the time, as it is described by monks themselves, and supported by other researchers (Paganopoulos, 2006) however their appropriation of technology was always limited to what they needed to survive.

The early to late 20th century is often described as a period of decline for many monasteries on Athos (Speake, 2002); the number of monks dropped from 7,432 in 1902 to only 1,145 in 1971. Adoption of new technologies was blocked for almost the entire 20th century, as the community was preoccupied with the more daily needs of survival. During that period Athos was mostly populated by the old monks; the median age was as low as 60 or in some monasteries even 70 years. This meant that people who were on the mountain left the world well before modern technological development touched the lives of citizens around the globe. Their monastic life, until recent times, did not require much beyond the basic instruments of survival. This situation of decline was not only associated with internal problems on Athos but was also due to external political and social factors. Monks had only limited external sources and could only depend on themselves - it was a survival priority that led the monastic community to conduct a more laissez-faire way of life (Speake, 2002), allowing monks to retain profits from their work.

In effect, the Athos community, until recent years, was mostly untouched by technological developments of the 20th century and could be characterized as thoroughly traditional. Although Athos was faced with many transformational processes of Western society and was involved, mostly indirectly, in many of the political and societal processes of the 20th century, such as the formation of the European Union and the legislative changes regarding the autonomy of its member states, Mount Athos has preserved its autonomy, following their own rules. Their sovereignty is explicitly defined in the Greek constitution.

Recently, circa 1980, monasteries started to return to their traditional coenobitic way of life. The number of new monks and tourists increased leading to greater restrictions for visiting. Monks characterized the current condition on Athos as a renewal; there are many newcomers, they are building roads, repairing houses and introducing ICT.

3.1 Data collection

Our research of the monastic communities of Mount Athos so far involved an extensive study of relevant published materials. For a period of three days during the summer of 2008, individual interviews with monks, pilgrims, and people who are employed by the monasteries were undertaken. We held interviews of 2-3 hours per person with 7 people. Additionally, we had a long communication of about 20 hours, through Skype, with an employee. Further follow-up interviews with some of the interviewees, seeking additional information and clarifications, were conducted by email.

The inaccessibility of Athos and sensitivities of the monastic community posed particular constraints to our research. At the beginning we had planned to conduct semi-structured
interviews with monks and other stakeholders (pilgrims, workers). However, the researcher realised that it was difficult for monks to cooperate in answering questions in semi-structured interviews and he conducted mostly informal interview sessions which resulted in the collection of narratives, often presented in a form of personal stories. In these sessions the researcher led the interview by asking framing questions. These concerned the following particular topics:

- Questions to establish contact with respondents (paying attention to whether he was a monk or not), including control questions to test the logical non-discrepancy and trustworthiness of answers.
- Questions to understand the purposes of ICT uses on Athos; their goals, objectives of utilization, and timeline of changes so far.
- Questions aiming to find out the respondent’s personal involvement with ICT, their motivation and utilization, as well as to uncover work-related and personal motivating factors.
- Questions to uncover their attitudes of individuals, their concerns about ICT usage, and other behaviour aspects.
- Questions regarding views of globalisation, processes of change in society in general, the Athos community in particular, its traditional and moral principles, and way of life.

Language presented a few problems with the exception of one worker who didn’t communicate in English well so it was necessary to use a translator. Appropriate clothing had to be worn during interviews to help generate trust on the side of interviewee, as monks were sensitive to visual appearance. Monks were generally positive and even enthusiastic in responding to our invitation, but not very cooperative when directly enquired about their usage of ICT. Because it was difficult to construct a full narrative of life with ICT on the Mount, our empirical study concentrated on particular topics that are associated with implementation and usage of ICT on Athos. After the trip additional data were collected by investigating the online presence of the monks as well as by studying their posts on the Internet, thus complementing the research with information that was not disclosed during the interviews.

3.2 The usage of ICT on Athos

Different monasteries on Athos have different rules. Individual perceptions towards technology are also extremely heterogeneous. For example, at the Vatopedi monastery this is believed to be one of the most ‘high-tech’ on the Mount, with a population of 150 monks, only 8-10 use computers on a regular basis. Monasteries with a larger number of new and younger monks (the Vatopedi for example) are more modern and tend to use computer technology more extensively than more traditional ones (the Esphigmenou for example) with a smaller number of newcomers. Location also plays an important role in such tendencies and globalisation processes have less effect on remote monasteries.

Each monastery and even some scetes have a direct telephone line and a fax, and Mount Athos has a well designed and maintained web presence: http://www.inathos.gr/athos/en/. Every monastery has its own email but they don’t make their addresses public. Currently

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2 The habitation of a hermit.
there are six fully operational WiMAX stations that provide high-speed internet access (60 Mbps) and IP telephony covering nearly 100 percent of Mount Athos. This innovation is relatively new, implemented in August 2008, and only six monasteries are using the network so far; however the broadband opens new perspectives on adoption and usage of ICT on the Mount.

Computer technology is currently utilized on Athos in various ways with different degrees of commitment. We identified the following categories of ICT use.

**ICT for conducting business:** The monks who are engaged in the major business activities of the community - mainly harvesting and exporting forestry products - use MIS and accounting tools unrestrained. They also engage in e-commerce, both for buying and selling: two monasteries run internet shops to sell icons, books and CD-ROMs and occasionally monks will use the Internet to shop for items they need. However, most of the work is outsourced and monasteries, usually, are not directly involved.

**Communication technologies:** Some monks use email and VoIP. However, in general they tend to avoid communication with perfect strangers – monks tend to communicate only with other monastic communities around the world, although they communicate with strangers in their economic activities. Even monasteries which run Business to Consumer E-commerce sites avoid direct communication with customers - other people sell the goods and run the shop, while monks just give advice; as one employee suggested: “So we have some guidelines, or ask them in some mails what to replay. That way they avoid the direct communication with the world.” Hence appropriation of computer technology on Athos often doesn’t include the communicative component. Nevertheless, with the recent introduction of high-speed wireless Internet and VoIP this may soon change.

**Technology for the preservation of culture:** Currently monasteries are collaborating with the Greek government and the European Union in digitization projects aiming to preserve their cultural heritage. It is interesting to note that these collaborative projects were initiated by the monks themselves. They also use autoCAD for architectural plans and the design of a solar electric station. They use digital photography, electronic publishing tools, and produce multimedia CD-ROMs about monasteries.

4. **DISCUSSION**

4.1 **Personal attitudes to the use of ICT**

The peculiarity of the Athos community is that it is not a closed society. As an entirely male community in which no children have been born for many centuries, it is constantly relying for its survival to people entering the community from outside. This situation introduces an interesting phenomenon: They have to accept monks who by definition are more ‘modern’ than their predecessors in order to maintain the community with its traditional heredity and succession of values. Thus people in their 30s, who are joining the monasteries on Athos now, know about information and communication technology not by hearsay but have first-hand experience and possess substantial technological knowledge. The prevailing majority of fresh monks have university degrees, not only in Theology but also in Physics, Chemistry and Computer Science. However, in order to become a monk, they have to detach themselves from the social institutions of modernity and only then are they accepted into the brotherhood, embedding them into the communal monastic life. This act of de-modernisation is neither easy nor is it an instant process. But in contrast to our modern world, there are traditions and rules that have to be followed, paraphrasing Bauman (2000); there are ‘beds’
furnished for ‘re-embedding’. The community of Mount Athos also acquires some of the individual’s properties on the way to this mutual socio-technical discourse (Giddens, 1982); this process of transformation is not instant and both parties acquire properties reciprocally.

In should be noted that the community of Mount Athos is much more diverse than it is usually perceived by some researchers (Sherrard, 1960) and cannot be treated as a monolithic entity. Even if they are under the direct control of, and obedient to, the Constantinople Patriarch, different monasteries may have different rules and monks can have concessions, as a result de jure ‘collective’ tradiotionalism sometimes coexists with de facto ‘personal’ modernity. Levels of personal modernity differ on Athos; even within one monastery monks perceive technology differently and have strong polarization of views. This division is often associated with the age of the monks, with the younger monks having more positive attitudes towards ICT.

An interesting effect of a monk’s work at the monastery as a programmer is that he can actually commodify time more easily than his colleagues; he can redistribute his work in such a way as to still have time for the ‘leisure’ activities, even though they are close to his duties. Commodification of time is argued to be a modern phenomenon (Appadurai, 2005). The behaviour of programmer monks is interesting as it shows that even if present levels of ICT on Athos and practices associated with its usage may be deemed sufficient for the needs for which they were called upon (administration, record keeping, digitizing of manuscripts, etc), the individual interests of the monk and his attitudes towards the work stimulates the development of new practices and leads to the adoption of new information technologies on Athos. Thus, in addition to the various ICT projects launched by the administration of the monasteries and their businesses, the monks who are ICT savvy and keep contact with virtual communities are a continuous source of technology innovation through exercising their personal interests without conflicting with their religious beliefs.

4.2 Signs of de-traditionalization

Here we tried not to question the deep faith of new monks or their attitudes towards their religious practices. Instead concentrating on changes in traditional lifestyle in general. ‘Classical’ monastic tradition implies limited external communication; currently computer technology on Athos is mostly utilized in a way as to avoid the communicative component. However other types of communication like mobile phones, ha ve a lready become a part of local life. A radio station and mobile phones were introduced on Athos to call for help during emergency situations but now their usage is much more ubiquitous. Introduction of communicative technologies on Athos may ultimately erode their traditional disengagement with the rest of the world, which can be viewed as one of the transformative effects on the time-space organization of the pre-modern condition (Giddens, 1990, 2008; Bauman, 2000). Tradition on Athos has formed a prism through which computer technology is viewed and appropriated with a local meaning. Monks do not perceive ICT as contributing to their main goal in the religious community, which is spiritual: it aspires to following the orthodox process of becoming free of sin and being united with God, ‘θέωσις’. However,

3 There were some attempts to develop a theoretical framework for evaluation of personal modernity levels (Yang 1988; 1993; 1999; 2000) but they were widely criticized (Hwang, 2003). In the current context I use it to address the attitudes towards usage of modern ICT.

4 Even clocks on Athos show Byzantine time. However, some monasteries conducting business activities have to use two clocks
those who use ICT value it for making things ‘easier and faster’. Perceived economic needs of the monastic communities lead monks to use communication technologies more extensively than ever before. Doing things faster and trying to avoid wasting time is a key characteristic of modern societies (Weber 1958), in contrast to the traditional perception and value of time. One monk remarked: ‘we have all eternity to digitalize the manuscripts’.

Thus, for monks on Athos, there is an interesting mix of ‘instrumental rationality’ and religion. In the monks’ expressed ideals, ICT saves time for praying. But in the modern western world, ‘instrumental rationality’ itself is often promoted to the rank of religion. The tension between instrumental thinking and behaviour towards rational economic and political goals and spiritual values is neither new nor should it be associated exclusively with the adoption of ICT with its inscribed instrumental logic. For example, the ERP systems and e-commerce applications are not introducing a new logic and new values, but may be reinforcing the values of economic gain in a competitive society and take the monks along the path of the constant search for innovation of liquid modernity.

In terms of space, the Athos community was always defined and limited by its location. Monks never attempted to extend their territory; on the contrary, they always had to defend their boundaries. Appadurai (2005) mentions that the difference between a strong and a weak society is between territory well guarded and territory open to intrusion. The territory of Mount Athos is guarded very carefully – physical boundaries of Athos are guarded by the military. However, there is no protection from social intrusion associated with the deployment of modern ICTs.

Before the introduction of ICT on Athos, monks were able to avoid direct encounters with perfect strangers without confining themselves to a cell. Even pilgrims that were always a part of a local socioscape on Athos were, to some extent, legitimized either by their orthodox religious beliefs or by the authorities who issued them with a permit to be on the Mount. Now, with the help of ICT, monks can potentially be approached by anyone whatever their intentions. Athonite monks have high levels of trust and ontological security within the local community; but so far risk levels are quite low as well. Their common faith can be seen as an institutional safeguard that protects them and becomes what Erikson (1993) calls a ‘sign of trustworthiness in the community’ which is often absent in modern ‘liquid’ times where life is often associated with a high level of risk and diminishing levels of trust (Beck, 2008). Traditional and especially religious communities do not have a developed risk culture (Giddens, 1990) and may not be able to foresee the consequences of virtual communication with strangers.

4.3 The risks associated with dissemination and preservation of culture

As mentioned above, monasteries on Athos are initiating projects to transfer knowledge accumulated during the centuries to electronic media; three monasteries are already digitizing the manuscripts they possess. For example, the Vatopedi monastery together with the Greek government opened a tender for companies to bid for a project to digitize and systematize manuscripts, letters, books and visual material. But these projects of systematizing the storage of the knowledge and the cultural objects of the monasteries have implications for both their culture and their historically formed role.

The cultural objects that are being digitised have so far been preserved on Mount Athos by the continuity of practice of the Byzantine Christian Orthodox rituals. Manuscripts, icons, and various objects are inseparable parts of the conduct of life of the community. Extracted from the context of meanings and practices of the isolated religious community, and entered in the world which does not share its practiced culture, the digital images are images of
relics. In this form of preservation Mount Athos becomes primarily an archive, i.e. items disembedded from a community’s life context.

Another shift in the role and identity of the monasteries as preservers of Byzantine culture that is nurtured by the monasteries stems from the new possibilities of opening access to the preserved knowledge and images of the cultural objects to the wider public. At present there is demand across the western world for opening up archives and providing access for education and various other purposes. With this prevailing view about the value of archives, the digitization of manuscripts, icons, photographs, etc. entails the possibility of a significant shift from the role of keeping an ancient culture alive, that Mount Athos has played for over a millennium, to a role of disseminator of knowledge about a bygone culture (Hand, 2008). The internet shops are an indication that the monasteries may indeed be interested in making their cultural heritage available to the rest of the world, particularly as this provides another source of income.

5. CONCLUSIONS

The case of Mount Athos demonstrates that current globalization processes are reaching even the most socially remote and very traditional places on our planet. ICT is embraced by the monasteries of Athos as a benign and useful technology and our study shows that its introduction into the traditional community has not had immediate and grand transformational effects. At this stage, monks do not disentangle ICTs from the meanings attributed to them in their context of origin. They recognise them as useful mainly because of their potential efficiency effects in terms of information storage and processing, thus accepting the dominant perception of their value in modern societies. Those monks who opt to use them don’t see them as incompatible to their spiritual goals, with the justification that they have the potential to save time for praying. We found no alternative articulated views about the nature of ICTs and their potential to enable social change. However there are some interesting observations that merit further research and continuing analysis.

First, ICT is too broad a category of study. Different technologies attract different levels of interest and trust by the monks. Computerised information systems for the conduct of business, digital technologies for storage of knowledge, and design technologies are introduced without reservation. Communication technologies, such as email and the internet are at present used reluctantly and with suspicion of bearing intrusions. Further study is required to identify the particular technological artefacts, their perceived functionalities and their judgement about matching or contradicting the values and way of life of the community.

Second, the study shows that even in the strict monastic traditions of the Mount, there is individual agency in the appropriation of technologies. While the coenobium is still deeply traditional, there is significant space for personal modernity which results in idiosyncratic use of ICTs on Athos. There is no general agreement on the usage of ICT, but the current variety of attitudes doesn’t appear to provoke a visible confrontation among monks. Research is needed to examine the way personal idiosyncratic uses of technologies affect the community overall. Among the aspects of influence that need to be studied are changes of values towards communication with the world outside the community, and power relations, both within the community and its contact with the outside world.

Third, although our study did not find that ICT has immediate visible transformation effects on the religious community, it identified signs of potential transformative changes, such as increasing communication with the secular world beyond the peninsula and the potential shift
towards a role of dissemination of knowledge on an ancient culture. Longitudinal research will be needed to study whether and how such potential changes will be realised.

The research we present in this paper is limited in terms of data and exploratory in terms of analysis. We intend to follow up this research with a substantial ethnographic study aiming to understand daily life in the monastic community and the way ICT is accommodated into it. Moreover, better understanding of the way life on Mount Athos unfolds and the way it is associated with its surrounding world requires the study of the institutional context of the Churches (Greek Orthodox, Russian Orthodox, and other national ecclesiastic hierarchies), the national states and the supranational organizations that influence and legitimate it.

Moreover, we need to make a further effort to unravel the combination of spiritual motivation and reasoning that underlies the apparent peculiarities we observe in the traditional society of our study, its perceptions of value of various ICTs and their particular appropriations. This may prove the most difficult task of our future research in this area. But we believe that exploring the non-rational motivations and aspirations for the appropriation and shaping of ICTs can significantly enrich existing theoretical explanations of the emerging ICT-mediated ways of life.

6. REFERENCES AND CITATIONS


Abstract

The road of development through Information and Communication technology (ICT4D) is lined with deep potholes and dead ends since little is done to “accumulate either knowledge or practical guidance” (Heeks and Bailur, 2007, p. 243). This paper concerns how ICT can lead to development and, in particular, how ICT can facilitate government policy implementation in a development context; development being the emancipation and/or freedom of people from different forms of domination such as poverty, disease and oppression. Based on a three year ethnographic immersion in an emancipatory oriented longitudinal research project four theories stood out in their ability to offer some answers; the Capabilities Approach, Actor-Network Theory, the Diffusion of Innovations Theory and Habermas’ Theory of Communicative Action. Each of the named theories gave resourceful explanatory insights on how ICT can lead to development but each fell short at some point. By adopting an ethnographic approach where various theories explain different parts of the problem but not the whole of it, a theoretical framework was derived from the four theories. The framework was able to more cohesively explain how ICT can lead to development. This paper reports on the process of deriving the theoretical framework and uses the framework to analyse one research setting as a case study. The practical and theoretical contributions of the framework are respectively in its critical interpretivist explanatory power of ICT4D projects as well as in its provision of guidelines on how to conduct ICT4D research.

Keywords: ICT for Development (ICT4D), Critical Interpretivism, Capabilities Approach, Communication Action, Diffusion of Innovation, Actor Network Theory, Ethnography, South Africa
TOWARDS A CRITICAL-INTERPRETIVE ANALYSIS FRAMEWORK FOR ICT4D IN GOVERNMENT

1. INTRODUCTION

With more than 43% of the population living below the poverty line (The Presidency, 2007) emancipation and development are critical driving forces for the South African government. South Africa has been bold enough to admit that despite the open and active sponsorship and support for the use of ICT to implement government policy (e-government), the expected benefits are far from being realised (Harris, 2006, Republic of South Africa, 2006, South Africa, 2006).

IS researchers would argue that the main reason for the failure is the overly deterministic approach that has been adopted to drive e-government initiatives without taking into account the necessary human and social contexts. Most published e-government strategies are based on successful experiences from developed countries, whose experiences are not relevant to the local contexts in developing countries (Alexander and Phahlamohlaka, 2007, Averou, 2003, Kanungo, 2004, Odedra-Straub, 2003, Wade, 2002, Young and Ridley, 2003, Walsham, 2001). Chen et al (2006) report that e-government publications only focus on the potential and perceived benefits of the technological innovations. Chen et al (2006) highlight five contextual areas where developed nations differ from developing ones: history and culture; technical staff; infrastructure; citizens, and; government officers.

These differences additionally highlight the critical need to contextually adapt ICT when implementing government initiatives. These differences also present an opportunity for a solution that is relevant to developing countries. The latter two statements pointed to a research opportunity to investigate how ICT can facilitate government policy implementation in a development context. The expected contribution of this paper to research and to practice is in proposing a framework on how ICT4D research can be conducted as well as providing a step-by-step guide on how ICT4D projects can be carried out in practice.

The paper is structured as follows; the next section explains the ethnographic research design employed to investigate the research question. It is followed by the research setting describing how data was collected and analysed. The following section builds on the key findings from the analysis to describe the process of developing the theoretical framework. The final section draws conclusions, the contributions of the framework to research and practice, and identifies the limitations of the research.

2. RESEARCH DESIGN

In order to investigate how to adapt ICT in an e-government perspective while at the same time taking into consideration the development context of South Africa, it was necessary to adopt a research design that is “interactive and creative, selective and interpretive, illuminating patches of the world around it, giving meaning and suggesting further paths of enquiry” (Rock, 2001, p. 30). This research design was ethnography.

Ethnography is a qualitative research design where the researcher is involved by “participating, overtly or covertly, in people’s daily lives for an extended period of time, watching what happens, listening to what is said, asking questions — in fact, collecting whatever data are available to throw light on the issues that are the focus of the research” (Hammersley and Atkinson, 1995, p. 1). Ethnographers unearth the basis of human social
actions before they assign meaning to behaviours and beliefs (Schensul et al., 1999, p. 1) and rather than hide from situations that arise in the contextual situations, ethnographers create “window(s) of opportunity” (Zuboff, 1988).

The research setting is composed of two research projects initiated in 2003. The two projects are centered on emancipating people on their awareness of the Promotion of Administration Justice Act 3 of 2000 (PAJA) in South Africa through the use of collaborative technology (Phahlamohlaka et al., 2008, Twinomurinzi, 2007, Twinomurinzi and Phahlamohlaka, 2005, Twinomurinzi and Phahlamohlaka, 2006). The next section describes the research projects, hereafter referred to as the PAJA Projects, as the research setting.

3. RESEARCH SETTING
Due to space limitations of conference publications the research settings are briefly described guided by the PAJA Project inputs, process and outputs.

3.1 PAJA Project Inputs
The aim of the first PAJA Project was to explore the ability of web-based Group Support Systems (GSS) to increase the awareness of South African citizens about the PAJA whilst the citizens engaged with government ofcials. The aim of the second PAJA Project was to harness government-citizen interactions using web-based GSS tools.

The PAJA Projects research was conducted in three field locations between 2005 and 2008 (Table 1): Lebotloane in the North West Province (hosted by Lerethlabetse Multi Purpose Community Centre – now called the Lerethlabetse Thusong Service Centre); Siyabuswa in the Mpumalanga Province (hosted by the Siyabuswa Education Improvement and Development Trust - SEIDET); and the University of Pretoria in the Gauteng Province (hosted by the Department of Informatics). Lebotloane and Siyabuswa are both rural towns.

Table 1: Research Participation at the Research Sites

<table>
<thead>
<tr>
<th>Province where Research Participants came from</th>
<th>Siyabuswa</th>
<th>Lebotloane</th>
<th>University of Pretoria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mpumalanga Limpopo</td>
<td>22</td>
<td>29</td>
<td>8</td>
</tr>
<tr>
<td>Number of Research Participants (2005)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Research Participants (2006)</td>
<td>12</td>
<td>24 (1 new)</td>
<td>8 (1 new)</td>
</tr>
<tr>
<td>Number of Research Participants (2007/8)</td>
<td>18</td>
<td>16</td>
<td>4</td>
</tr>
</tbody>
</table>

3.2 PAJA Project Process
The PAJA Project conducted one-day research workshops. These workshops consisted of; social interactions such as brief introductions of the participants and the meals; a description of the PAJA Projects; a theoretical explanation of the PAJA (Table 2); a practical simulation using technological artifacts of the PAJA in action (Table 3); and group/individual research feedback sessions. In addition to the research instruments used to conduct the PAJA Project and the data collected electronically, more data was collected at each of these stages through participant observations.
Table 2: Theoretical Training across the three research sites

<table>
<thead>
<tr>
<th>Year</th>
<th>Siyabuswa</th>
<th>Lebotloane</th>
<th>University of Pretoria</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005 Trainers</td>
<td>1. Professor of Law from the Justice College</td>
<td>1. Professor of Law from the Justice College</td>
<td>No training provided</td>
</tr>
<tr>
<td></td>
<td>2. A Master of the High Court from the North West Province</td>
<td>2. A Master of the High Court from the North West Province</td>
<td></td>
</tr>
<tr>
<td>2006 Trainers</td>
<td>1. The PAJA Project leader made a recap and handed out PAJA brochures</td>
<td>1. The PAJA Project leader made a recap and handed out PAJA brochures</td>
<td>No training provided</td>
</tr>
<tr>
<td>2007/8 Trainers</td>
<td>No training provided</td>
<td>No training provided</td>
<td>No training provided</td>
</tr>
</tbody>
</table>

Table 2: The Technological Artifacts Used

<table>
<thead>
<tr>
<th>Technology Artifact used in</th>
<th>Siyabuswa</th>
<th>Lebotloane</th>
<th>University of Pretoria</th>
</tr>
</thead>
</table>

* The GroupSystems® failed and we were forced to use MS Office Word 2003 ®. Thereafter, we decided to use MS Office Word 2003 ®

3.3 PAJA Project Outputs using Grounded Theory

The plethora of data collected over the three years was qualitatively analysed using Strauss and Corbin’s (1990, Strauss, 1987) approach to Grounded Theory which adopts the three phases of open coding, axial coding and finally selective coding.

The Grounded Theory analysis revealed a number of issues ranging from unemployment to the (ir)relevance of the ICT artefact. The key insights that emerged in terms of development, suggest that there exists an environment in South Africa where people, especially women, are limited in their opportunities to become emancipated. Women are not the preferred candidates for employment. Society also causes women to accept positions of inferiority and does not prepare them for the likely adverse conditions that they could face. Women often end up unemployed and being forced to raise their families on their own. The townships while being crime infested are where these women can probably afford certain basic minimums without being employed. For such women in desperate conditions, they probably assume that the government will empathise with them in their condition. The Government on the other hand in being bureaucratic makes assumptions about the conditions of any applicant – regardless of gender. They make it the responsibility of the applicant to provide all the required and substantiating information that is needed.

Persuasion emerged as an important characteristic in emancipatory research. In persuading individuals to form a collective for the workshops we primarily drew on a personal power base which is more aligned to the South African notion of Ubuntu. During the process of persuasion it is easy to unconsciously raise unrealistic expectations. It is consequently necessary to manage expectations in particular those that concern finances and the capacity to assist individuals with their personal problems.

Persuasion is however not enough; a balance is required between the social and the technical. On one hand, there are minimum technical requirements that are needed to support the interactions while on the other hand, there is a need to deal socially with individuals. The technology needs to be functional enough not to be seen as a threat but as a tool that enhances emancipation for individuals. In the event that the technology is not functional enough,
something which is a strong likelihood in rural areas, there should be manual non-automated-technology alternatives which can be resorted to such as paper.

Collectives are formed because of the continual engagements over the three years. A new lifeworld is created amongst these collectives with each of the individuals accepting a role within the collective. The new lifeworld is based on the experiences learned because of being part of the PAJA Project. Such a lifeworld which demonstrates emancipation automatically attracts other members to it.

During the three years of immersion into the above PAJA Project, efforts were made to identify a theory that could explain; how ICT can lead to development and, in particular, how ICT can facilitate policy implementation in a development context. In the next section, we turn our attention to the necessity of trying to identify a suitable theory for the research.

4. A THEORETICAL FRAMEWORK

Theory is an important and essential guide for research. Theories are based on underlying assumptions about the nature of a phenomenon and as such are a way of viewing and not viewing the phenomenon (Reed, 2005, Walsham, 2001). The choice of theory to use is often a matter of complex judgement about the relative insights and fruitfulness of each theory or parts of it (Klein and Huynh, 2004, p. 196). There are no correct and or wrong theories but those which a reader finds appealing in explaining a phenomenon. The explanatory power of the identified theories can only be judged through a peer review (Walsham, 1993, p. 6).

Walsham (1993) justifies the creation of a synthesized analysis framework for organisational change based on the dimensions of context, process and the content identifying four major hallmarks; i) a clearly delineated set of levels of analysis, ii) a description of the process under examination, iii) a model of human behaviour and, iv) the linkage between context and process (1993, p. 53-54). Accordingly in this paper, the level of analysis is delineated with regards to the emancipation of people. The description of the process of emancipation and model of human behaviour are both described in the previous section on the PAJA project outputs. Walsham (1993) then linked context with process with respect to IS using structuration theory with a view to create the analysis framework towards understanding organisational change.

In this paper we argue that the context of organisational change as focused on by Walsham (1993) is at a micro level. Richardson and Robinson (2007, p. 264) point to the necessity in critical research such as this of identifying the level of context at the micro, meso or macro level. This research in dealing with communities at government level adopts its context at a macro level and hence found more than one theory to be appealing.

During the immersion in the PAJA Project, a number of theories were explored which could link the process of the PAJA Project and the community at a macro level context to understand emancipation with respect to IS. Four theories appealed to the authors to link context and process; the C abilities Approach, Actor-Network Theory, the Diffusion of Innovations Theory and Habermas’ Theory of Communicative Action. Each theory had an appeal in explaining only a portion of how IS could make a contribution to development but not one of them could explain the entire picture. Hence, and consistent with the ethnographic design of this research, a theoretical framework was iteratively created using the breakdown-resolution-coherence process from ethnography as described next.

4.1 The Breakdown-Resolution-Coherence Process

Agar (1986) notes that studying humans requires an intensive personal involvement and “an improvisational style to meet situations not of the researcher’s making, and an ability to learn
from a long series of mistakes” (p. 12). Agar (1986) deconstructs the definable attributes of a theory as *strips* that can serve as observable research points. During an ethnographic immersion into the research phenomenon, the researcher will invariably meet disjunctions between the traditions within the research phenomenon and the theory guided expectations; the disjunction signals a breakdown. That is, when a *strip* of the theory is not understood in relation to tradition, a breakdown has occurred. Once a breakdown is identified, something must be done about it and the process of moving from breakdown to understanding is called resolution. In resolution, the theory is modified or a new theory is constructed before trying again. This process of resolution continues until all breakdowns are resolved, resulting in what is called coherence. A coherent resolution can be known to have been reached when the resolution can “1) show why it is a better resolution than others that can be imagined 2) tie a particular resolution in with the broader knowledge that constitutes a tradition and 3) clarify and enlighten, to elicit an “aha” reaction from the members of the different traditions that make up the ethnographic encounter” (Agar, 1986, p. 22). The process is diagrammatically depicted in Figure 3.1 below.

![Figure 1: The Breakdown-Resolution-Coherence Process of Creating a Theoretical Framework](image)

Thus, to explore the possibilities of ICT to facilitate policy implementation in a development context the four identified theories presented ‘*strips*’ through which the research phenomena could iteratively be ‘resolved’ towards a ‘*coherent*’ schema.

### 4.2 The Capabilities Approach

The Capabilities Approach (CA) with its underlying paradigm in welfare economics (Sen, 2001) is an interdisciplinary framework (Robeyns, 2005b) which has been used in to analyse emancipatory research (Fukuda-Parr, 2003, JICA, 2005, Evans, 2002, Sen, 2005, UNDP, 2007).

This research regarded the Capabilities Approach (CA) as the foremost framework for the research because of its emancipatory essence. CA assesses individual well-being and social arrangements based on what individuals are able to do and to be. CA prescribes removing obstacles that inhibit individuals from living the life they value and providing the means to achieve such a life (Robeyns, 2005a, Sen, 1999). The CA argues that opportunities for development should not merely be judged by their existence for it is possible for the opportunities to exist but in reality cannot be drawn upon and achieved.

#### 4.2.1 Empirical Evidence for CA

For example, there are internet facilities within the government THusong Service Centres (TSC) where individuals have the opportunity to interact with the government through channels such as email. In reality, these opportunities cannot be drawn upon because the individuals do not know how to use email. As such, the real value of internet facilities as a
development commodity within TSCs for individuals to interact with government does not exist.

The CA has been shown to be problematic in two main ways; it is not prescriptive and, it takes an overly individualistic approach which in retrospect then avoids issues of political economy (Stewart and Deneulin, 2002, Krishnakumar, 2007). The strength of traditional approaches to assessment of well-being is in their structured proposition of the indicators that can be used to assess well-being as well as the weightings for those indicators. This prescriptive quality of traditional approaches makes them favourable to be adopted into policy (Stewart and Deneulin, 2002) unlike the CA which proposes a (contextually dynamic) list of capabilities (Uyan-Semerci, 2007) that are needed by every individual for that individual to be considered to be living a satisfactory life (Robeyns, 2005b). To overcome this operationalisation problem, Robeyns (2000) proposed a schematic representation of the CA (Figure 1).

![Figure 1: A schematic representation of the Capability approach (Robeyns, 2000)](image)

The individualistic approach which is a dominant aspect of the CA makes the implicit assumption that people come together for instrumental reasons alone thereby ignoring the need for a affiliation that is intrinsic to people and is a necessary part of development. The same individualism ignores the power of politics in influencing decisions which can only be combated through the collective and not through individual efforts (Stewart and Deneulin, 2002). The CA is insufficient to comprehensively capture the interactive and socially influenced relationship between the collective and the individual as it has as e in collaborative government-citizen interactions. To counter this shortcoming, Ibrahim (2006) calls for an expansion to collective freedoms which he defines as “the freedom of a group to perform a set of agentially distinct actions in combination”. Collective agency plays a role in individual agency and collective action is more powerful than individual action. Collective agency and action are powerful enough to influence “policy and bring about political change” (Fukuda-Parr, 2003). This interaction within the collective agency can be explained through Habermas’ TCA which explains how the collective can reach agreement through rational discourse.

**4.3 Theory of Communicative Action:**

Emancipation is one key element of CST which sets it apart from other social research. In this sense, CST goes beyond explaining to revealing and critiquing injustices and inequity as is required in development informatics or ICT4D as this research is. With TCA emanating...
from CST, it illustrates how traditional IS has predominantly focused on instrumental action and thus serving to unquestionably reinforce prevailing systems of governance.

4.3.1 Empirical Evidence for TCA

With reference to South Africa, this realization exemplifies the need to rethink and restructure the ICT systems in place if transformation and emancipation from the previous oppressive means of policy implementation is to be achieved. Traditionally, ICT systems are used to increase productivity and also to support management and administrative compliance, thus to effect social compliance. This signals an important danger, that if ICT systems that are used to facilitate social interactions are employed uncritically, these ICT systems may only actually reinforce existing systemic distortions and power plays rather than overcoming the barriers to effective social communication.

For this research it is the concepts of communicative and discursive action which are of interest. Communicative action explores bases for compromise and agreement, interpretations of shared norms and, values and the meaning of observations and experiences. In the event that there is no shared base, people fall back to a common background of assumptions about the world – their lifeworlds. If there are different backgrounds, discourse can fail.

In critique of communicative action Foucault suggests that power is not lodged in a central institution that can be easily identified and overthrown but resides in the collectives that determine what counts as legitimate evidence and acceptable forms of arguments through regimes of truth (Rose, 1999, Denzin and Lincoln, 1994). Foucault questioned whether rational discourse is possible if the power vestiges are invisible but can determine the agenda. The latter significant criticism related to the collective signaled another breakdown of TCA to succinctly explore the collaborative government-citizen interactions towards policy implementation. To resolve this breakdown we turned to socio-technical literature which examines the relationship between society and technology and takes into account power relations; the Social Shaping of Technology and the Diffusion of Innovation theory. These theories explore the social processes in collectives and how they tone technological innovations.

4.4 Social Shaping of Technology and Diffusion of Technological Innovation:

Social Shaping of Technology (SST) studies examine the relationship between society and technology by exploring the unique social processes and contexts that shape technological innovations (Howcraft et al., 2004, p. 239). SST suggests that political, economic, social, cultural and organisational actors influence the design and usage of technological innovations. The Diffusion of Innovations (DoI) theory offers a different linear explanation to the introduction and spread of technological innovations within society. DoI proposes a four stage process in which; (1) a technological innovation (2) is communicated through certain channels (3) over time (4) among the members of a social system.

Actor-Network Theory (ANT), a conceptual social constructivist tool of SST, attempts to avoid the linear causality problem of other SST approaches. In IS research, ANT has been used analytically especially as an interpretive lens and has been credited as giving a voice to technological artefacts (Cordella and S haikh, 2003, Stanforth, 2006). Avg erou and M adon (2004, p. 176) also recommend ANT as an appropriate methodological tool that can be used to analytically frame IS studies where the boundaries of the problem emerge from within the context. ANT lends support to the ICT4D argument that IS should be considered as a social constructivist tool of SST.
sociotechnical system whose technology is embedded and influenced by the social structures rather than IS having intrinsic value in itself. In so doing, ANT helps to elucidate the processes that occur in the creation of a stable network as comprised of technology and humans whereby the technology evolves accordingly to reflect and support the interests of the human members of the network.

4.4.1 Empirical Evidence for DoI and ANT

At government level, the creation of a stable network comprised of technology and people, as explained by ANT, needs to be made explicitly clear for the purpose of policy implementation. In policy implementation, which is concerned with putting into effect the aims of policy decisions on an ongoing basis (Barrett, 2004, Barrett and Fudge, 1981, Van Meter and Van Horn, 1975), it is crucial for there to exist clear guidelines on what to do, when and where as well as a clearly identified actor who purposively seeks to influence other actors towards a better way.

Two important criticisms of ANT which are critical for this research is that ANT does not consider the wider social structures that operate at the macro level (Lievrouw, 2006) such as government which structures have a significant influence at the micro level. Secondly, ANT is good on describing but not on explaining (Howcroft et al., 2004). Government decisions influence actions at the local, sectoral and individual level, which influence needs to be understood and further explained to those at the local level in order to suggest relevant and contextual improvements. The resolution of this particular breakdown is accounted for in Habermas’ TCA where the process of dialogue is explicitly laid out and the interaction between the wider social structures and local social structures is exemplified, albeit, as ideal types.

The other significant criticism of ANT is the presumption that the actors are chosen and defined by prior external decisions and then the process continues (Barnes, 2001). This externality of decisions creates a great deal of ambiguity for decision makers and signals a significant inability of ANT to contribute to policy implementation, another breakdown point. To resolve this criticism, we borrow the trip of ‘change agent’ from the Diffusion of Innovations Theory.

In the Diffusion of Innovation theory Rogers (1997, 1995) explains that the diffusion of technological innovations occurs along a four stage linear process of communication of new ideas, in which; (1) a technological innovation (2) is communicated through certain channels (3) over time (4) among the members of a social system. A change agent is one who seeks to influence other individuals towards what the change agent believes is better.

DoI is criticised for being technologically deterministic in its treatment of innovations as a given, unitary and stable phenomenon throughout the diffusion process, and in its assumption about a linear rate of adoption as depicted in the S-shaped curve. DoI’s linear top-down suggestion of how the four variables come together towards the adoption and implementation of an innovation does not apply to the complex societal mix and collaborative approach to policy implementation that this research is investigating. However, in practice it is required to have a list of actionable points to follow which is easy for implementers to adopt (a deterministic approach) and DoI provides this type of approach which if incorporated into an overall conceptual schema avoids the deterministic nature of the DoI.
4.5 The Theoretical Framework

Together, the above theories assisted in creating a more coherent understanding of how ICT could policy implementation in a development context. Figure 3 graphically represents the theoretical framework that resulted from the breakdown-resolution-coherence process which began with the CA, through the TCA and finally through the diffusion of technological innovations theories. Table 3 illustrates the theoretical framework as a tool to guide research adopting an Action Research strategy and as a tool for analysis analyzing the research setting as a case study.

![Figure 3: The Theoretical Framework](image)

Table 3: The Theoretical Framework as a Research Guide and Analysis Tool

<table>
<thead>
<tr>
<th>AR Stage</th>
<th>Theoretical Framework Stage</th>
<th>Analysing the PAJA Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosing</td>
<td>1. Identify the existence of a problem. The existence of:</td>
<td>1. The problem consisted of;</td>
</tr>
<tr>
<td></td>
<td>a. A situation which prevents the emancipation of the livelihood of an individual or group of</td>
<td>a. Unemployment</td>
</tr>
<tr>
<td></td>
<td>individuals in the community</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. An opportunity to improve the livelihood of the individual and/or community</td>
<td>b. The existing communities with a partnership with the research group</td>
</tr>
<tr>
<td></td>
<td>c. Policy whose implementation will lead to the improvements of the livelihood of individuals</td>
<td>c. The Promotion of the Administrative Justice Act 3 of 2000</td>
</tr>
<tr>
<td>Action Planning</td>
<td>2. The change agent persuades individuals into a n</td>
<td>2. The researcher and/or</td>
</tr>
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<td></td>
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</tbody>
</table>
innovative collective illustrating;

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<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>The innovative collective’s composition of technological artifacts &amp; people</td>
<td>a.</td>
<td>The community available computers at the Thusong Service Centres (TSC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>Role of the individuals to participate in open debate</td>
<td>b.</td>
<td>The explanation of the need for open debate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>Role of the technological artifacts in their characteristics</td>
<td>c.</td>
<td>The computers as tools for open debate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>The group influence</td>
<td>d.</td>
<td>The group is able to influence decision at government level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td>Demonstrable examples of achievement</td>
<td>e.</td>
<td>Research feedback e.g. “This program has been a life changing experience”, “it makes life easier for our communities, and this freedom at last”</td>
<td></td>
<td></td>
</tr>
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### Action Taking

3. Convinced individuals enroll into groups. The enrolment process involves the Obligatory Passage Point which means assenting to;

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</thead>
<tbody>
<tr>
<td>a.</td>
<td>All discourse will be conducted in open debate</td>
<td>a.</td>
<td>The participants signed the ethical clearance &amp; research participation forms agreeing to a) – d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>Discourse where necessary will be facilitated using technological artifacts.</td>
<td>b.</td>
<td>The change agent does not have to be available for open debate to occur</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>Usage of technological artifacts is available for novices</td>
<td>c.</td>
<td>By the third year, the researchers did not have to give the instructions on what needed to be</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>The group makes an attempt at an achievement and follows it through.</td>
<td>d.</td>
<td></td>
<td></td>
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</tbody>
</table>

### Evaluating

4. Check the existence of a new social system emerging

<p>| | | | | | |</p>
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<tr>
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</thead>
<tbody>
<tr>
<td>a.</td>
<td>Members of the innovative collective attempting to recruit new members</td>
<td>a.</td>
<td>“The invitation must be extended to (the) community at large” were indicative of member recruitment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>The change agent does not have to be available for open debate to occur</td>
<td>b.</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

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Hossana Twinomurinzi, Jackie Phahlamohlaka and Elaine Byrne
5. CONCLUSIONS

The theoretical framework proposes a plausible framework on how ICT can facilitate policy implementation in a development context. It begins with the government providing its citizens a vector of commodities in the form of infrastructure such as ICT, enabling policies and various other incentives that will emancipate people. These are the means to achieve. For the citizens to take advantage of the available vector of commodities, they need to collectively learn how to actually take advantage of the available vector of commodities. The processes of learning are social and environmental conversion factors. The purpose of ICT is to facilitate interaction with government officials and for the purpose of building consensus within the collective as part of the social and environment factors. ICT as a commodity is drawn on for its appealing characteristics in moving people in the collective towards consensus more effectively and efficiently. Over time a new lifeworld is created which consists of ICT as one of the actors/actants in the collective (social network). This new lifeworld of the collective has its own ideals and as such identifies what it believes are actual achievements. As a result of the collective’s continuous engagement with government officials, the collective will be able to actually attain one of the achievements. This makes the collective appealing and will as such attract more members.

Through the framework, we were also able to observe how a change agent is able to use influence people, individually and collectively, to emancipate themselves using available means such as the law. This is an important element for ICT4D research, emancipation and the ability to draw on freedoms towards an achievement.

5.1 Contribution to ICT4D Research

The theoretical framework provides a coherent critical-interpretive approach that can inform ICT4D research in its critical and reflective view of the role that IS plays in maintaining social order and relations in organisations and society (Doolin, 1998, Pozzebon, 2003).

5.2 Contribution to Practice

The framework provides an easy to follow process with prescriptions on what to do. This is an important element for decision makers who prefer to work with easy to follow steps rather than ‘esoteric’ notions. Practitioners prefer prescriptions and not descriptions. The framework incorporates past successes as a motivator for potential new members of the new lifeworld. It also incorporates the ability for discourse on past failures and how they could have been better approached.

5.3 Limitations and Areas for Further Research

Due to space limitations as required for a conference paper, we are only able to briefly espouse the ethnographic immersion as well as the theoretical framework that emerged.

The framework as it exists is arguably supported in the qualitative paradigm. To ascertain its fitness as a critical-interpretive approach for ICT4D, the framework needs to be subjected to ‘rigorous’ testing to verify and validate it. This can be achieved by applying the framework in
more than one setting. Typically, this would be to test the framework’s ability to drive, guide, explain and evaluate ICT4D research and projects in another developing context.

4. REFERENCES AND CITATIONS


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The School is committed to the creation of knowledge, the dissemination of best practice and the training of policy makers in the Arab world. To achieve this mission, the School is developing strong capabilities to support research and teaching programs, including

- applied research in public policy and management;
- master’s degrees in public policy and public administration;
- executive education for senior officials and executives; and,
- knowledge forums for scholars and policy makers.

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