Empowerment: The invisible element in ICT4D projects?
The case of public health information systems in India and Kenya

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Ma, this is for you
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Abstract

This thesis is situated in the context of Information and Communication Technology for Development (ICT4D) research, with a focus on health information systems (HIS) strengthening efforts in the public health sector of Low and Middle Income Country (LMIC) contexts, specifically India and Kenya. The key argument in this thesis is that “empowerment is a key but neglected ingredient of ICT4D projects” and enhancing focus on it would help to strengthen human centred design and implementation approaches of HIS. This can help addressing some of the bias arising from the dominance of technology driven focus in ICT4D projects, which contributes to much of system failures. The research aims this thesis addresses concerns understanding the nature of empowerment of health care providers, and how is empowerment shaped. Practically, I have tried to understand how design and implementation of HIS can be strengthening by explicitly considering empowerment. These questions have been studied using Amartya Sen’s Capability Approach, which places individuals at the forefront of development concerns, and enabling them to follow the choices they value. My thesis tries to understand how ICTs shape empowerment, conceptualized as the expansion of individual capability, and situated within the mutual interaction of human agency and opportunity structure. My analysis is based on an interpretively informed comparative case study design, involving three studies involving different settings, technologies (involving open source hospital information systems and MHealth applications), with varying opportunity structures and individuals with different agencies. This comparative design allowed me to discern how empowerment (or its lack) is shaped through the interaction of these different elements. The output from the thesis is in the form of a theoretical framework, which identifies participation and capability as important conditions that shape the opportunity structure and human agency interaction with implications of empowerment. I conclude the thesis by describing empowerment as the “invisible” element of ICT4D projects, which is all pervasive, but still not explicitly considered and understood. Foregrounding empowerment can help to critically question the claim by many ICT4D researchers that most projects fail in LMICs. My thesis draws implications for both research and practice, including the potential application of the proposed theoretical frameworks to domains other than health.
Chapter 1

1. Introduction

Personal Motivation

All my summer vacations (May-June) throughout 15-years of schooling were spent with my grandmother in her village in north India. And for working parents, like mine, it was a regular practice to dispatch children to grandparents during the holidays. In my case, I was lucky that my village was located in the Himalayas (Himachal Pradesh) with cool summers at 22-25°C (while the plains sizzled at 40-45°C)! The only not so lucky part of that to the commute - had to change three buses and then walk 6-7 kms to complete the 150 kms journey, which took about 10 hours. The first bus from Chandigarh (the city where I lived with my parents) to Shimla (capital of Himachal Pradesh about 120kms from my home) was early in the morning, and there was no direct bus (there still isn’t any). Next, I would need to take a bus from Shimla to Tutu (small town about 30kms from my village) and there were only five buses a day on this route. Then there was a third bus to be taken from Tutu to a stop closest to my village. With only a few buses plying on this route through the day, you really could not afford to miss the connection, else would need to walk all 30 kms with your luggage up and down the mountains! From this ‘nearest’ bus stop, my village was about a 9 kms walk. One was lucky if could complete the last leg of the journey in day-light, as there were no street lights in the mountainous stretch.

Today, in 2015, this scenario has not changed significantly, except that the frequency of buses has increased. But even today I don’t have a metaled road in my village. In case of a medical emergency, though I could call for a modern and a well-equipped ambulance, but would need to carry the patient to the road which was 9 kms from my village. Right up to 2005, every household in my village fetched drinking water from the baori (village step well) in plastic buckets over multiple trips as there was no running water available in their homes. As children we were required to make 2-3 trips a day to ensure required water levels at home for drinking and cooking. I always worried for my grandmother, as once we (my brother and I) left the village after the holidays she had to depend on someone getting her water filled. Since 2005 we have piped water, if not till the kitchen, but at least one common tap for 2-3 households. Agriculture is the mainstay for my village, and also for all the neighbouring
villages. Farming there is still subsistence and manual, which means: ploughing is still done with a pair of oxen and harvesting based on sickles. Primary reason for this is not illiteracy to use the equipment, but due to the poor roads, which constrained the agricultural support equipment like tractors, and thrashers to reach the farm.

One very interesting feature in my village was that every day at 7pm most people gathered in a particular common place, not for socialisation, but to watch a TV programme called ‘Krishi Darshan’ (farm view). This government channel one hour programme gave farming information, weather forecasts, information on seeds, cropping and other insights, which was watched religiously by most families. I only saw people watch this programme in the village, as in the city of course people were spoilt for choices of programmes to watch.

The closest primary school to our house was in the next village, which was about a 4-5 kms walk. The next school up to higher secondary was in village further past the bus stop, about 12-14 kms of walk. And the nearest college was in Shimla, 30 kms away. Since 2010, my village has had a government run health facility (called sub-centre) which is right next to the bus stop, on the outskirts of village. Still women travel to the hospital in Shimla even for their antenatal and immunisation care. With all these ‘givens’ in my village, literacy still is 100%. Even though only about 30% of the population has made it to college, but most have completed school up to higher secondary.

Since a child, these differences between my city and my village have bothered me. I failed to understand why should the situation change as much within a 100 odd km distance? If ‘development’ is the difference, then why should development be so difficult and slow in one location as compared to the other? How could these processes of development be facilitated to make processes more equitable? What mediums and technologies can support the pace of this change process? My first-hand experience with the process of living development in my village has inspired me to study and understand these processes deeply and how I could contribute? Given that I had seen people depend much on that one hour TV programme for farming insights, this made me believe in the potential of technology as a medium to facilitate this development process by strengthening capacities, and enabling individuals to make informed choices by exploring other opportunities available.

I pursued a masters’ degree in ‘development communication’ from an education media research centre in an Indian university, to try and understand this relationship between
technologies and communication and how these supports or not processes of development. My professional working life, with NGOs, working in the area of corporate social responsibility, and with newspapers and government, I have been in pursuit of finding answers to questions shaped by my childhood experiences in the city and the village – how can processes of development be facilitated? My PhD studies too have been in line with this pursuit, of how ICTs can play a role in facilitating development, specifically within the domain of health.

1.1. Thesis aims and research questions

In India, as in many developing countries, there are on-going efforts to strengthen health systems through the introduction of ICTs. Often, the focus of these efforts is on the “supply side” with more and different types of technologies and infrastructure being provided by development partners and others to governments to strengthen systems. Mathias (2013) uses the metaphor of a ‘conveyor belt’ to describe how various choices of technologies are being put on offer for developing countries to use, often ignoring concerns around the demand side, including usability issues from the perspective of users and organizational priorities.

An important issue from the perspective of users concerns the additional choices that ICTs provide (or take away) them in their everyday work. This concern raises the focus of my study on empowerment, representing individual level capacity to take control of a situation, and the role of ICTs in the strengthening or not of this capacity. This focus raises the question: how to understand the mutual relation between ICTs and empowerment within the broader context of development? The empirical basis for my analysis is provided by the public health sector broadly in the Indian and Kenyan contexts. More specifically the questions I explore are the following:

i. How is empowerment of the individual health care provider shaped within the public health system in the context of ICT4D projects?

ii. How can the relationship between empowerment and ICT interventions be strengthened?

To answer these questions, my thesis seeks to develop a framework inspired by the Capability Approach. In answering the research questions, I will expand on Kleine’s (2013) Choice
Framework which was developed in the context of telecentres in Chile, also based on the Capability Approach. Firstly, I apply the approach to the public health context which is unique. Secondly, I seek to better understand the role of ICTs in shaping health worker empowerment, which arguably has not been addressed in earlier research, including in Kleine’s Choice Framework. In this way, the thesis contributes to the development of more human-centred approaches to ICTs design and implementation, as contrasted with the dominant technology focused approaches seen in ICT4D projects. I next discuss the Capability Approach.

1.2. Theoretical Perspective: Understanding the ICT-Empowerment Relation

My theoretical perspective is informed by Amartya Sen’s Capability Approach, and its application to ICT4D by different researchers. I describe some key concepts of the Capability Approach, and then outline how I draw upon it to study the ICT-empowerment relationship.

1.2.1. The Capability Approach

Amartya Sen’s (1999) Capability Approach focuses on understanding individual level capabilities to pursue choices that they value, and the ability and conditions for them to convert their capabilities (or potential) to realized potential. Sen’s human centred approach to development places primacy on the individual, and whether or not they are able to realize the capabilities which is not just dependent on his/her valued objectives and ability to achieve those objectives, but also on what choices are available, which is conditioned by institutional and social conditions. The term “capability” in ICT4D research tends to refer to an individual’s ability to use technology within the social and institutional conditions of the setting (Zheng, 2009). In comparison, in the Capability Approach, “capability” refers to the freedom to achieve and accomplish goals. ICT is viewed as a type of commodity that is meaningful only in the ways that it enhances human capabilities. This avoids the risk of seeing ICT as intrinsically good, as if its use in itself was a valuable achievement. This view of the Capability Approach focuses on the extent to which technology expands people’s abilities to determine and realize lives that they value.
Development, for Sen, is about the expansion of freedoms. The Capability Approach is comprehensive and inter-disciplinary, and provides a broad normative framework for the evaluation and assessment of individual well-being and social arrangements, the design of policies, and proposals about change in society (Robeyns, 2005). It has in recent years been used as the conceptual basis for the calculation of the Human Development Index (HDI) by the United Nations to measure the status of development of countries.

In the next chapter, I outline the various concepts that I draw upon from the domain of Capability Approach and Information Systems research to develop my theoretical approach.

1.3. Practical Perspective

My practical perspective is shaped by my empirical engagement within the domain of public health in India and Kenya. My practical interest is in developing more human centred approaches to ICTs design and implementation, where humans are placed at the centre of new technology initiatives, which helps address the bias of dominant “technology push” approaches. In my experience of more than a decade of working in this domain, I have seen time after time, new ICT initiatives being introduced, each coming with new promises and expectations, but often the outcomes are similar – unrealized potential of the technology. Why does this happen? And why do these patterns persist? One broad pattern I see is that we (managers, designers, users) often are enamoured by new ICTs, and position them as a silver bullet to solve problems which are often institutional and human based. A practical question this raises is whether ICTs are being used to address the correct questions, and what are the new questions they raise.

My practical perspective is strongly shaped by the need for strengthening a human centred approach, which takes into account the aspirations, desires, capacities of individuals, and the utilities that ICTs provide them in their everyday work. Understanding how ICTs and supporting systems can be designed and used which promotes these individual level needs and empowers them is an important practical aim of my thesis.

1.4. Research setting

The empirical setting is based on is a longitudinal and comparative case study analysis conducted within on-going, large-scale implementations of HIS within the public health
sector in India and Kenya. My empirical experience consists of a seven-year engagement with strengthening health systems and HIS in various settings, which includes the last 4 years as a part of my formal PhD work.

My research has spanned multiple settings, technologies, and projects spanning across India and Kenya. As a part of the global HISP (Health Information Systems Programme) research and development network at the University of Oslo, I have also been able to learn from the research experiences presented by other faculty and doctoral students. This broad experience has helped me develop a wide and rich understanding of the role of ICTs in the health sector of developing countries. For purposes of my doctoral work, I have selected specific empirical cases which enable me to develop a rich comparative analysis of the relations between empowerment and ICTs. For this, I selected cases which involved different technologies, varying contexts, and projects. More specifically, the three cases studied in this research include:

1. Design, development and implementation of an open source based hospital information system (2009 – ongoing) in the state of Himachal Pradesh, India. In this case, I have studied from the perspective of the staff in the district hospitals (doctors, nurses, and health care providers), what has been their experience of the introduction of the system, and what has been their sense of empowerment or not as a result. I have specifically studied issues of participation and capacity strengthening around the introduction and use of ICTs, and how these shape empowerment.

2. Design and implementation of mobile based reporting system, and the related implementation of a Mother and Child Tracking System (MCTS) (2008-2014) within the health system in Punjab, India. My focus was on the field health workers (ANM – Auxiliary Nurse Midwife) who were the primary users of both these technologies. I have specifically focused on understanding the relation between opportunity structure and agency, with an emphasis on power relations and their implications on empowerment of ANMs.

3. Design and implementation of Hospital Information System in Machakos County, Kenya. I studied these processes from the perspective of an Indian NGO (HISP India) to which I belong, who were tasked with building the system. I specifically focus on the efforts to build a “community of practice” in Kenya based on participatory design,
what were the challenges faced, approaches to overcome them, and the role of ICTs – both as an object of study, and also as a mediator in processes of participation and capacity strengthening. This project started in 2012 and is ongoing.

In this way, the three cases provided the possibilities of analysing different ICT – empowerment relationships, in multiple settings and projects involving different technologies. Empirically, I have played dual roles of “PhD Researcher” and “Project Coordinator”. As PhD researcher, in the case studies I have tried to understand empowerment, while as Project Coordinator in an Indian NGO (HISP India), I have been engaged in operational aspects of HIS project design and implementation. While the role of project coordinator helped me to gain intimate and rich access in the case studies, practically, I needed to struggle between the demands of action (conducting the project) and research (reading theory, writing papers and this Kappa). In hindsight, often the demands of action won over research. Writing this kappa is an attempt to strengthen this balance between action and research.

1.5. Research Approach

The five key elements underpinning my research approach is discussed;

1.5.1 Philosophical underpinning of Interpretivism

My research focuses on understanding “empowerment” within an ICT4D context. Since empowerment is understood differently by varying groups of people with underlying meanings of power, I believed an interpretive approach would be appropriate to help develop multiple interpretations of the truth, rather than a “single truth” I saw the strength of the interpretive research perspective in offering the space to understand these multiple viewpoints without locking me to a singular view. This multiplicity of perspectives was especially important for me, as empowerment is a subjective concept that needs to be understood through different perspectives. These multiplicities give rise to varying and value-laden perspectives on empowerment, which an interpretivist approach allows me to develop.

1.5.2 Research strategy of action research

My research has been conducted within the framework of the HISP research programme, which has pioneered the action research approach of “networks of action” (Braa et al 2004). This approach works on the principle that we learn better in collectives (termed as networks) than is isolated settings, and action research is about creating these collectives and enabling
the sharing of experiences, ideas, artefacts and resources across this network. Specific actions identified by the authors included the sharing of open source software, resource materials (such as training manuals) and implementation experiences across the network. In my work, I have had the task of trying to enable and strengthen networks within health facilities (across departments in a hospital) and also across hospitals in a state. Specific actions included capacity building, participatory design and building standards around health data.

The action research approach adopted subscribes to the view that social change is complex and multidimensional, making it very difficult to analyse cause and effect (Wood-Harper 1985). The value of action research lies in providing mechanisms for understanding social processes while attempting to change them. Action research requires researchers to be reflective and iterative (Baskerville and Wood-Harper 1998), while collaboratively participating in the change processes in an organization (Baskerville 1999). Engaging in such a process of action and reflection has been the basis of my work to both practically improve the value of ICTs, and to develop new knowledge of the empowerment-ICT relationship.

My action research efforts were rooted in two fundamental bases. The first concerns my affiliation as a PhD student in the Department of Informatics, University of Oslo. My other base was at HISP India, the Indian NGO, which was working on various ICT based HIS projects, some of which I have selected for my thesis. HISP India had formal agreements with the states to conduct different interventions, such as Memorandum of Understanding (MoU) and Non-Disclosure Agreements, which defined the client-infrastructure framework. My PhD work involved merging the two bases of research and action, which was indeed a big struggle. While I have not followed the traditional cycles of diagnosis, action, learning and revision, these processes have been simultaneous and ongoing. The MoUs helped me to collaboratively with the client define the problem to be addressed, a fundamental requirement of action research. There were milestones defined in the project, which were sites of collaborative review and identifying and taking corrective action. These were points of reflection and conceptual development expressed through different research papers written for my thesis.

**1.5.3 Comparative case study analysis**

A case study allows the in-depth examination of a phenomenon within a situated context. I have followed a comparative case study strategy to study the phenomenon of empowerment in three specific case contexts. The intra and inter case analysis allowed to compare and contrast
the processes of empowerment and how they may be shaped. In each case, the unit of analysis has been the individual health care provider (health worker or medical doctor), and the opportunity structures that shape their agency. The cases have involved different technologies, project settings, varying individual capacities, all of which shape processes of empowerment.

1.5.4 Longitudinal design of research over a 4 year period

I have been part of each the three cases right from inception, and have engaged in each project in terms of its conceptualisation, building the proposal, understanding system requirements, system design, capacity strengthening, institutionalisation, feedback, trouble shooting, implementation support, and much more. In both the Indian case studies, I have regularly visited the implementation sites (at least once a month), while in the Kenya case, due to the distance and costs involved, I have had only four visits over two years. These multiple visits where I repeatedly met some of the same actors helped me to understand their expectations, and how these have evolved, providing rich insights to my research focus.

1.5.5 Multi-level engagement

While my research spanned multiple levels of the global, national, state, district, sub-district, and facility, my focus in studying empowerment has been on the individual level health care provider. I have engaged with global developers, Ministries of Health, national level teams, state administrators, county teams, district administrators, hospital administrators, sub-districts and hospital staff (including medical officers, health supervisors, health workers), state IT and training officers. However, I must admit that my interactions have been limited with patients and citizens and end users of health services.

1.6. Positioning the research

Overall, my research is positioned within the broad HISP action research approach of solving practical problems relating to HIS in context, and through this engagement developing new and relevant knowledge which are expressed through research papers and the PhD thesis. The point of departure of my research as compared to others in this genre is my focus on empowerment, not explicitly studied till date, especially in the context of public health systems. My perspective as a social scientist and development theorist provides an alternative view as contrasted to a technology focused analysis which dominates. The application of
Sen’s Capability Approach to my analysis, represents one of the first direct uses of this theory within the domain of public health in developing countries, where the role of ICTs is explicitly theorized.

1.7. Expected contributions

My thesis seeks to make theoretical and practical contributions as outlined below.

1.7.1. Theoretical

i. Developing a framework to understand the relation between ICTs and empowerment, within the broader context of ICT4D.

ii. Through the framework, analysing the interaction between agency and opportunity structure, and its implications on empowerment.

1.7.2. Practical

i. Contribute to the design, development and implementation of open source HIS applications based on human centred approaches.

ii. Strengthen capacities of the health systems to absorb ICT interventions more effectively, supporting individual and institutional level work.

iii. Formulate capacity building efforts that help individuals to pursue aspirations they value.

iv. Develop participatory approaches to HIS design, which allows for users to more actively own and evolve the systems.

1.8. Structure of thesis

This thesis consists of the following chapters:

Chapter 1: Introduction – where I have sketched out the overall contours of my research, including motivations, the research problem, theoretical perspective, and the empirical approach followed.

Chapter 2: Relevant literature and theoretical perspective – here I identify the different key theoretical concepts that underlie my thesis, discuss relevant literature around it, and
based on this formulate a theoretical perspective which can help to answer the research questions posed in my thesis.

Chapter 3: Research context – here I outline the context of my research which is relevant to the understanding of empowerment in a public health context. Here, I discuss the overall situation of the health system surrounding my case studies, the existing institutional structures, and some prior experiences with ICT projects.

Chapter 4: Empirical approach – here I provide details of my empirical approach including research design, my role in the research, data collection and data analysis.

Chapter 5: Overview of cases studies– here I provide broad details of the three case studies I have studied, which allows the readers to place my analysis into better context.

Chapter 6: Summary of research findings – here I summarize key findings from each of the research papers I have included in my Kappa, and how these findings help to answer the broader research questions posed in my thesis.

Chapter 7: Analysis and discussions – here I develop the overall theoretical and practical contributions emerging from my thesis, and relate it to existing literature.

Chapter 8: Conclusions – here I present overall conclusions, including some future directions and research limitations.
Chapter 2

Positioning of study: Relevant literature and theoretical perspective

This chapter focuses on positioning of my work within relevant literature, which in my case spans research studies on information systems, with a particular focus on ICT4D and HIS, and social sciences specifically covering the domain of the Capability Approach. I draw together relevant learnings from these research streams to develop a perspective to analyse the empowerment-technology relationship.

I start this chapter with a discussion on development and public health which helps to put my work in context. I next discuss empowerment, which is a normative development aim. Next, I review the literature on ICTs and development, which provides the empirical focus of my case studies. I then attempt to synthesize relevant literature to articulate an initial conceptual framework to help guide my empirical analysis. I return to this framework in Chapter 7, when I flesh it out drawing from the findings from my empirical analysis.

2.1. The development and health context

This thesis is firmly situated within the context of development. Health is fundamental to development, and strengthening of HIS is an explicit objective of enhancing the coverage, quality and decision making in health systems with implications on broader development processes. Development has multiple perspectives and meanings associated with it, and I outline the perspective to development that I draw upon for my thesis.

Peet and Hartwick (2009) who make a broad overview of various perspectives on development, describe development in general terms as making a better life for everyone. Peet and Hartwick do not offer a particular theory of development like Sen’s Capability Approach, but instead go on to outlined certain general characteristics of development. After a brief overview of some of the general characteristics, in the next section I discuss Sen’s Capability Approach which provides the theoretical basis of my thesis.

The world in which we live in grossly unequal, so naturally what “better” means will vary with people and geographies. This unevenness is especially true in the context of public health, while for many of the poor, basic services such as for child birth and immunization are not
easily accessible, while the rich are engaged in accessing high cost medical tourism services, delivered in five-star like hospitals. These inequalities exist within and across countries. Today, more than 150 million households have slipped into poverty traps due to catastrophic health expenditures, putting them to risk in accessing basic health care. This has led to the increased focus of global agencies and national governments on establishing Universal Health Coverage (UHC). UHC implies ensuring financial risk protection to all in accessing quality and effective health care services, for which robust HIS is a strong prerequisite. Meeting basic health needs would mean sufficient food to maintain good health, a safe and healthy place to live, and being treated with dignity and respect.

Beyond meeting basic needs, development is subject to meeting material and cultural visions of different societies. The needs, visions, and aspirations of those living in developing countries are naturally different from those in rich countries. For the rich, the vision of basic needs could be of having a healthy and green environment to live in, eating organic food, having regular holidays to exotic places, maintaining work-life balance and so on. For the poor from developing countries, basic needs are around receiving subsistence food, a place to stay, clothes, good health and opportunities for everyday livelihood. Policy responses to achieving these needs vary with contexts with implications on the kinds of ICT initiatives that are deployed. For example, where in the rich countries the focus is on the individual patient requiring electronic medical record (EMR) systems, in developing countries, in contrast, the focus is on population health based on aggregate HIS to monitor quality, equity and coverage of services. As the rich in developing countries get richer, they aspire for the ideals of the West, bringing forth a convergence of technologies – such as deploying patient record systems in public sector hospitals in developing countries – often leading to poor use of significant resources with not so optimal impacts on improving population health.

Development implying a better life for all, has a strong emotive appeal, and may not be subject to huge disagreements. Development also represents a founding belief of modernity, where it is assumed that rationality and technology will change the world for the better. Peet and Hartwick (2009) write:

In development, all the modern advances in science and technology, in democracy and social organization, fuse into the single humanitarian project of deliberately and cooperatively producing a better world for all (pages 2-3).
Development also carries with it a neo-liberal ideology of freedom and rationality, which may often mask the potential adverse impacts of politics and conflict around the agendas of development itself. This neo-liberal ideology may only force us to see the positive values associated with development, which may lose focus on the underlying motives of the different actors involved, such as of furthering business motives in the name of development.

The impact of such ideological and modernity underpinnings is especially visible in the contexts of ICTs and developing countries. Every so often, a new technology, such as the smartphone or the tablet, is presented as a silver bullet for solving existing public health problems, and is adopted up by governments. Technologies, when not designed and implemented based on context specific approaches, can create more problems than solutions.

Historically, development has been associated with economic growth, a trend which has come to be challenged in recent years, notably through the writings of Sen. Economic growth means achieving a more massive economy, producing more goods and services, and developing larger income levels. However, economic growth can be achieved without touching development problems of inequality and poverty since benefits may accrue most often to those not experiencing development challenges. It was for long assumed that economic growth will be accompanied with trickle down effects, where the benefits will slowly start to flow down from the rich to the less rich. Failure of this theory and these assumptions which underlie projects of the World Bank and IMF over many decades (Puri 2003), have led to various critiques, and today development carries quite different and expanded notions than of classical economic growth. One important critique comes from the Nobel Prize winning economist Amartya Sen. His ideas provide the basis for my formulation of a perspective to understand development, empowerment and the role of ICTs in public health. In the next section, I discuss some of these ideas relevant to my research.

2.2. Sen’s Capability Approach, and its relevance for my work

The focus of Sen’s Capability Approach is on the expansion of people’s freedoms, and development then is about removing “unfreedoms”, and providing enhanced possibilities for individuals to pursue choices that they value (Sen, 2001). The Capability Approach has also led to a new and highly interdisciplinary literature in the social sciences resulting in the formulation of a new policy paradigm based on the so-
called ‘human development approach’. I outline key concepts from Sen that are relevant to my thesis.

2.2.1. The Capability Approach

Sen defines development as a process of expanding the freedoms that people enjoy, which depends on other determinants e.g. social and economic arrangements (e.g. education and health facilities), political and civil rights. He further argues that development requires the removing of major sources of unfreedom: poverty, tyranny, poor economic opportunities, social deprivation, neglect of public facilities (schools and health) and social intolerance.

Sen positions the Capability Approach as a response to other more limiting development views of the utilitarian, welfare and income or resource based approaches, which exclude non-utility information from the evaluation space (Sen, 1979). The Capability Approach focuses on actual achievements and people’s needs and functionings (Alkire, 2002; Madon, 2000). That is not to say that Sen sees resources and utilities as being unimportant. Rather, a person’s well-being should be judged by their ability to choose between opportunities, given the social and institutional conditions they face, to be able to live a life that they value.

Although the Capability Approach is deliberately vague (Sen, 1992) and contains ambiguities and unclear boundaries (Gasper, 2007) without clear prescriptions, it has prompted important debates on issues such as measurement of inequality, capital, and savings, and the role of non-market institutions (Corbridge, 2002). Rather than providing a directly applicable and prescriptive tool kit, the essential value of the Capability Approach lies in its usefulness as a “mode of thinking” about development (Robeyns, 2005). The Capability Approach represents a flexible and multi-purpose framework, rather than a precise theory (Sen 1992), making a clear analytical distinction between the means and ends of well-being and development.

Sen identified five instrumental freedoms that help advance the general capabilities of an individual: i) political freedoms, ii) economic facilities, iii) social opportunities, iv) transparency guarantees, and, v) protective security. All are in different ways applicable to the understanding of ICT4D. Only the ends have intrinsic importance, whereas means are instrumental to reach the goals of development. However, both in reality and in Sen’s more applied work, these distinctions often blur. The importance lies especially at the analytical level – we always have to ask and be aware what kind of value things have, whether value is instrumental or intrinsic, and its associated importance (Robeyns, 2003).
2.2.2. Core Concepts: Functionings and Capabilities

What are then, according to the Capability Approach, the ends of well-being and development? These are in terms of people’s capabilities to function, that is, on their effective opportunities to undertake the actions and activities that they want to engage in to be whom they want to be (Robeyns, 2005). Core to understanding the means and ends of development, are concepts of capabilities and functionings. Functionings include working, resting, being literate, being healthy, being part of a community, being respected, and so forth. Functionings are the “beings and doings” of a person (Sen 1992). While travelling is a functioning, the opportunity to travel is the corresponding capability. This distinction is between the realized and effectively possible, between achievements, on the one hand, and freedoms or opportunities, on the other (Robeyns, 2011).

A functioning is an achievement, whereas a capability is the ability to achieve. Functionings are, in a sense, more directly related to living conditions, since they are different aspects of living conditions. Capabilities, in contrast, are notions of freedom, in the positive sense: what real opportunities you have regarding the life you may lead (Sen 1987: 36).

For Sen, what is ultimately important is that people have the freedoms (capabilities) to lead the kind of lives they want to, to do what they want and be the person they want to be. Once they effectively have these freedoms, they can choose to act on them in line with their own ideas they value. Taking an example from my fieldwork, a health worker who has been given a mobile phone by the public health department for purpose of sending reports, has now the capability of sending the reports on time without having to travel long distances and consequently be able to spend more time with her family which she values. However to convert this capability into functioning, she needs the capacity to use the phone, adequate airtime and charging stations, so while the mobile phone creates the potential or capability other conditions are required to actualise that into an achievement or functioning.

The Capability Approach helps evaluate policies that impact people’s capabilities, such as their access to health, clean water, and protection from infections and diseases. It can help ask whether people are well-nourished, and whether the conditions for this capability, such as sufficient food supplies and food entitlements, are met. For some of these capabilities, the main inputs are financial resources and economic production, but for others it can also be
political and social practices, such as the effective guaranteeing and protection of freedom of thought, religion or political participation. The Capability Approach thus covers the full terrain of human wellbeing to develop a more holistic perspective to development, emphasizing the links between material, mental, spiritual and cultural dimensions of life. While ICTs can help shape these links, both positively or not, they have been largely absent from Sen’s writings.

2.2.3. Human agency and role of conversion factors

Sen defines agency as “what a person is free to do and achieve in pursuit of whatever goals or values he or she regards as important” (Sen 1992), implying agency is intrinsically valued, and directly conducive to well-being. While capability refers to potential, human agency concerns the will and ability of the individual to realize the potential. Kleine (2011) defines agency as the capacity of the individual to make meaningful choices.

Crocker and Robeyns (2010) drawing upon Sen’s different discussions of agency put forth their summarized view of the same:

A person (or group) is an agent with respect to action X, to the extent that the following four conditions hold: (i) self-determination: the person decides for himself or herself rather than someone or something else making the decision to do X; (ii) reason orientation and deliberation: the person bases his or her decisions on reasons, such as the pursuit of goals; (iii) action: the person performs or has a role in performing X; and (iv) impact on the world: the person thereby brings about (or contributes to bringing about) change in the world.

The above summary of agency builds on Sen’s fundamental focus on the individual and the manner in which they are able to exercise their agency to convert their capabilities into functionings. To achieve either wellbeing or non-well-being goals and to have the freedom of will and action to do so is to realize agency freedom. This represents the capacity of the individual to decide and act on the basis of what he or she values and has reason to value, whether or not that action is personally advantageous. A person’s agency freedom is the freedom to so decide and the power to act and be effective.
To the above discussion on agency, Robertson (2015) adds the notion of critical agency representing the ability of disadvantaged people to better self-determine their own development. This involves both their critical analysis of the root causes of the disadvantage that they experience, as well as their agency to act on those structures to transform their situation. Robertson studies the role of this critical agency in the context of a community of disadvantaged Zambian women in a male dominated society. Robertson studies the articulation of critical agency and the use of participatory video to enhance it, drawing on the Capability Approach and critical feminist pedagogy.

This focus of the Capability Approach on the individual allows for diversity (Zheng, 2009), by emphasizing their varying abilities to realize functionings in different contexts, which are best understood through qualitative methods. As an example, if we only measure the use of mobile phones quantitatively (such as access), without including individual variations, we can be satisfied by showing universal access to the phone. A health worker’s ability to utilize that phone will however, differ. For example, an elderly health worker may not be able to use it to the same extent as a younger person. Likewise, a health worker posted at a facility with a disrupted network connection will be similarly constrained. Thus, increases in an individual’s well-being resulting from being able to use a mobile phone will vary, including being able to utilize a potential functioning. We must therefore look at both the capabilities made available to people and their opportunities to utilize them, given their specific context. The two are interrelated and in the analysis we cannot exclude one in favour of the other. Agency understood in relation to a context tends to be situated or restricted, and has to be understood as such.

Another important idea in the Capability Approach is that of conversion factors (Sen 1992). Resources, such as marketable goods and services have certain characteristics that make them of interest to people, as illustrated by the bicycle example discussed earlier (Robeyns, 2011). The relation between a good or a resource and the achievement of certain things with it represents a ‘conversion factor’: the degree to which a person can transform a resource into a functioning. Within the Capability Approach, there are three groups of conversion factors. **Personal conversion factors** include individual characteristics, such as gender, literacy and disabilities. For eg: If a person is disabled, is in bad physical condition, he is limited in
achieving certain functionings. **Social conversion factors** include norms, policies, rules and regulations but also cultural issues, such as educational structures and gender roles. **Environmental conversion factors** include geographical location and climate, as well as the availability of resources and infrastructure. For example, how much a bicycle contributes to a person's mobility depends on their physical condition (personal conversion factor), the social norms, for example whether women are socially allowed to ride a bicycle (social conversion factor), and the availability of decent roads or bike paths (environmental conversion factors) to enable the effective use of the bike (Robeyns, 2011). Conversion factors influence both the enablement of a potential functioning and the ability of people to utilize that potential.

For example, field nurses may tend to value their contributions lower than that of doctors, due to various factors including disparities in education, social perceptions, and the gendering of work. Such a tendency is further compounded by their already low bargaining power in the health system, thus resulting in their resignation to fate (Sen, 1990a). Sen (2006) expresses concern with deprivation of such freedom as they result in weak social conversion factors. In this way, the Capability Approach has an implicit concern with power relationships, not dissimilar to Foucault’s (1977, 1980) argument that inequalities and power relationships operate not solely through direct forms of repression but often through less visible strategies of normalization.

A person’s actual freedom is represented by having different choices and his or her ability to choose between different combinations of capabilities (Sen, 1990). Madon (2004) views individuals not as passive recipients of development but rather as active agents of change. When individuals are provided with opportunities they have the power to shape their own lives and help each other to fulfil their lives (Sen, 1999). An analysis based on the freedom perspective, emphasizes both the capabilities made available to people and their opportunity to utilize them, given their specific contexts. In information systems research, discussions on agency are associated with notions of technology or social determinism, or of the symmetry of agency between the two (Latour, 2005).

**2.2.4. Capability approach as an evaluative framework**

The Capability Approach makes a key analytical distinction between the means and the ends of well-being and development (Robeyns, 2003). It proposes a different “evaluative space” (Sen, 1993, p. 33), recognizing the plurality of functionings and capabilities, as opposed to
income, utility, and other traditional approaches to study development. From this perspective, poverty should be seen as “the deprivation of basic capabilities rather than merely as lowness of incomes” (Sen, 1999, p. 87), which is only of instrumental importance. Important is what obstructs people from obtaining freedoms (Hatakka 2013), emphasizing the context of the individuals which shapes their power to act:

The Capability Approach not only advocates an evaluation of people’s capability sets, but insist also that we need to scrutinize the context in which economic production and social interactions take place, and whether the circumstances in which people choose from their opportunity sets are enabling and just. (Robeyns, 2005a, p.99)

Gigler (2004). Access to technology is not an end in itself, but how the individual is able to use it for something h/she values. Technology in itself is not an outcome. This view of outcomes brings to critique views of technology development approaches based on supply side indicators such as the coverage of mobile phones and internet connections. In ICT4D, Macueve (2008) used the Capability Approach based on a UNDP framework to analyse the development outcomes of three e-governance initiatives in Mozambique. She concluded that these projects started with developmental objectives, but in practice they only supported achieving efficiency gains. Seen only in monetary terms, these projects may be a success, but from a development perspective, which focuses on the plurality of functionings and capabilities as the evaluative space, the results of the evaluation of the outcome was quite different.

The Capability Approach is not a theory that can explain poverty, inequality or well-being; instead, it rather provides a perspective and framework within which to conceptualize and evaluate these phenomena. Its application to issues of technology in development will require the use of complementary explanatory theories and concepts, such as in my case relating to empowerment and technology studies. Before discussing them, I discuss some criticisms of the Capability Approach, and how I have tried to address them.

2.2.5. Some Criticisms of the Capability Approach

There are various critiques of the Capability Approach, coming from the view that it promotes a neo-liberal ideology, with a “feel good” focus given its emphasis on freedom. It has also been criticized for being abstract and lacking a degree of operationalization (Alkire, 2002;
Comim et al, 2008), as it primarily outlines what is important to evaluate, but does not guide to additional theories required for conducting the analysis (Robeyns, 2003). However, Sen never meant for the Capability Approach to be a complete framework, which could be directly applied to analyse empirical data, and it would always need to be complemented with other relevant theories (Sen, 1999, Zheng 2009). In my thesis, the complementary theories drawn upon relate to ICT4D and empowerment.

Another common criticism is that the Capability Approach is ‘underspecified’. Nussbaum, (2003) has argued that it is necessary to define which capabilities to focus on during the analysis, arguing the need for a well-defined but general and universalistic list of ‘central human capabilities, which governments should endorse and pursue (Robeyns, 2003). For Sen, these capabilities should never be a priori determined from “above” but should be articulated by those whose freedom is at stake.

Another area of critique concerns the approach being too individualistic (Gore, 1997; Deneulin and Stewart, 2002) and downplays macro social and power structures, treating the individual outside their social environment (Robeyns, 2005). In defence, Sen explicitly takes into account social environment, societal structures, and culture, first by the distinction between functionings and capability, and second by recognizing the conversion factors from resources to functionings (Robeyns, 2005). Sen refers to unfreedoms which reflects different constraints individuals face in pursuing the choices they value.

In this thesis, I have tried to address its critiques of lack of operationalization and specificity in two ways. Firstly, I have used the theory as a sensitizing device to develop a perspective to understand the ICT4D and empowerment relationship. Secondly, I have drawn upon other concepts such as empowerment and technology, to provide more specificity to my analysis.

A central notion of analysis concerns empowerment, which I discuss next.

2.3. Understanding Empowerment

I start with discussing different concepts of empowerment presented by researchers, and then relate it in the following two sections to power and choice and participation respectively.
2.3.1. Concepts of Empowerment

‘Empowerment’ is a widely contested notion, defined by various authors, for example as the expansion of agency (Ibrahim & Alkire, 2007), or as a process of enhancing human capacity to make effective choices, and enhance outcomes (Alsop et al 2006). Empowerment is a multidimensional, culturally grounded and a relational concept (Samman et al 2009), and its meaning will vary with contexts. Power relations are inherent in shaping empowerment, as enhancing the ability to make a ‘choice’, implies that this ability was previously denied and will involve changing existing power dynamics.

Despite the centrality of the term ‘empowerment’ to contemporary political and theoretical debates (Perkins et al., 1996), it is often defined only vaguely or by implication, in contrast with ‘disempowerment’ which is generally seen to have a more accepted definition (Lyons et al., 2001). A more generic view of empowerment is as ‘any process by which people’s control (individual or collective) over their lives is increased’ (Somerville, 1998, p. 233).

Empowerment is related to terms such as agency, autonomy, self-direction, self-determination, liberation, participation, mobilization and self-confidence. It is much debated, and ascribed a wide variety of definitions and meanings in various socio-economic contexts (Ibrahim & Alkire, 2007). The Dictionary of Social Work focuses on empowerment as a means to the realisation of rights (Barker, 1991), while the World Bank’s (1999) emphasis is not on empowerment as a facilitator of rights in general, but as a realisation of rights to enable greater control over livelihood resources. Another Bank report sees empowerment as the process of “enhancing the capacity of poor people to influence the state institutions that affect their lives, by strengthening their participation in political processes and local decision-making. And it means removing the barriers—political, legal and social—that work against particular groups and building the assets of poor people to enable them to engage effectively in markets” (World Bank, 2001, p. 39). It follows that ‘empowerment’ relates to power relations and is rarely neutral (Lyons et al., 2001). Lyons (2011) adds that the ultimate target is independence of the community from external agents in defining their agenda.

Alsop and Heinsohn (2005) define empowerment as a person’s capacity to make effective choices, and transform these choices into desired actions and outcomes. Robert Chambers (1993) describes empowerment as a process that gave the poor more control over their lives. The Norwegian Agency for Development Cooperation (1999) sees empowerment as
increasing the opportunities for men and women to control their lives, giving them the power to make decisions, have their voices heard, to define agendas, negotiate, and find ‘the power within themselves to challenge past customs. Clearly, a process of empowerment is incomplete unless it attends to people’s abilities to act, the institutional structure, and the various non-institutional changes required to enhance agency (Ibrahim and Alkire 2007). To cite an example, a school graduate from a rural area may have the skills and willingness to work in an entry-level job (agency), but there may be no opportunity for her because such work is not considered appropriate for young women (opportunity structure). Agency and opportunity structure are thus interdependent, shaping empowerment as a complex and dynamic process.

Discussions on empowerment originated in work on gender relations and community participation (Moser 1991), and has increasingly been discussed in development studies (Friedmann 1992, Craig and Mayo 1995). A key focus is on power, how it shapes agency and the manner in which it is contested. Moser (1991) understands power as people’s access to and control over material and non-material resources that will enable them to make life choices. Malhotra et al. (2002) see empowerment as enhancing assets and capabilities of diverse individuals and groups to engage, influence and hold accountable the institutions that affect them.

While Oxaal and Baden (1997) stress that empowerment cannot be defined in terms of specific activities or end results because it involves a process whereby women can freely analyse, develop and voice their needs and interests, without them being pre-defined, or imposed from above. Strandburg (2001) argues that empowerment refers to all those processes where women take control and ownership of their lives, enabling an array of opportunities to choose from. While human development entails enlarging choices, empowerment is the process of acquiring the ability to choose among these enlarged choices (Bartlett, 2004, p. 59). Samman et al (2009) see empowerment as a multidimensional, culturally grounded and a relational concept. Kabeer (2009) emphasizes the power dimension arguing that empowerment refers to the process by which an individual gains the ability to make choices in a context where this ability was previously denied to them.

Degrees of empowerment are measured by the existence of choice, the use of choice, and the achievement of choice with respect to outcomes such as development. Empowerment is
shaped by the interaction between opportunity structure and agency. For example, Kabeer (2009) emphasizes the role of power in constraining or enabling the expansion of agency, and thus shaping empowerment. The process of exercising power involves bargaining and negotiation as well as resistance and manipulation, which may have spill over effects on agency in different domains other than that originally intended.

Samman et al (2009) argues that empowerment is ‘relational’ which does not occur in vacuum. This also means that certain groups are empowered or disempowered in relation to others with whom they interact. This process of ‘increasing-power’ is conceived as the result of the interaction between agency and opportunity structure. Opportunity structure is what enables (or not) agents to become effective, thus representing conditions that allows people to translate their asset base into effective agency (Alsop, Bertelsen and Holland 2006). Ibrahim and Alkire (2007) see expansion of both types of freedoms – processes and opportunities – as the objective of development, just as growth is the increase in GDP per capita.

2.3.2. Empowerment in relation to Power and Choice

Ibrahim and Alkire (2007) in a review of different interpretations of empowerment, argue all have an underlying concept of gaining power in some way, that is dependent on agency and opportunity structure. Kabeer (2008) sees empowerment as being fundamentally about power – about the power of people to redefine possibilities and to act on them, and providing them the courage to do things they never thought themselves to be capable of. She further adds that one way of thinking about power is in terms of the ability to make choices: to be disempowered, therefore, implies to be denied choice (Kabeer 2009). Empowerment is thus inescapably bound up with the condition of disempowerment, referring to the processes by which those who have been denied the ability to make choices acquire such ability, implying a process of change. People who exercise a great deal of choice may not be necessarily empowered because they were never disempowered in the first place. ‘Increasing-power’ and ‘gaining choice’ is the result of the interaction between agency and opportunity structure. Power can thus both enable social change and also sustain the status quo (Kabeer 2008). Rather than as a resource that can be possessed, acquired or lost, power is part of all social relationships and institutions, shaping the limits of what are possible for people to do or envisage themselves doing. Power is thus as much a positive force that enables people to bring about changes in their own and others’ circumstances as a negative constraint to freedom. Structural inequalities mean that some people and social groups are less able to
shape their futures than others. Kabeer adds that power is tied up with the notion of choice, implying the possibilities of alternatives, and the ability to have chosen otherwise. Further, she see argues that people themselves must be significant actors in the process of change, including making decisions, resisting, bargaining, negotiation, and reflection of the ‘power within’.

Kabeer (2009) points to both negative and positive meanings of power with respect to empowerment. In the positive sense of ‘power to’, referring to people’s capacity to define their own life choices. And in a more negative sense of ‘power over’, refers to the capacity of an individual or a group to override agency of others. Power can also operate in absence of any agency, for instance norms and rules governing social behaviour. Power relations are expressed not only through the exercise of agency and choice, but also through the kinds of choices people make. Power is controversial, because it allows for the possibility of dominance to operate through consent and complicity as well as through coercion and conflict.

Rowlands (1997) adds to Kabeer with the concept of ‘power with’ (acting in a group) and ‘power from within’ (enhancing self-respect and self-acceptance). Rowland adds that the poor are usually empowered in group settings. Groups are rarely homogenous, and are often characterized by unequal power relations, which can lead to both empowerment or disempowerment. Power from within refers to having control and choice, empowerment also involves the ability to change, and enhancing one’s own self-acceptance and ability to contribute to this change, and be an effective agent. Ibrahim & Alkire (2007) add that empowerment is about “the extent to which some categories of people are able to control their own destinies, even when their interests are opposed by those of the other people with whom they interact”.

2.3.3. Empowerment in relation to participation

Enhancing participation of users in systems design and development processes has for long been a research and practical endeavour in IS research. A different paradigm sees empowerment as the true end of participation (Friedmann, 1996; Rakodi, 1991). While a strong link has been argued for between participation and empowerment (Perkins et al., 1996, Atkinson, 1999), the directionality of this relationship remains unanswered. Empowerment is not only upon the person’s freedom to act, but upon the concrete material, social and institutional preconditions required for an individual to participate (Lyons et al., 2001).
The World Development Report 2000/2001 views empowerment as the process of enhancing the capacity of poor people to influence the state institutions that affect their lives, by strengthening their participation in political processes and local decision-making. Narayan (2005) defines empowerment as the expansion of assets and capabilities of people to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives.

Ibrahim & Alkire (2007) also emphasize different intervening processes that generate an increase in empowerment, such as democratization and participation. The UNDP’s Human Development Report (1995) argues that empowered people need to participate fully in decisions and processes that shape their lives. Empowerment in the political domain is often related to democratization and political participation, as well as the strengthening of marginalized social groups to participate in national and local politics.

Processes of capacity strengthening are an important ingredient to enhance the participation of individuals in an ICT4D project (Braa and Sahay 2012). With limited capacity, individuals are constrained to participate, and enhanced capacity supports participation. The relation also goes the other way, with participation in projects helping to enhance capacity. Drèze and Sen (2002) argue that people engage in learning and education for several reasons, and Robyen (2006) discusses intrinsic and instrumental roles. Intrinsic learning is when a person values knowing something simply for the sake of knowledge, say learning different languages or poetry. In contrast, instrumental roles are economic or non-economic taking place at personal and collective levels. Drawing from this, in ICT4D projects, capacity strengthening can have two broad differences in terms of reasons. The first concerns learning ICT skills to enhance instrumental roles, such as doing one's everyday job better. Dreze and Sen refer to this as building human capital. The second reason is capacity strengthening for the sake of learning and knowledge, for example someone learning computers to be able to surf the internet and learn about other cultures. This form of capacity strengthening, is oriented towards building human capabilities.

Power is intrinsic to the conceptualization of empowerment, with a person becoming empowered implies that he/she was disempowered to begin with, and gains power in doing so. Empowerment is also shaped by participation, providing the space for people to negotiate with, influence and control those institutions that affect their lives. Empowerment is shaped,
enabled and constrained, by the existing opportunity structure that provides the preconditions for exercising effective agency.

Summarizing, my conceptualization of empowerment is the expansion of capability. This expansion also reflects the increased choices available to the individual, and their ability to materialize these choices to achieve functionings within the social context that one is situated in. Of interest in this thesis is how ICTs can become meaningful available choices for individuals, and how that is drawn upon by individuals to achieve desired functionings. This together with an analysis of the enabling and constraining conditions in this process helps me to understand the ICT-empowerment relationship.

In the next section, I focus on understanding technology.

2.4. ICTs and ICT4D

In this section, I develop my conceptualisation of technology within the ICT4D context. I start by discussing how technology is conceptualized in IS literature and then within the development context. Next, I discuss issues of determinism and the developmental impacts of ICTs. Finally, I present my conceptualisation of technology informed by the Capability Approach. .

2.4.1. ICTs in IS literature

My thesis has postulated ICTs as a central actor in the development space, introduced with the promise of catalysing health and development outcomes, in my case, with respect to empowerment.

I take as my point of discussion, Monteiro and Hanseth’s (1995) paper “on being specific about the technology,” and the subsequent well cited paper by Orlikowski and Iacono (2001) “Desperately seeking the “IT” in IT Research – A call to theorizing the IT Artifact” where the authors map out the different theoretical approaches to understanding IT. Orlikowski and Iacono argue that IS researchers focus primarily on the context, things surrounding the technology, which itself becomes invisible. Alternatively, ICTs are seen as independent or dependent variables, with limited explicit focus on the technology. Based on a meta-review of IS research, the authors identified five broad conceptualizations of technology.
The first was a tool view which saw the ICT as an engineered artefact, expected to do what its designers intend it to do. Technology is seen in terms of largely technical matters, such as specifiable information processing capabilities. ICTs becomes an independent variable bringing about changes in terms of labour substitution, enhancing productivity, information processing, and for changing social relations.

The second was the proxy view where the ICT is seen to stand for some essential aspect. The authors identified three sets of proxy logics. The first was on understandings of ICT use, such as the “ease of use”. The second concerns the diffusion logic relating to the ability of the ICT to penetrate and spread within firms, industries, economies and societies. The third proxy logic is constituted by monetary measures of ICTs, and the value it brings to the firm or the economy.

The third categorization is the ensemble view, where the ICT is seen as only one element in a “package,” which also includes other socio-technical elements. Kling and Scacchi (1982) had earlier developed this “web of computing,” and Latour (1999) made the statement that “airplanes don’t fly, airlines do,” both emphasizing that technology is only one element in a broader socio-technical network representing the ensemble view.

The fourth categorization concerns the computational view, which concerns the abilities of the ICT to represent, manipulate, store, retrieve, and transmit information, thereby supporting, processing, modelling, or simulating aspects of the world. There are two broad forms of computational views, the first concerns the development of algorithms and the production of running code, while the second involves the development and use of computational capabilities to create simulation and decision-making models.

The fifth and final category is called the nominal view which represents ICTs “in name only, but not in fact.” Under this view, the terms “information technology,” “information system,” or “computer” are used, but this usage is only incidental or as background information, while the analytical emphasis is elsewhere, such as related to politics, leadership or social impacts.

In this thesis, I adopt an ensemble view where technology is seen as part of a broader socio-technical and heterogeneous network including development agendas and interests, countries priorities of development, the domain in my case of public health systems, and various others. Given this ensemble view, an interesting question is how ICTs are implicated in development, which I next discuss.
2.4.2. Do ICTs cause development? Questions of determinism:

Early analysis of ICTs and development were done primarily by international agencies arguing for technology as a key component of development plans. The International Telecommunications Union (ITU) undertook the first major research project on understanding some of the linkages between IT and Development, concluding that ICTs and their supporting networks need to be strengthened in order to share their benefits to “health and other social services, administration and commerce, but also in stimulating economic growth and enhancing the quality of life” (Maitland, 1984: 65). Twenty years later, the World Summit on the Information Society (WSIS) convened by the United Nations in 2003 and 2005 served to solidify opinions amongst government and development practitioners on the potential impacts of ICTs on development (WSIS, 2005), and contributing to the achievement of the Millennium Development Goals (UN, 2000; Rezaian, 2006).

The above discussions were largely based on economic growth theories (Rostow 1960), on the assumption that ICTs can provide developing countries with necessary mechanisms to “leapfrog” stages of their development by embracing the new “knowledge-based” economy (Davison et al. 2000; Singh 1999). This approach emphasized physical access to ICTs and that people will derive benefits from their use once they have access to the necessary infrastructure (Gigler 2015). Donor agencies, including the World Bank (1995, 1998, 2006), United Nations Development Programme (UNDP 2001), United Nations Conference on Trade and Development (UNCTAD 2013), and International Telecommunication Union (ITU 2012) have emphasized the benefits of ICTs and stressed that developing countries need to be proactive or suffer the negative consequences of an increasing digital divide, with adverse implications on their overall development (Steinmueller 2001; Pohjola 2002; Rodríguez and Wilson 2000). Just as there are disagreements on what ‘development’ is and how to achieve it, there are also disagreements on whether ICTs contribute to development. While some see ICTs as a necessity (McNamara 2000), and creating new social and economic opportunities (Pohjola, 2002, UNDP 2001), citing examples of positive cases (Niles & Hanson 2003), others take the opposing view that ICTs will enhance existing inequalities and power relations (Nulens 2000), and enhancing the digital divide benefiting only the already privileged (Wade 2002).

Today, ICTs have become an important and taken for granted and undisputed component of national development agendas, such as of “Digital India” or “Vision 2020” in Malaysia, ICTs.
Nhampossa (2008) describes how many countries have national ICT strategies and visions positioning them as determinants of development, which also helps attract significant investments and political legitimacy.

As a research discipline, Information and Communication Technologies for Development (ICT4D) is a nascent sub-discipline within broader IS research. The establishment of the IFIP WG 9.4 on “Social Implications of Computers in Developing Countries” in the eighties was an important starting point in its evolution. Within over three decades, Heeks, 2010 describes, the field has moved from debating whether ICTs are good or bad for development, to discussing anecdotal case studies of ICT applications, to a situation now where it is no longer a debate about “whether or not ICTs”, but on how ICTs can effectively contribute to development. ICT4D has evolved into an important sub-discipline in its own right, with established journals, conferences, research groups in universities, and creating research publications also in mainstream IS research.

Today, the research field is engaged with the debate of how and why ICTs should be used for development (Andersson, et al., 2012). Increasingly, the very notion of development has become a subject of debate, raising questions on: what development is? and, how ICTs contribute to achieving development? There have been critiques that the ICT4D community needs stronger theorization (Sahay and Walsham 2006), requiring a shift from studying ICTs in developing countries to ICTs for development.

A special issue on IS in developing countries in MIS Quarterly contributed to highlighting the issue of how ICTs lead to development (Walsham, Robey & Sahay, 2007). In recent years, various analyses have been presented on the links between ICTs and socio-economic development (Avgerou, 2008, 2003 Avgerou and La Rovere, 2003, Madon, 2000; Mansell and Wehn, 1998; Heeks, 1999). Sein & Harindranath (2004) observe that ICT is treated as monolithic and homogeneous entity in the development literature which firstly fails to capture the multiple facets of the technologies and their impacts on development, and secondly, is limited in developing generalized understandings of the phenomenon to enable cross-country comparisons. They propose three conceptualisations of ICT to examine its use; as a commodity to support development activities; based on a nominal view; and, as something which induces impact at primary, secondary and tertiary levels. Gigler (2015) has argued that much of the literature articulates a positive link between ICTs and socioeconomic
development, including economic growth, social development, and enhanced democratic participation.

Over a decade after the special issue in MIS Quarterly, reflecting the growing importance of ICT4D, a special issue has been announced in the Journal of the AIS, which emphasizes the need to develop more innovative conceptualizations of development, and novel implications which may also be relevant for mainstream IS, representing a “reverse innovation”.

2.4.3. Challenges in achieving developmental impacts of ICTs

I discuss three key challenges identified in the ICT4D literature: institutionalization; contextualization; and evaluation, which are relevant to my theorization of ICT4D within the Capability Approach.

*The challenge of institutionalization and sustainability*

Institutionalization refers to the process by which technologies get embedded within particular organizational settings and routines, and can endure once external support is withdrawn. How can processes of ICT enabled development be institutionalized has been a matter of significant concern for ICT4D researchers (Madon et al 2009) as they influence sustainability and scalability. Institutionalisation is not a one-off static event, but needs to be nurtured over time. Sahay and Avgerou (2002) argue that developmental benefits have been difficult to achieve because governments are unable to nurture technology projects over the long run, typically required.

Braa et al (2004) discuss the problem of sustainability in the context of HIS in developing countries which contribute to projects failing to scale, beyond pilot studies. Scaling and sustainability failures are intertwined because the projects don’t reach a stage of maturity where the health system will like to invest in them to continue. To deal with these twin problems, they propose the approach of “networks of action” where the effort is to enable learning and sharing in collectives or networks.

*The challenge of contextualization* – ICTs are typically designed and developed in the West and transferred to developing countries, with appropriate local adaptation. Such processes of transfer are fraught with design-reality gaps contributing to wide-spread failures (Heeks 2003), Sahay and Avgerou (2002) argue that technological solutions from the “developed” world, conveyed by professional norms, standardization “imperatives,” or the emulation of
patterns seen elsewhere as successful, cannot be replicated in the developing world with the expectation that similar results would accrue. Local adaptations are necessary which require a sensitive understanding of the context.

Avgerou (2008) has theorized the social embeddedness of ICT enabled development processes. Development is seen as a contested notion, embedded in a social context, where ICTs are understood from a diffusion or social embeddedness perspective. The transfer and diffusion perspective examines the process by which technology moves from a centre to the periphery – from developed to developing nations – assuming this process is independent from the social circumstances. 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, and how ICTs are embedded in the social dynamics, local concerns, and situated meanings of ICT. Avgerou (2008) provides a positive example of the social embedded perspective through the Health Information Systems Programme (HISP) research initiative of the University of Oslo, Norway. The strength of HISP has been the systematic manner in which it has tried to socially embed the HIS innovation in the context by collaborating with local universities and departments of health, and with local researchers working on relevant problems from their own context.

The challenge of evaluating ICT4D initiatives - Many ICT4D studies, explicitly or implicitly, have a strong evaluative focus. For example, the recent work of Gigler (2015) has led to a framework for evaluating the impact of ICTs on economic and social development. This framework tries to go beyond debates about the “digital divide” and argues the need to instead focus on the “capability divide.” While the digital divide focuses attention on the physical availability of computers and connectivity, the capability divide instead emphasizes issues of content, language, education, literacy, or community and social resources. Understanding issues of empowerment contribute to building richer insights to the capability divide.

Gomez and Pather (2012) argue that current ICT4D evaluation efforts focus on quantifiable tangible values, while deemphasizing intangible values relevant for human development. While some ICT4D studies focus on understanding these intangible values, they focus mostly on outputs and economic outcomes (Mathias 2013). Intangible values are more difficult to evaluate. For instance, it is easier to go into a classroom and count the number of computers than evaluating whether the use of those computers have empowered the students to learn.
Within ICT4D, there have been limited empirical studies on impact of ICTs on individual well-being (Gigler 2015), with a primary focus being on economic development. Access and use parameters are easily studied, but are limited in improving understanding about the effects of new ICTs on people’s lives.

Critical IS studies have found that ICT investments seldom yield the expected outcomes, are of limited value to poor communities, or result in either partial or complete failures (Anderson et al. 1999; Heeks 2002; Robey and Boudreau 1999; Avgerou 2000). Heeks (1999) stresses that the literature lacks a coherent theoretical framework and is based primarily on scattered anecdotal evidence. Furthermore, Wilson and Heeks (2000) also emphasize the need to consider opportunity costs in ICT4D evaluation.

A growing number of authors have called for a much deeper and more nuanced understanding of the relationship between ICTs and development (Heeks 2002; Madon 2000; Barja and Gigler 2005), and real impacts on socioeconomic development and people’s lives. Such studies require more holistic approaches that fully “integrates ICTs into the overall development objectives of specific programs, rather than being driven solely by technological concerns” (Heeks 2002, 7). Heeks (2008, 2009) and Gomez and Pather (2012) and various others have argued that the ICT4D field follows broadly global development agendas, which tends to be technology deterministic and promoting the modernization agenda. However, there is now a realization that the focus has to change, with increased attention needed on the impact of ICTs on the needs of the poor and their wellbeing and capabilities (Mathias 2013).

A Capability Approach inspired perspective provides a rich avenue to develop such an alternative perspective, which I now discuss.

2.4.4. Operationalising Capability Approach in ICT4D

Some conceptual underpinnings

While Sen has not explicitly theorized ICTs in his Capability Approach, he has argued to deepen our understanding of ICTs in the development domain;

The easy way these communicational technologies have been absorbed by people shows that, despite their modernity and, I suppose, “globality,” they are not things that are completely alien to the local culture. The important issue is what we can do with all the technologies that are
available. The right way of seeing IT [information technology] is also not to cast it in terms of what we can do on the basis of our own culture, unaided, because we do not have any unaided culture. IT has become an interactive culture across the world, and the important question is how we can make people more functionally efficient, not just with their own things, but with everything—the global, as well as the local. (Sen 2010, 2)

In contrast to the physical objectives, ICTs, also inscribe a "profoundly moral agenda" that aims to empower people and communities by answering the difficult questions of not only "what should be done" in the practice of development but also "how we should do it" (Unwin, 2009a: 33).

One of the early applications of the Capability Approach to ICTs was Johnstone’s (2007) work in the domain of computer ethics. This approach emphasized a theory of value based on core human functionings and the capabilities required to realize them. Johnstone argues the underlying functionalism of capability theory as enabling the integration of normative and descriptive analysis of technology in terms of human needs and values. He describes the capability agenda in the field of computers to be both descriptive as well as a normative, and one which will need to directly and indirectly draw upon knowledge from a variety of social and technical disciplines. Also, the Capability Approach helps to extend the scope of analysis beyond ethics to also include concerns of justice focusing not only on capabilities themselves, but also on their actual and possible patterns of distribution, and their normative evaluations. Capability based ethics is thus concerned with the expansion of the agenda of capability and functionings, and also of their distribution in society.

Mahbub ul Haq, an intellectual founder of the Human Development Reports, argues that achieving development and promoting choices does not only mean increased levels of health and security, but also increased access to information and knowledge (Haq, 1995). Mchombu et al (2004) explains that the Capability Approach helps see ICTs as tools to establish and increase access to information for marginalised groups, as tools that promote autonomy and participation. Jean (2010) argues that the information shared through ICTs can become capability enhancers, allowing people to make better judgments. Sen considers this interplay
between information and one's capabilities to be of immense importance, since "informational limitations restricts or distorts consequential judgments" (Sen, 1984: 302).

Practitioners of ICT4D understand that technology itself cannot contribute to human development. What ultimately makes a difference in peoples' lives is the specific use of technology and the extent to which they help communities and individuals reach their respective development objectives (Jean 2010). As Sen (2001) notes, policy makers and practitioners need to reflect on the appropriateness of technologies being used in development and how these shape development strategies. As new technologies displace older ways of doing things, there will inevitably be trade-offs and hidden costs that rarely figure amongst the analysis of ICT4D.

*Some empirical applications of capability approach in ICT4D*

Zheng emphasized the philosophical and conceptual foundations of the Capability Approach, which can help to avoid some “existing or potential pitfalls in e-development” (Zheng 2009). For instance, the emphasis on human diversity enables researchers to move beyond analyzing only the effects of ICT diffusion and instead to also focus on the “interpersonal variations in conversion factors and decision-making processes in e-development” (Zheng 2009, 76). Furthermore, she points out that the Capability Approach’s emphasis on people’s agency helps recognize existing social conditions and cultural values for ICT programs, also to critically evaluate them. She concludes, “rather than maximizing access to technology, ICT for development should take into account the free flow of valuable information to enhance both well-being and agency freedom of individuals” (Zheng 2009, 79).

Zheng and Walsham (2008) draw upon the Capability Approach to study social exclusion in an e-society. They raise the question of “exclusion from what?” and analyze capability deprivation by an analysis of the essential capabilities in an e-society, and who are those who get disadvantaged in this society. They argue that deprivations and exclusions in one sphere can lead to effects in other domains. Based on their empirical study of health information systems in South Africa and China they describe how in South Africa, the capability failure of health workers in South Africa to effectively use ICTs led to their exclusion from the district health information system, which contributed to the capability deprivation of patients to receive quality health care. In this way, by conceptualizing social
exclusion as inequality and different types of capability deprivations, the capability approach provides a sensitizing lens to understand the complexity of the phenomena of the e-society.

Gigler’s (2015) empirical analysis is based on his work with indigenous communities in Bolivia in introducing ICTs and studying their impacts. His analysis suggests that measuring ICTs in terms of capabilities does not indicate a linear relationship between having access to ICTs and using them. Having Internet access is a necessary, but insufficient, condition for its use. This goes hand in hand with one of the fundamental principles in the conceptual framework of the Capability Approach, which is that access to a basic good, in this case ICTs, represents an entitlement and key prerequisite for its use. Sen (1999) argues that people have different ways of transforming the same bundle of goods (ICTs) into opportunities they value.

Thus, when assessing the impact of ICTs on well-being, it is essential not only to evaluate the range and potential of ICTs available, but to also consider people’s capabilities—that is, their ability to transform these options into actual or realized functionings (Garnham 1999). A useful concept developed is that of “information capabilities” which extends the idea of “ICT capabilities” (Gigler 2015), and also relates to the essential capabilities identified by Zheng and Walsham (2008) in their analysis of the e-society. ICT capabilities represent the extent to which a person is proficient in the use of the technology, and is defined as “a set of skills and understandings required by people to enable meaningful use of ICT appropriate to their needs” (Oliver and Tower 2000, 384). This functional view of ICT literacy stresses how people can appropriate technology to meet their local and cultural needs. ICT capabilities extend beyond “ICT use,” which encapsulates the simple use of ICTs, such as the Internet, while informational capabilities takes an information-centric approach, which analyzes information in a sociocultural context (Horton 1983; Castells 1995).

The important role of information as a source of empowerment is demonstrated by the work of Sahay and Madon (2002) in the case of slum dwellers in Bangalore, India. Though they do not draw upon the Capability Approach, they describe how slum dwellers draw upon the power of information to negotiate and bargain with local authorities to demand for their rights as slum dwellers, such as the provision of toilets and street lights. The increased choices for negotiation which information helped provide, represented a source of empowerment which allowed slum dwellers to pursue what they valued doing or being.
Dorothea Kleine (2013) has drawn upon the Capability Approach to study how ICTs and state policies promoting them, relating to telecentres, affected the lives of Chileans. She proposed the “Choice Framework”, which acknowledges and conceptualises structure as well as agency. For Kleine, choice in itself reflects empowerment. Drawing from Sen, and the idea of what choices people value, Kleine adds to the conceptualization of empowerment by including the very notion of choice, which focuses on the aspirations of people, which may not necessarily represent what they actually achieve. As Kleine says: “the understanding of capabilities presented here includes the ways of being or doing that people aspire to, whether or not they seem achievable” (Kleine 2013, 44).

Bass et al (2013) have argued the value of integrating institutional theory and the capability approach help to answer the question of “how can the combined complementary strengths of institutional theory and the capability approach inform ICT4D?” Through this novel conceptual integration they identify the social drivers that may inhibit or enable individuals from taking full advantage of ICT resources for improving their own lives. Further, they try to address the question of how enhanced capabilities can also contribute to positive institutional change. They identify two kinds of influences of institutions on capabilities – excitors and inhibitors, drawing upon an empirical case study from the Ethiopian public education sector. An example of an exciter is the Ethiopian government’s plan to enhance the capabilities of teaching staff through sponsorship of higher degrees. An example of an inhibitor is the lack of strategic management skills among senior officers in universities. In this way, Bass et al provide some unique insights into understanding the relationship between institutions and capabilities, which also help to expand the scope of capability approach from individuals to collectives.

Vaughan (2013) have argued for utility of the Capability Approach as an evaluative tool for ICT policy and assessment, in particular at a grass-roots community level. The author argues that the Capability Approach allows for evaluations to see ICT beyond a mere resource (such as for providing access), to actual outcomes. Empirically, the argument is based on the study of indigenous communities in the north east of Australia. Key to the conceptual approach is the identification of community defined, context specific notions of well-being and valued functionings and the derivation from this of required capabilities. The informational basis of the Capability Approach provides for an effective tool for policy and evaluation analysis, and the author argues that ICT programs which seek to explicitly contribute to community well-
being and aspirations through the enhancements they make to capabilities are sustained by communities, while programs which merely treat ICTs as a generic resource tend to fall by the wayside.

Summarizing, we find an increasing interest and application of the Capability Approach to understand a variety of issues of relevance to ICT4D. These issues range from the digital divide, social inclusion, community-based ICT programs, health information systems, public sector education, e-governance, computer ethics and various others. This rising interest is reflected in special issues on this subject being carried in international journals. For example, Andersson et al (2012) editing a special issue on the subject in the Journal of Information Technology for Development have argued that Amartya Sen’s Capability Approach provides for a rich approach in understanding issues of development in the context of ICT4D. Silva and Westrup (2009), editing another special issue in the same journal have also echoed similar views on the potential of Amartya Sen’s ideas in furthering the research field of ICT4D. And as we see more empirical applications of the Capability Approach to ICT4D, we will be able to better address the critique that “the Capability Approach is philosophically profound, but methodologically somewhat vague” (Zheng and Walsham 2008).

We also see various advancements towards operationalization and also enrichening of the Capability Approach taking place by researchers attempting to integrate with concepts drawn from other other theories. For example, the paper by Bass et al (2013) brings in concepts from institutional theory to help situate individual capabilities in the broader context of an institution. This not only helps to address some of the criticisms of the weakness in the theorization of structured conditions, but also helps to understand some of the linkages between individual capabilities and that of the collective. Then we have the example of the work of Zheng and Stahl (2011) who have integrated critical theory with the Capability Approach to develop a form of critical Capability Approach. Drawing upon the notion of Sen’s notions of agency and the non-neutral view of technology from critical theory they analyze the impact of ICTs on development.

While such theoretical integrations can help in enhancing the applicability of the Capability Approach to ICT4D, there are specific problems which still need to be addressed. Kleine identifies two key stumbling blocks in this regard. The first she calls uncontrollability, which reflects the challenge of funders who support projects based on their own agendas, and not by
the promise of people being empowered as the Capability Approach would emphasize. The second is operationalizability reflecting the challenge of translating the richness of the Capability Approach to project planning and execution. Qureshi (2011) identifies another challenge as the duality between research in ICT for development and ICT in developing countries which exist in parallel with little or no overlap with each other. The latter does not make the expected contributions to understand development.

2.4.5. Summarizing my conceptualization of ICTs

Similar to the argument made by Orlikowski and Baroudi (1991), even in the ICT4D literature we find ICTs as being either absent, black-boxed, abstracted from context, or reduced to surrogate measures. The development context is a complex space, populated by donors, ministry of health officials, government bureaucratic structures, different technologies, technology vendors, users, infrastructure, and various socio-technical-institutional elements. In my research, I have had the advantage of studying different ICTs (hospital information systems, MCTS, mobiles, DHIS2 etc) within the context of different projects. By following specific projects over periods of time, I have been able to observe changes in how the ICTs are taken up (or not) by the health care providers, what they are able to do with it and how.

Orlikowski and Iacono’s (2001) analysis help me understand and I take an ensemble view of technology as being part of a larger socio-technical network. From Capability Approach, ICTs is first seen as a resource which needs to be converted into a capability. Further, this capability needs to be converted into a functioning. Through my empirical work, I will seek to understand these sets of conversion factors.

2.5. Overall conceptual framework guiding the thesis

The key concepts I draw on to guide my data collection and analysis are summarized below:

1. Empowerment is the expansion of capabilities, including the choices available to individuals and their ability to materialize these choices to achieve desired functionings. This expansion is necessarily related to aspects of power as it concerns the movement of a person from a more disadvantaged position to one of more advantage.

2. Empowerment is seen as shaped by the contextual conditions (opportunity structure) which an individual experiences in creating and exercising choices they value
(agency). Opportunity structure (for example, bureaucracy or donor policies) can be both enabling and constraining to the exercise of this agency.

3. ICTs have been conceptualized within an ensemble view. They represent a resource which can be converted into a capability. This capability needs to be then further converted into a desired functioning. The role of ICTs in this process provides the focus of my analysis to understand the expansion of capabilities, and with it the ICT-empowerment relationship.

4. Participation helps build capacities to use the technology so as to valuable capabilities, and their conversion to achieve desired functionings.

5. Capacity of individuals shapes their ability to participate, and enhanced level of participation helps to strengthen capacity. Capacity strengthening approaches are required for the building of capacity in a ICT4D project.

These set of concepts provide me with a sensitizing lens which helps serve three key purposes. First, in my data collection it helped to understand the issues of focus. For example, in discussing with health care providers I would try to understand what kind of choices they saw coming with the new ICTs, and whether they represented something additional or alternative to what existed before. Second, these concepts became the focal points around which I developed my different papers that I have included in my Kappa. Third, it helped me in my analysis and development of the overall framework which I present in Chapter 7.
Chapter 3

3. Context of the Research

This chapter sketches the context of the research, with a purpose to draw attention to some elements relevant to understanding aspects of HIS in the public sector in India and Kenya which are relevant to my case studies. The chapter first briefly introduces key features of the Indian public health system, and the challenges it is currently facing. The first three sections of this chapter provide different details of the Indian public health context and HIS. The fourth section focuses on describing the context in Kenya, which is not as detailed as the India case. In each discussion, I try to develop some implications the context has for understanding processes of HIS projects.

3.1. Understanding the context: the emphasis given to public health systems in India

India offers a paradox of sorts. On one hand, India is seeking to becoming a global economic superpower, and spearheading efforts such as forming the BRICS (Brazil, Russia, India, China and South Africa) platform as an alternative to the World Bank and IMF. On the other hand, India shows very poor human development and public health indicators, in some cases like nutrition showing achievements which are poorer than countries in sub-Saharan Africa. On the same lines, India is seen as a global ICT superpower, but yet applications of ICTs in their public health sector have shown limited successes. Why is this case? Is it because the majority of the country does not give importance to the public health system, and we take it for granted as being non-functional and beyond improvement? Does this apathy also reflect in how we view new technological interventions in the public health system? This section seeks to understand some of these underlying issues, as they shape the views of the health staff and how they think that technologies may help them and their work processes.

While India has experienced a steady rising rate of economic growth (though significantly reduced in the last few years), there has been much speculation about whether and when India may catch up with and surpass China’s achievements. It may be rather silly to be obsessed with this economic race concerning rate of growth of GNP, while not comparing India with China in other respects, like education, basic health, or life expectancy. Economic growth can,
of course be enormously helpful in advancing living standards and in battling poverty. But there is little cause for taking the growth of GNP to be an end in itself, rather than seeing it as an important means for achieving things we value such as health, which is now reflected also in the measure of the Human Development Index. While India races towards catching-up with economic growth, there’s a much wider gap to fill with respect to social and health indicators, such as related to maternal mortality, infant survival rate, infant mortality, and life expectancy.

India compares less than favourably with its neighbours like China and Bangladesh who represent varying levels of economic growth (Sen 2011). Sen argues, that for a minority of the Indian population—but still very large in actual numbers—economic growth alone has been very advantageous, since they are already comparatively privileged and need no social assistance to benefit from economic growth. For their health care needs, they rely on private systems, and pay little attention to the state of the public health sector. However, the danger is that the illusions generated by those distorted perceptions of prosperity may prevent India from bringing social deprivations into political focus, and how improvements can be enabled through its democratic system. A fuller understanding of the real conditions of the mass of neglected Indians and what can be done to improve their lives through public policy should be a central issue in the politics and in public debates. However, what is conspicuous by its absence is public debate on issues of significance such as malnutrition, infant and maternal mortality rates, high levels of privatization and various others. While the plethora of news channels on TV emphasize sensational events of rapes and murders through the day, very rarely does one hear informed debates of these issues of relevance to public health.

One of the positive things about economic growth is that it generates public resources that the government can devote to its priorities. Public spending on preventive health services has a low priority in India over curative health in the country as a whole. Indian public spending on health is amongst the lowest in the world, whereas its proportion of private spending one of the highest. More than USD 25,000 million is being spent annually as out of pocket household expenditure on health, which is more than three times the public expenditure on health. Even though, one of the major cornerstones of the National Rural Health Mission (NRHM), a flagship initiative established by the government in 2005 to reform and strengthen the public health systems, contributed to increase the budget outlay for public health to about 0.2 percent of the GDP per year for first five years of the mission, it was far too little to make a major difference in the country of the scale and complexity of India. The current debates on
introducing Universal Health Coverage (UHC) in the country, is again shifting the focus to insurance systems and the role of private players in providing it, which may deemphasize deep public health concerns.

While it can be argued there has been a relatively lack of importance given to public health systems in India, what can be said about technological interventions in this sector? The last two decades or so have seen a rise in technology projects in the country, often involving high investments and the introduction of expensive technologies through international donors and private providers. It can be inferred the focus of these projects is on attempting modernization through new ICTs, but not addressing the systemic problems of centralization, and weak governance. These tendencies have implications on empowerment of health workers, something that my thesis seeks to examine through empirical case studies.

3.2. What is the state of public health in India?

India shows gross inequities in access to health-care services and its underlying quality. The huge inequity is evident, as on the one hand, there is a flourishing international medical tourism, and high-technology biomedical interventions being done relatively cheaply, and, on the other, there are minimum levels of health care being unavailable to those unable to pay, which constitutes a high percentage of the population (Lancet 2014).

Improvements in health outcomes in India during the past two decades have been slower in comparison to other developing countries such as Bangladesh and Nepal. For instance, while IMR in India has declined by 50 percent between 1990 to 2012, the decline has been 67 and 60 percent respectively in Nepal and Cambodia over the same period. The decline in Under 5 mortality in India during the period from 1990 to 2013 has been 3.8 percent annually, while declines in Bangladesh has been 5.4 percent, Nepal 5.6 percent, Cambodia 4.9 percent, and Kyrgyzstan 4.3 percent for the same period. Similarly the rate of decline in MMR for India is at 70 percent from 1990 to 2010, while Nepal and Vietnam showed respective declines of 78 and 75 percent. India has not achieved many of their MDG targets, for example against the IMR target of 27, the achievement in 2013 was 40, the achievement in MMR was 167 against the target of 109, and proportion of births attended by skilled professionals was 66.6 percent compared against a target of 100 percent. While India reported a decrease in mortality due to TB to 43.6 percent from 2000 to 2012, for China it was 63.1 percent for the same period. Mortality due to measles decreased in India from 87.3 and 81.4 percent respectively during
the same period. It is thus evident that India has shown slower progress in controlling these conditions, consequently leading to a triple burden of disease including communicable and non-communicable diseases, and the traditional primary health care problems such as of maternal and child health.

It is not all gloom and doom, and there have been significant achievements in areas like Polio elimination, the lowering of fertility rates by 21 percent between 2005 and 2013, in HIV prevalence by 42.6 percent from 2001 to 2011, and a decrease in malaria incidence by 50-75 percent between 2000 to 2015. But overall, it can be inferred that the public health status in India is poor, and reflected in the overall Human Development Index rank which has stagnated since 2008, rising by only 1 unit, while the rise in Nepal and Bangladesh has been 4 and 2 units respectively.

While the state of Indian public health indicators is indeed poor, it begs the question of what has been the role of ICTs in trying to alleviate them? Broadly, it can be inferred that the technological interventions have their own trajectories that are rather independent of the public health problems being faced. The focus of these initiatives remains largely on data collection and reporting, rather on how information can be used to address these problems (Sahay 2010). This separation of the intent of the technology and the need to address public health problems can be seen from my case study of the introduction of the Mother and Child Tracking System (MCTS). While there are serious challenges of maternal and child health the country is facing, as reflected in some of the indicators discussed above, the rationale for the introduction of the MCTS was primarily on improving the “truth” content of the reports sent by the field health workers rather than being based on the health logic of improving outcomes.

3.3. Why is ‘health’ in this state?: Issues of governance and service delivery

There are inter-connected issues of governance and service delivery which need to be understood to better analyse why the Indian public health system is in such a weak state. I discuss the challenges of governance and some of its implications on HIS.

3.3.1. Challenges of governance

A Planning Commission report (2005) described the development of India’s health system into the following three distinct phases:
The first phase, 1947-1983, when health policy was formulated based on two key principles. The first was that none should be denied care for want of ability to pay, and the second that it was the responsibility of the state to provide health care to all. With meagre resources, this period saw the effective containment of malaria, bringing down the incidence from an estimated 75 million to less than 2 million, the eradication of smallpox and plague, the halving of maternal mortality, reduction in infant mortality from 160 per 1000 live-births to about 105, containment of cholera and increase in longevity to almost 54 years. These gains were in no small measure due to the professional cadre of public health specialists leading from the front, camping in villages in hostile environmental conditions, whether to eradicate smallpox or supervise the malaria worker.

The second phase, 1983-2000, saw the first National Health Policy of 1983 that articulated the need to encourage private initiatives in health care service delivery. At the same time, access to publicly funded primary health care was expanded. This phase witnessed an expansion of health facilities for providing primary health care in rural areas and the implementation of National Health Programmes for disease control under vertically designed and centrally monitored structures. Fiscal stress also forced states to innovate to strengthen accountability and efficiency in resource use.

The third phase, post-2000, witnessed a further shift with potential to profoundly affect the health sector in three ways: (i) the desire and need to utilize private sector resources for addressing public health goals; (ii) liberalization of the insurance sector to provide new avenues for health financing; and, (iii) redefining the role of the state from being a provider to a financier of health services as well.

The first phase was the most promising in terms of advancing public health aims, contributed to by a strong zeal amongst the health staff with their field level and holistic orientation. For example, a doctor going to the field would not only do immunization but would also examine the overall health status of individuals. As we moved to the second and third phases, health care became more vertical, with a loss of the comprehensive approach. Serious governance issues arose from the failure to establish a regulatory framework and accreditation processes for governing the private sector. There was an absence of a holistic surveillance and epidemiological system which resulted in poorly designed health interventions and supporting HIS. There were also inadequate investments made in developing skilled human resources,
and an increasing reliance on third party contractors. Both at the central and state levels, despite various attempts to develop several innovations, the efforts were poorly accountable and rather disconnected from public health goals. As a result, the innovations were inadequately equipped to address people’s expectations and provide financial risk protection to those unable to pay to access care.

Governance challenges also arise from the multi-sectorial nature of the public health system. Unlike other sectors, health is intertwined with socioeconomic and cultural factors. In India, this is made more complex with various ministries administering matters that directly affect population health with no coordinating mechanisms amongst them. For example, in the Central Government, the pharmaceutical industry is under the Ministry of Chemicals, policies related to the import or export of drugs and technology are the responsibility of the Ministry of Commerce, drug regulation is under the Ministry of Health, nutrition is partly under the Department of Women and Child Development, and health insurance under the Ministry of Finance. This leads to less than adequate attention to being given to determinants of health, in terms of access to nutrition, safe water & sanitation, housing, clean air, and productive employment , all of which have a direct bearing on the future health burden of the community.

Governance challenges also arose with the ambiguity around the division of responsibilities between centre and states. Overlapping responsibility tends to blur accountability of outcomes and systems which are still in early stages of maturity. While health is a state subject, the centre has jurisdiction on infectious diseases, medical education and research, population control and vital statistics including registration of births and deaths. The distribution of subjects between the centre and states has no rational basis and has in no small measure affected accountability of both parties. Such fragmentation of responsibility across departments and constitutional entities has resulted in confining health governance to implementing only public-funded activities and programmes, to the exclusion of wider health system issues, including the functioning of the private sector, which was seen as an independent, autonomous entity to the detriment of the overall health system. This lack of regulation clearly reflects in the health information systems where the private sector data is largely absent. Given that the private sector accounts for a large proportion of health care provided in the country, this lack clearly affects adversely the quality of the overall information systems and its utility for health policy.
Another major impediment in the effective governance of health is the structural mismatch of the vertical programme divisions. For example, the Reproductive and Child Health (RCH) Programme rarely addresses HIV/AIDS, Malaria or Tuberculosis (TB) programmes. Likewise, the Malaria Control Programme has no indicator focusing on pregnant women, or nutritional deficiencies in the child health programmes. This mismatch has adverse implications, for example pregnant mothers are not tested for HIV because the antenatal and HIV programmes are independent. These programmes tend to have their own supporting information systems, and despite being technically possible, there is no cross-linking of data from these two programmes. Many such example of fragmentation of systems and HIS can be seen.

Weak governance also results from the lack of decentralisation of authority and power from the Centre to the States, and from there to districts and then health facilities. Such devolution of leadership and governance means having the ability to plan, budget, implement, manage, monitor, review and accept responsibility for decisions taken. In fact, besides functional delegation, fiscal devolution is more critical; it is more than the mere release of funds for carrying out public functions. Rather the public health system is highly centralised, wherein not only the decisions of design of health programmes, but the micro-planning and implementation directions also come from central government, with states being reduced to mere passive implementers of decisions. This for obvious reasons leaves limited accountability and ownership with states, districts and facility staff, and in times of crises the centre and the state blame each other.

These issues of governance are well reflected in the domain of HIS. While health is a state subject, the centre is seen to mandate to the states what software they should use to send their data. Instead of focussing on getting macro level data to monitor the performance of health programmes, the centre has mandated to the states to report on facility (to the level of Sub Centre) and even individual level data of pregnant women and children immunization. The centre neither has the need for such person level data, other than exercising power of visibility, and neither does it have the bandwidth and capacity to analyse and use data to improve health care delivery.

As noted in the Planning Commission Report (2005), improving public health delivery in India will require the building up of the health system over a long term basis based on certain core values, which they describe as: (i) promoting equity by reducing household expenditure
and experimenting with alternate models of health financing; (ii) strengthening public health infrastructure and restructur- ing the existing primary health care system to make it more accountable; (iii) reducing disease burden and the level of covariate risk; (iv) establishing institutional frameworks for improved quality of governance of health; and, (v) investing in technology and human resources for a more professional and skilled workforce and better monitoring. Some of these efforts were attempted through the National Rural Health Mission (NRHM) which we next describe.

3.3.2. Reforming the Indian public health system in mission mode: the NRHM

In trying to strengthen the public health system, the government launched in 2005 an ambitious programme of the National Rural Health Mission (NRHM), which is now called National Health Mission (NHM). The NRHM established by the UPA government had the bold agenda of building public trust in the health system, and get people back from the private to the public system. The NRHM sought to make systemic changes in the public health system and introduce architectural corrections in the public health delivery. These included processes of decentralisation, community participation, convergent action on determinants of health, flexible financing and mainstreaming IT in health. For the first time, a health system strengthening framework was designed, which shifted the focus from schemes and diseases or programme specific interventions to a holistic health systems approach. One of the important aims of NRHM was to increase the public health expenditure from 0.9% to 2-3% of the GDP (NRHM Framework 2005).

The NRHM dealt with a variety of interventions, including ensuring infrastructure was in place through deployment of additional human resources, over 18,000 ambulances for free emergency response, and cash transfers up to 1,00,00000 women annually, to strengthen access to maternal health care services. Decentralization involved earmarking an untied fund being made available for each health facility for local maintenance. Establishing of programme management units at each level – national, state, district and block – and hiring of professionally trained human resources for these units was provided to strengthen management support to the health system. There were various other interesting interventions carried out within the NRHM framework, but I focus my discussions on the HIS component.
Broadly, the systemic corrections within the HIS were around three areas: i) integration of HIS; decentralization of HIS; and, the enhancement of evidence based decision making. These systemic corrections involved a redesign of the data collections forms. Braa and Sahay (2012) have written in detail about this reform process, so I will not describe that in any detail in this chapter. But it would suffice to say that there was a radical reduction in the number of data elements collected, and their linking with indicators to enhance data use. Systematic design principles were developed such as not allowing for any data to be entered more than once, and to reduce the burden of data work of health workers. Simultaneously, a core strategy was to strengthen capacities for data collection, assessment and review for evidence based planning, monitoring and supervision. The introduction of technology was seen as a driver for these reform efforts, and various technological initiatives were introduced.

The redesign process focused on integration, and efforts were made to include programme specific data elements within the HMIS (Health Management Information Systems) to avoid duplication. Minimum success was achieved in these efforts. For example, the Integrated Disease Surveillance Programme (IDSP) managers refused to integrate as they believed systems for surveillance had a different logic of reporting than HMIS (Braa and Sahay 2012). Further, while the Child Health division agreed to include the immunization data in the HMIS, in practice they did not give the necessary instructions to their field officers to carry out the integration. Programmes like TB and HIV did not even agree to come to the integration table for negotiations as they believed their existing systems were superior to the proposed HMIS.

The reform outputs which emerged at the end of 2008 was a new and revised set of recording and reporting formats, which showed a 90% of reduction in the number of data elements collected. Further, standardized data sets were created for each facility type (Sub Centre, Primary Health Centre, Community Health Centre, and District Hospital), and these were customized on software made available to the states. There were two types of software deployed. One was the national web portal developed on a proprietary platform, and states were asked to report their district wise aggregated data on to this portal. Entering this data into the portal was obligatory for all states. The other software in play was the open source DHIS2 (District Health Information Software Version 2) introduced through the National Health Systems Resource Centre (NHSRC) in technical partnership with a NGO called HISP India to which I belonged. States who adopted DHIS2 were also those interested in decentralization, as the software allowed them to enter facility wise data, and upload required reports into the
national web portal while simultaneously providing them the facility to carry out local analysis and enhance evidence based decision making. In other words, DHIS2 supported the NRHM agenda of integration, evidence based decision making and decentralization.

However, with both these software in play, there were various tensions that played out. One, was the tension between proprietary versus open source software, with the central ministry supporting the former. The other tension concerned the use of one software for all versus allowing states to use software of their choice. The centre strongly advocated the use of the portal as the “single window of truth” and applied their power over states to discontinue the use of other software such as DHIS2. Over time, as the portal was also enhanced to provide some of the features that DHIS2 provided of local analysis, the pressure from the centre led to the 20 odd states that had adopted DHIS2 to be reduced to about 10 states by 2012. These reflected the governance related tensions that played out in the process of implementing the reforms.

Two of the states that continued with the DHIS2 were Punjab and Himachal were the empirical sites of my research. I provide an overview of the case studies in Chapter 5.

3.4. The Kenya case of hospital information systems

3.4.1. The Kenyan context

The Republic of Kenya is located in Eastern Africa, and bordered by Ethiopia, Somalia, Tanzania, Uganda, and Sudan. Kenya has three main broad cultural groups: the Bantus, the Cushites and the Nilotes, and at least 42 ethnic sub-groups. Kenya is rich with a diverse culture, with 80% of rural population. In terms of development indicators, Kenya has a fertility rate of 4.6, Under-five mortality of 74 per 1,000 and prevalence of underweight Under 5 children at 16.1 % in 2008/09. Infant mortality rate is at 52 per 1,000 live births, significantly better than the regional sub-Saharan Africa average of 76, and maternal mortality ratio is 488 per 100,000 births. This is from 414 in 2003, but substantially lower than both the regional average (832.16). The table below summarizes the top 10 causes of death in the country.
HIV/AIDS disproportionately affects the country’s mortality and morbidity. Although its prevalence is higher than the regional average, at 6.3 percent for people ages 15-49 (KNBS 2010), it is much lower than many of the southern African countries. In addition to HIV/AIDS, tuberculosis, malaria, and diarrheal diseases are major killers.

The Ministry of Health is split into two ministries: the Ministry of Medical Services (MOMS) and the Ministry of Public Health and Sanitation (MOPHS). The MOMS administers secondary and tertiary hospitals (levels 4–6) of the health system, while the MOPHS oversees primary health care facilities (levels 1–3). This categorization, done primarily on political considerations, has raised concerns of duplication, competition for resources, and strained political allegiance. Their respective functions are summarized.

<table>
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<tr>
<th>Table 3.2: Kenya Health Ministry key functions and responsibilities</th>
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<tr>
<td><strong>Ministry of Medical Services</strong></td>
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<td>Medical services policy</td>
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<tr>
<td>Curative services</td>
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<tr>
<td>HIV/AIDS and other sexually transmitted infections (STIs)</td>
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<tr>
<td>Maternal services</td>
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<tr>
<td>Rural medical services</td>
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<tr>
<td>Clinics and hospitals</td>
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<tr>
<td>Registration of doctors and paramedics</td>
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<tr>
<td>Nurses and midwives</td>
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<tr>
<td>National Hospital Insurance Fund</td>
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<tr>
<td>Clinical laboratory services</td>
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<tr>
<td>Kenya Medical Training College (KMTCA)</td>
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<tr>
<td>Kenya Medical Supplies Agency (KEMSA)</td>
</tr>
<tr>
<td>Regulatory bodies for pharmacy and medicine</td>
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<tr>
<td>Member of KEMRI board</td>
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Source: KMO 2008, MOPHS 2009
To strengthen the health system in country, Kenya formulated the National Health Sector Strategic Plan in 2010, with objectives to:

- Increase equitable access to health services;
- Improve quality and the responsiveness of services in the sector;
- Improve the efficiency and effectiveness of service delivery; and,
- Foster partnerships in improving health.

And one of the key recommendations of National Health Sector Plan was decentralization of health services to address the problems of centralization which resulted in regional and provincial discrepancies in the health service distribution, disparities in resource allocations, and inequitable access to quality health services. Decentralization was aimed at increasing decision-making power for resource allocation and service delivery at the district and facility levels and to strengthen community involvement in health management. Hence, in 2010 the constitution was amended which led to the creation of forty-seven sub-national units (counties) with elected assemblies and executives responsible for planning and managing the healthcare services in respective counties and programme implementation, while the national ministry was responsible for providing support on policy and standards, and supporting the county when requested.

Another important recommendation was on donor coordination, which was to be managed centrally at the MoH level to ensure improved integration of support. This was important because, the health sector is financed from three primary sources: public, private including households (consumers), and donors. For programmes such as HIV/TB, donor contribution is up to 75 percent (NACC 2008). See figure below.

![Figure 3.1: Financing of health sector in Kenya](image-url)
The Ministry of Health spends 71% of their allocation on recurrent costs including salaries, and 68% on outpatient/inpatient care services (mostly in large secondary and tertiary hospitals). The two tertiary hospitals, Kenyatta and Moi, consume 16 percent of the recurrent budgets. This leaves very little for capital development, including for expansion of health facilities and replacement of aging buildings and equipment, resulting in dilapidated infrastructure across all levels (GOK 2009d). Hence, the donor coordination recommendation is to ensure investments in priority areas of the Ministry. The issue of donor-MoH coordination was an important aspect of the analysis of my case, which I discuss in Chapter 5.

In summary, this research context chapter has highlighted that the Indian public health system is generally weak in terms of key health indicators and ranking poorly with its immediate neighbours. The potential of HIS to strengthen these health outcomes have also remained largely unrealized. This broad environment I argue has an influence on how health staff views new ICT initiatives, with possible implications on the creation of empowerment. In Kenya, the dependence on donors for their financing was high, and this influence what ICTs were introduced and the processes surrounding their implementation.
Chapter 4

4. Empirical Approach

In Chapter 2, I discussed relevant literature around key concepts underlying my theoretical perspective to understand empowerment. In this chapter, I present details of my empirical engagement which has helped in inductively developing an understanding of these concepts and enable their conversations with theory. The chapter has four main sections. Firstly, I describe my role in the research, and the underlying ethical dilemmas that I have experienced and tried to deal with. In the second section, I discuss my overall research design including the philosophical basis, action research approach, case study method, and the longitudinal and multi-level engagement. In the third section, I discuss my overall approach to data collection, which is followed by data analysis in the concluding section.

4.1. My Role in the Research

In this research, I have played two roles of “PhD Researcher” and “Project Coordinator”. As PhD researcher, I have studied the implementation of various ICT initiatives in the Indian and Kenyan health sector to understand empowerment within a broader conceptual framework. Secondly, I am employed as Project Coordinator in an Indian NGO called HISP India which has for more than a decade has supported Indian national and state governments in the design, development and implementation of HIS. I have been engaged with the case studies prior to starting of my PhD work at Oslo. The projects done by the NGO in different contexts have been my primary source of research access. As Project Coordinator, I have made decisions (for example related to system design or implementation) which may reflect an exercise of power that could influence processes of empowerment of the health workers that I am seeking to understand as a PhD researcher. As a result, my relationship with projects and health staff by design was not neutral requiring me to simultaneously implement the project based on HISP India’s contractual obligations, and also study the same from the perspective of my research design. The “researcher-researched” relationship between me and the health staff I studied was very much tied up to my two roles, raising issues which I needed to negotiate continuously. I provide some examples of the same.

The project on the design, development and implementation of a mobile phone based reporting system for frontline health workers in Punjab, was one which I coordinated for
HISP India and this was also a part of my PhD research. At the start of the project, the application developed by HISP India was installed on the mobile phones bought by the government and distributed to about 5000 health workers. After two years, the health department changed the reporting formats, which meant that the application also needed to be changed and reinstalled on the mobile phones. In the process of installing the new application on the phones, HISP India trainers which included myself, discovered that in most cases the phones had no remaining memory space for installing/upgrading the application, as the phone memory was full with songs and pictures which the health workers had downloaded in their personal capacity. In this case, since the new application could not be installed, as Project Coordinator, I took the decision to randomly delete pictures or songs to create adequate memory on the phone to install the application. This act of deletion represented an ethical dilemma as I exercised power in capacity of Project Coordinator, which potentially could significantly influence feelings of empowerment the health workers felt with respect to the phone, which was an object of my research endeavour.

Another example is provided from the project of the design, development and implementation of a hospital information system for district hospitals in Himachal Pradesh. The mandate of the project was to design a system driven by local requirements in the hospital, rather than implementing an ‘off the shelf’ system. As Project Coordinator for HISP India, I initiated the process of understanding requirements for the system from hospital staff. The team soon realized that the hospital staff found it very difficult to articulate their requirements as they had not experienced such a system before. This then created a deadlock situation, and with it created project delays. As Project Coordinator, I needed to make an intervention to this situation, and started to proactively articulate requirements based on global practices and my own understanding of what was important. The immediate reaction to my actions was that it helped to kick-start a dialogue on requirements, even though the hospital staff started to give my articulated requirements as ‘theirs’. In this example, I exercised power in my capacity as Project Coordinator to articulate requirements to help kickstart the dialogue. While this helped to initiate the process, this could lead to the danger of the hospital staff not taking ownership of the requirements process as their own, significantly influencing the process of empowerment which I was studying as a part of my PhD research.

A third example I give from HISP India’s project to design, develop, and implement a hospital information system for public hospitals in Kenya. The mandate of the project was to
build local capacity and create a community of practice which could then take forward the implementation and support process of the pilot system from one county to other counties in the country. The Indian and Kenyan teams were based in different locations, requiring capacity building sessions to be carried out over Skype. As Project Coordinator, I needed to design a capacity building schedule, with included Skype calls twice week, starting at 12 noon India time which was 10am local Kenya time. Though this time much suited the MoH officials and consultants in Kenya, it was not a good time for the hospital users where 10am was peak OPD time in the health facilities. This led to drop in participation of facility users in capacity building sessions. This example also reflects an exercise of power from me arising from my position of Project Coordinator in terms of defining a “convenient time” for the Skype call, which was inconvenient and led to the exclusion of hospital users who needed the sessions most.

In these above examples, I used my personal position as Project Coordinator to make decisions which could influence processes of empowerment as experienced by the health staff, which I was studying for my research. The ethical dilemmas it raises for my research: if it is the process of design that I am trying to study in my research, and I am the one making crucial decisions, then how independent is my research? And, does the action dominate over research? I have no clear answers on how I have negotiated these ethical dilemmas during the course of my research. However, in expressing these concerns at the start of my methods chapter, I try to bring out the context of research, relevant to understand the subjectivities involved in the data collection and its subsequent analysis. These examples and more can be interpreted to have had an influence on the answers I got during data collection. I discuss this issue in Section 4.3 on Data Collection.

4.2. Research Design

In this section, I present the design of the research, which is described over 5 key elements:

i. Philosophical underpinning of interpretivism.

ii. Research strategy of action research.

iii. Comparative case study analysis.

iv. Longitudinal design of research over a 4 year period.
v. Multi-level engagement.

Each of these elements are now discussed.

4.2.1. Interpretivism

My research study focuses on understanding “empowerment” within an ICT4D context. Given that empowerment is a subjective concept, I believed an interpretive approach which allows for multiple interpretations of the truth, rather than a “single truth” emphasized by positivist approaches would be appropriate to guide my research.

Interpretivism implies that the researcher sees the world as socially constructed (Orlikowski & Baroudi, 1991) and my research is my subjective interpretation of the world. In my research, I have tried to derive meanings to my empirical work, based on others’ interpretations of the situation and happenings, and how processes of inter-subjectivity are developed. During my empirical work, I interacted with multiple individuals, who shared divergent views on the same system and the process. This experience did make me believe strongly in the interpretive perspective, which allowed me to see issues which will always be interpreted differently by different people (Walsham 1993), based on their cultural, social, educational backgrounds and experiences.

Also one of the consequences of interpretive perspective is that, while different individuals share divergent views of the same system, I too create meaning of these views based on my own background and experiences, which influence how I see the world. Hence, I did not take this research from a value-neutral position and the data I collected, but that it was always “value-laden” and influenced by my own world views. For instance, while working on understanding requirements for designing the hospital information system in India, I interacted with staff from multiple departments in the hospital – clinical, laboratory, radiology, OPD, accounts and administration – to try and understand how they envisaged the hospital information system and their expectation of how this would support their work? The responses were very different. The registration clerks felt such a system would make their work efficient, allowing them to search and count patients, check for duplications and generate statistics asked for by their superiors from time to time. The clinicians felt that the system used for recording patient encounters will take away time from patient interaction, will increase their work load and maybe make it also more ‘clerical’. This view too changed while talking to younger doctors, who thought introducing computers to support work will make
their work much efficient and reduce the manual task of filling multiple forms. The pharmacists and laboratory team thought that introducing computers will reduce their manual work of making reports, maintaining registers, counting stock, and writing patients reports. While the store manager was most apprehensive about introducing computers as he felt this will make everything including stock positions visible, which will reduce his power of the ‘gate-keeping’ role currently enjoyed.

In making sense of these multiplicities of views, I must admit that I was influenced my own views on how I thought technology could support their work. I believed that ICTs have the potential to empower health staff, which made me constantly juxtapose the views I was gaining from field work, with those of my own coming from my background of being an Indian, a woman, a human geographer, my childhood experiences where I saw the value of technology being used in my village, and various other socio-cultural influences. I realized my interpretations would always be unique and different from others, a point emphasized by Walsham:

Interpretive methods of research start from the position that our knowledge of reality including the domain of human action is a social construction by human actors and that this applies equally to researchers. Thus there is no objective reality which can be discovered by researchers and replicated by others (Walsham, 1993 p. 5)

This viewpoint is also reinforced by Orlikowski and Baroudi:

Interpretive studies assume that people create and associate their own subjective and intersubjective meanings as they interact with the world around them. Interpretive researchers thus attempt to understand phenomenon through accessing the meaning participants assign to them (Orlikowski & Baroudi, 1991, p.5)

I tried to understand these different interpretations through what people say and do on the ground. For example, while the mobile phones were initially seen enthusiastically by the field nurses as how it would help their reporting, and interactions with doctors, colleagues, and patients, the State saw this phone as helping to improve control. These differences were expressions of the varying interpretations these groups had of the phone, and as a researcher I tried to understand the “why” behind them.
I saw the strength of the interpretive research perspective in offering me the space to understand and reflect on the complex and multi-faceted phenomenon of empowerment, without being locked in a certain viewpoint. This multiplicity was especially important for me, as empowerment is understood differently by different people, shaped by similar and different structures and power relations, their own agency, willingness and space to participate, and their relations with technology. These multiplicities give rise to multiple value-laden perspectives on issues, which interpretivism makes building understandings of them much nuanced.

4.2.2. Research strategy of action research

I believe that technologies do not come ready with a ‘perfect fit’ for a context; and these need to be cultivated and designed to fit the context, especially in the public sector of a resource-constrained environment. This process of cultivation and design is an ongoing, reflective and an iterative process, influenced by culture, social structures and user perceptions. Action research provides the tools and framework to carry out such cultivation through an ongoing process and analyze a multidimensional world where it is very difficult to analyze cause and effect (Wood-Harper 1984, p. 180). Baskerville and Wood-Harper (1996) describe action research as the touchstone for the development of good organizational practice, and since my research involved contributing to practices of system development and project management, action research was valuable to my approach. Further, the value of action research lies in providing a mechanism for understanding complex social events in the real world and the challenges in attempting to change them. Therefore, this mode of research requires researchers to be reflective as well as iterative in bringing about intended changes (Baskerville and Wood-Harper 1998). By design, the researcher collaboratively participates in the change processes in an organization, actively trying to improve some stated problem by introducing change and observing the effects of these efforts (Baskerville 1999).

In my case, the action research efforts have had two fundamental bases. The first concerns my affiliation as a PhD student in the Department of Informatics, University of Oslo. Within this community, I was exposed to theoretical ideas and approaches, and also how other researchers have addressed similar and different problems in other contexts. My other base was at HISP India, the Indian NGO, which was working with States in India on ICT projects, some of which I have selected for my thesis. HISP India had formal agreements with the states to conduct different interventions, and also the guiding principles and structures to do so, such as
having Memorandum of Understandings (MoU) with states including relevant Non-Disclosure Agreements. Such MOUs helped provide the practical side of my collaboration agreements and responsibilities with the clients (State governments) which defined the client-infrastructure framework. My PhD work then involved merging the two foci of my work – the research and action, which was indeed a big struggle. While I have not followed the traditional cycles of diagnosis, action, learning and revision in my work, these processes have been ongoing. The MOUs helped me to collaboratively with the client define the problem to be addressed, a fundamental requirement of action research. There were milestones defined in the project, which were sites of collaborative review and identifying and taking corrective action. These were points also of reflection and theoretical development expressed through the different research papers I have written during the course of my thesis.

My research was conducted within the HISP research programme, which has pioneered the action research approach of “networks of action” (Braa et al 2004), rooted in the Scandinavian tradition of participatory design and workplace democracy. The networks of action approach works on the simple principle that we learn better in collectives (termed as networks) than in isolated settings, and action research is about creating and sustaining these collectives and enabling sharing across elements in this network. Specific actions identified by Braa et al. includes sharing of open source software and resource materials (such as training manuals), circulating of ideas and experiences across members in the network.

To illustrate how the networks of action approach have informed by research, I cite an instance from one of my cases on the hospital information system. Action research allowed me to adopt an approach deeply grounded in participatory design principles informed by a collective comprising of staff members from different departments in the hospital. The idea was to enable forums in which the collective could meet, discuss, share their respective experiences, and enable learning from each other. This approach was also compatible with the need to define requirements as the project evolved rather than implementing pre-defined requirements. The staff found it difficult to articulate comprehensive requirements, which raised the need to enable a design process which was based on strong mutual collaboration and dialogue, where users were not assumed to be passive providers of requirements, but as actively engaged in co-constructing them, including defining future expectations from the system. The process included observing and understanding the work and information flows in a department, followed by discussions with the department team, returning with mock-up
screens representing our understanding of the requirements for discussions with users, making revisions as required, presenting final designs for signoff and initiating the development and testing of the particular module.

This process of participatory design carried out in collectives was inspired by the networks of action approach. These principles also guided other areas of action such as capacity building, strengthening linkages of development teams in India and Oslo, and various others. In the table below, I summarize key characteristics of the action research carried out from my three case studies.

**Table 4.1: Key characteristics of the action research carried out**

<table>
<thead>
<tr>
<th>Characteristics of Action Research</th>
<th>Case Study: Himachal Pradesh Hospital Information System</th>
<th>Case Study: Punjab MHealth/Mother and Child Tracking System for Health workers</th>
<th>Case study: Kenya Hospital Information System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of problem being addressed</td>
<td>Strengthening and networking of hospital IS</td>
<td>Developing innovative MHealth applications to reduce health worker burden and improve data quality</td>
<td>Design and development of an EHR, with potential for scaling</td>
</tr>
<tr>
<td>Nature of collaboration between researcher and client</td>
<td>MOU between State and HISP India, with my role as project coordinator</td>
<td>MOU between State and HISP with my role as project coordinator</td>
<td>Work contract with MoH Kenya and HISP India</td>
</tr>
<tr>
<td>Kinds of action</td>
<td>Participatory Design; Prototyping; Training; Advocacy; Technical Support</td>
<td>Systems development, deployment, training, support</td>
<td>Systems design, development, training, technical support</td>
</tr>
<tr>
<td>Enabling of networks</td>
<td>Within and across hospitals in the state</td>
<td>Within the state across and within 20 districts</td>
<td>Between different stakeholders in the country engaged with HER</td>
</tr>
<tr>
<td>Mechanism for reviews</td>
<td>Monthly reviews by State; Evaluation interviews</td>
<td>On completion</td>
<td>On project completion</td>
</tr>
<tr>
<td>Practical knowledge generated</td>
<td>Development of a robust and scalable HIS</td>
<td>Development of systems and knowledge on MHealth applications for government</td>
<td>Process of customization of a EHR across south-south country contexts</td>
</tr>
<tr>
<td>Theoretical knowledge generated</td>
<td>Conceptualization of participation, capacity, and infrastructuring work</td>
<td>Conceptualization of scaling and power relations</td>
<td>Conceptualization of Communities of Practice in a south-south collaboration context</td>
</tr>
</tbody>
</table>
After discussing the broad approach of networks of action guiding my research, I next describe the comparative case study approach I followed.

### 4.2.3. Comparative case study

A case study allows the in-depth examination of a phenomenon within a situated context. In my study, I have followed a comparative case study strategy to help study the phenomenon of empowerment in three specific case contexts. This then enabled me to compare and contrast across the cases to help discern how processes of empowerment are shaped (or not). In each of my cases, the unit of analysis was the individual health care provider (e.g., health worker or medical doctor), and I have tried to understand how individual level empowerment is shaped by the interaction between opportunity structure and individual agency. In the table below, I briefly outline my case studies, and some of differences and similarities in conditions which may have implications on empowerment.

<table>
<thead>
<tr>
<th>Research facets</th>
<th>Case Study: Himachal Pradesh Hospital Information System</th>
<th>Case Study: Punjab MHealth/Mother and Child Tracking System (MCTS) for Health workers</th>
<th>Case study: Kenya Hospital Information System</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nature of technology</strong></td>
<td>Open source hospital IS networked across 20 hospitals</td>
<td>Mobile based reporting /Software application (MCTS) to track individual mothers and child, linked with mobile</td>
<td>Open source Hospital IS, to be developed into a county wide HER</td>
</tr>
<tr>
<td><strong>Unit of Analysis</strong></td>
<td>Individuals including state administrators, district authorities, and hospital facility service provides.</td>
<td>Field level health workers (called ANMs)</td>
<td>Hospital facility staff</td>
</tr>
<tr>
<td><strong>Contextual conditions</strong></td>
<td>A progressive state with strong mandate on improving public health systems in decentralized settings</td>
<td>A state characterized by strong bureaucracy and processes of centralization</td>
<td>Kenya, a different country context, characterized by high donor dependency and global partners</td>
</tr>
</tbody>
</table>

My comparative analysis focused on understanding the process of empowerment across the three cases. In each case, I firstly studied the opportunity structures (such as donor funding in
Kenya and governance in Himachal Pradesh), and through interviews, participation and other means tried to understand from the perspective of the health care providers whether he/she felt they achieved additional choices (or lack of them) in providing care and supporting their everyday work. I further tried to understand the role of participation, capacity strengthening and technology in mediating this relationship between opportunity structure and agency, to make interpretations around empowerment within and across cases.

4.2.4. Longitudinal design of the research

I have been part of each the three cases right from inception and continuing, some starting from 2009, when I initiated my employment with HISP India, to my enrolment in the PhD programme in 2012 to date. During this period I have engaged in each project in terms of its conceptualisation, developing project proposal and plan, understanding system requirements, system design, capacity strengthening, institutionalisation, feedback, trouble shooting, implementation support, and much more. I have of course done all these activities as a part of the HISP India team working in collaboration with the health staff. In both the Indian case studies (Hospital and Mobile), I have been continuously visiting the implementation sites over the years (at least one visit a month), while in the Kenyan case, due to the distance and costs involved, I have had only 4 visits to the site. These multiple visits over time, many times meeting some of the same actors helped me to understand their expectations and fears, and how these have evolved and changed over time and space. This gave rich insights to different dynamics that may shape or constrain empowerment, and the role of technology.

The Himachal Pradesh project started in May 2010-current. And I have been visiting the implementation sites regularly till early 2014, for meetings, discussions with hospital staff, district teams and state teams. Since 2014, I have had limited visits to each hospital, though my team members have been continuing with visits, and engaging in hands-on and trouble-shooting support as and when required. My continued engagement with the hospitals has been continuing through emails, phone and other correspondence. The Punjab project started in 2009 till 2013, and my engagement changed with different project stages. Initially, we had review meetings at the state level every month and every quarter with districts. I also participated in block level meetings where all health workers came together to discuss the mobile based reporting (monthly report and cancer survey) and progress on MCTS reporting. For the Kenya project, I have been onsite four times between 2013 and 2015, with each trip
ranging from 2 to 6 weeks where we carried out tasks of project conceptualisation, requirements study, and implementation, capacity building and planning next steps.

In the figure below, I have tried to capture the different events of my research across the overall time period.

**Figure 4.1: Timeline of the case studies**

4.2.5. Multi-level and stakeholder engagement

My research across the projects has spanned multiple levels of the global, national, state, district, sub-district and facility. Across these levels, I have engaged with global developers, Ministries of Health, national level teams, state administrators, county teams, district administrators, hospital administrators and facility staff (including medical officer, health supervisors, health workers, nurses, pharmacists, etc) and staff external to health such as IT and Infrastructure. However, I must admit that my interactions have been limited with patients and citizens/users of health services, within the public health sector.

My primary unit of analysis is the individual health care provider and administrator spanning these different levels of the state, district and facility. Processes of empowerment are shaped by the interaction of staff and systems with other inter-connected levels and components of the health system. It is impossible to adequately understand something like empowerment of a
health worker without looking at issues of whom she reports to, how, when and other enabling and restricting conditions.

For example, in the mobile based reporting system project for health workers in Punjab, I worked closely with state, district and facility teams. As the initial monthly reporting system was designed top-down, I collaborated with the state team during the design of the system, finalisation of datasets, reporting flows, defining infrastructure specifications, getting technical systems to work and state-wide capacity building of 5000 health workers in 116 blocks across 20 districts. During capacity building, I worked with district teams to define training content and approach, and during the one-on-one capacity strengthening, where I learnt a lot about empowerment. During the development of the hospital system for Himachal Pradesh, not only I engaged in discussions with the global development community of OpenMRS on technical questions relating to the software platform, I had to work with the state to develop the implementation strategy and for them to provide for resources, with district teams, and individual hospital level departments and staff. This multi-level engagement was important to understand empowerment, how it is shaped, and how it plays out differently across levels and entities.

4.3. Data Collection

Data collection has been intensive, on-going and involved various methods, both formal and informal. Across all the cases, the modes of engagement that helped me to collect data included – interviews, requirement understanding sessions, meetings, training sessions, prototype demonstrations, trouble-shooting sessions, workshops, letters notifications, documents, conduct of capacity building, and building of user manuals, standard operating procedures, and presentations for these sessions. The capacity strengthening process was a rich source of ‘data,’ starting from understanding requirements from the department, including current and proposed workflows, and creating mock-ups and visualization of working screens. Users had difficulties to articulate their requirements, and this was an important source of understanding their mental models and also future aspirations around their work life.

A point of reflection. My personal role of a researcher and a project coordinator would have had a bearing on the process of data collection. Many of the health staff with whom I
interacted, I had a long period of association. In many cases, this stretched over many years, and they would sometimes see me more as a friend and confidante, rather than a researcher. As a result, they would share with me their intimate concerns (such as their interactions with seniors) which normally they would not discuss with external researchers. Further, many times the meetings with them took place in the field or in their offices, and I did not feel comfortable in making notes, as it would be seen as being a little alien to the interviewees. In such cases, I would just try to remember some of the important points made and note them later in my diary. In this process, I may have missed out direct quotes or issues of importance. Also, many times my meetings took place in groups, so responses could not be attributed to particular individuals.

During requirements analysis, discussions were held with users providing the basis for the formal documentation of requirements. Meetings were another vital and extensive source of data collection, including during the requirements study phase, where we had various rounds of clarifications on issues, review of progress, discussions with hardware vendors and network designers, discussions with state authorities on the reporting needs and various others. Capacity building processes were another important source of data collection, including understanding users’ opinions about the system, request for additional functionalities and features, and various others. Log books and suggestion books were maintained by HISP India team to record requests and suggestions from users for support. During many meetings and presentations on the projects, I received different comments which served as very useful sources of data. Various forms of written documentation was prepared, for instance in the case of hospital system design, reports were made for the requirements analysis for each module, flow of patients and information from one department to the other, progress reports, protocols for use of different modules, training material, technical notes on models of knowledge transfer, signage in hospitals to inform patients of revised process, wherever applicable and various others.

I have used interviews specifically in the case of the Punjab project to speak to about 30 ANMs to understand their personal views on the MCTS systems, how it has changed their work life, whether they thought it was for the better and if it provided them more choices in providing care, and their future expectations. In the case of the Hospital project, I helped to design a questionnaire to gather information from staff (and also some patients) on what has been their experience following the introduction of the hospital information system. Together,
with other members of the HISP team, I carried out interviews using this questionnaire in one hospital, and then the team went on to meet about 68 staff and patients from 7 hospitals in the state. This helped me to develop an understanding of the perceived outcome of the system in use and the perceptions of the hospital staff towards the system.

The electronic medium has been a rich and continuing source of data and multiple types of electronic tools were used. For example, at HISP India, we internally used the project management tool called Redmine to archive all project documentation, including reports, presentations, bug requests, bug fixes and the like. Skype calls have been a constant feature in my work, either for getting clarification on issues, or get more information to define a requirement and to review progress on work. Besides all this, there have been literally thousands of emails sent by team members to each other and to the hospital, district and state authorities, which have served as important means of data collection. Data recording took place through two main mediums. One, was my research diary where in I would note down my field observations and notes from interviews. The other was the electronic medium where I maintained my emails, project reports, presentations, meeting minutes and other documents of relevance to my research in designated folders. Then there were photographs which I took during the course of my research which I maintained in the photo gallery. There has thus been a rich, ongoing and intensive process of data collection – from both primary and secondary sources - involving various means and actors across all the cases and over time. In the table below, I summarize the different modes of data collection across the case studies.

Table 4.3: Data Collection Methods

<table>
<thead>
<tr>
<th>Case</th>
<th>Location</th>
<th>Setting</th>
<th>Data collection methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital IS, HP</td>
<td>Shimla</td>
<td>Requirement Study</td>
<td>Group discussions, system mock-up designs, requirement analysis documents, prototype demonstrations, meeting notes</td>
</tr>
<tr>
<td></td>
<td>Shimla, Solan, Bilaspur, Dharmshalla, Kangra, Tanda, Kullum Una, Mandi, Rohru</td>
<td>Capacity strengthening</td>
<td>Formal class room sessions, one-on-one discussions, participant observations, on-job handholding support, training material, standard operating procedures, group discussions, meeting notes</td>
</tr>
<tr>
<td></td>
<td>Shimla, Solan, Nalagarh, Reckong Peo, Tanda, Una, Hamirpur</td>
<td>Feedback</td>
<td>Interviews, focussed group discussions, research dairy</td>
</tr>
<tr>
<td>Case</td>
<td>Location</td>
<td>Setting</td>
<td>Data collection methods</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>---------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Shimla, Solan, Bilaspur, Dharmshalla, Kangra, Tanda, Reckong Peo, Palampur, Una</td>
<td>Troubleshooting</td>
<td>Emails, log books, letters, minutes of meeting</td>
<td></td>
</tr>
<tr>
<td>Shimla</td>
<td>Review meetings, planning meetings, policy drafts</td>
<td>Minutes of meeting, reports, letters, emails, meeting notes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secondary sources</td>
<td>Newspaper clippings, policy documents, notifications</td>
<td></td>
</tr>
<tr>
<td>Chandigarh</td>
<td>Requirement Study</td>
<td>Final datasets, translations in local language, requirement document, mock designs, mobile application</td>
<td></td>
</tr>
<tr>
<td>Amritsar, Gurdaspur, Tarn Taran, Nawanshahar, Hoshiarpur, Jalandhar, Kapurthala, Ludhiana, Ropar Fatehgarh, Mohali, Chandigarh</td>
<td>Capacity strengthening</td>
<td>Formal class room sessions, one-on-one discussions, participant observations, on-job handholding support, training material, standard operating procedures, group discussions, meeting notes</td>
<td></td>
</tr>
<tr>
<td>Fatehgarh, Mohali, Chandigarh, Amritsar, Ropar</td>
<td>Feedback</td>
<td>Interviews, focussed group discussions, research diary</td>
<td></td>
</tr>
<tr>
<td>Across 20 districts</td>
<td>Troubleshooting</td>
<td>Phone call logs, SMS’, emails, meetings, letters</td>
<td></td>
</tr>
<tr>
<td>Chandigarh</td>
<td>Review meetings, planning meetings, policy drafts</td>
<td>Minutes of meeting, reports, letters, emails, meeting notes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secondary sources</td>
<td>Newspaper clippings, policy documents</td>
<td></td>
</tr>
<tr>
<td>Nairobi, Machakos, Mitituni, Athi River, Kathiani Hospital,</td>
<td>Requirement Study</td>
<td>Group discussions, system mockup designs, requirement analysis documents, prototype demonstrations, meeting notes</td>
<td></td>
</tr>
<tr>
<td>Nairobi, Machakos, Mitituni, Athi River, Ikalakala, Katulani &amp; Kalama</td>
<td>Capacity strengthening</td>
<td>Schedule for online sessions, online skype sessions, online training portal, formal class room sessions, one-on-one discussions, participant observations, on-job handholding support, training</td>
<td></td>
</tr>
<tr>
<td>Case</td>
<td>Location</td>
<td>Setting</td>
<td>Data collection methods</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------------------------------</td>
<td>-----------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Machakos County facilities and national level</td>
<td>Feedback</td>
<td>Online skype sessions, interviews, focussed group discussions, research dairy</td>
</tr>
<tr>
<td></td>
<td>Machakos County facilities</td>
<td>Troubleshooting</td>
<td>Emails, log books, letters, minutes of meeting, skype sessions</td>
</tr>
<tr>
<td></td>
<td>Nairobi and Machakos</td>
<td>Review meetings, planning meetings, policy drafts</td>
<td>Minutes of meeting, reports, letters, emails, meeting notes</td>
</tr>
<tr>
<td></td>
<td>Secondary sources</td>
<td></td>
<td>Policy documents, presentations, WHO Protocols</td>
</tr>
</tbody>
</table>

In summary, data collection has involved multiple sources, involving different media, and has been carried out over time. This has indeed provided a rich contextual understanding of the issues, and how they may shape empowerment processes.

### 4.4. Data Analysis

My data analysis process can be broadly described as being inductive, where the empirical insights have helped to inform the development of my theoretical concepts. However, this inductive analysis is not similar to a grounded theory kind of approach where I have started from a blank slate. I had certain starting concepts around development, empowerment, and participation, and these were further revised as I carried out my empirical analysis. In this sense, my analysis process can be described as a process of a conversation between my concepts and empirical works, where each informs and is shaped by the other.

Data analysis throughout the action research projects had the aims of both developing practical knowledge to effectively implement the project and to generate theoretical knowledge which goes into the formulation of my research insights. The data collection and analysis processes have been intertwined, rather than taking place in sequential steps. I have not documented my work as going through incremental cycles of diagnosis, action, learning and revisions. However, action, reflection and revision were ongoing, and staff from the health department were intimately involved, for example giving comments on a report or presentation. These were part of the analysis process. As these various project level
interventions were carried out, the HISP India team members discussed these internally, and with the state team members on how these interventions would contribute to potential improvements. Within the action research framework, there have been periodic discussions on the progress of the project, challenges faced, and inferences on new insights and knowledge being generated.

In my initial theoretical framework, I defined empowerment to be shaped by conditions of participation, capacity, power, and technology. I then developed different papers where I explored each of these concepts in greater detail, for example the Himachal Pradesh case was examined for capacity strengthening, and the one in Punjab on the role of power. For the development of each paper, I read literature, developed themes around the concept, had discussions with my supervisors and colleagues to refine the concepts. Comments received from reviewers of my research papers submitted to conferences and journals further helped to develop the ideas. After having developed papers on the respective themes, I have tried to synthesize these to develop an overall understanding of empowerment within ICT4D framework, which I am presenting in this thesis.

4.5 Conclusions: Reflections on my empirical approach

My empirical approach combines action research and case study. The action research approach helped me to engage in the process of guiding the ICT interventions, while also learning by and through doing. I adopted the case study approach, which guided me to understand what is to be studied. As Stake (2005) says, ‘the name case study is emphasized by some of us because it draws attention to the question of what specially can be learned about the single case’ (443). In my research, by object of learning was the ICT-empowerment relation, and one of my vehicles of learning was action research adopted. There was sometimes a tension between the action research orientation and the case study approach which emphasized understanding. While the case study focuses on understanding a phenomenon in context, the action research is about trying to bring change in that same phenomenon. I was thus trying to study the same phenomenon that I was also seeking to change. I tried to deal with this tension by not being hasty in carrying out the action. I would spend a lot of time in talking to the staff in the setting, collaboratively trying to diagnose the issue before planning and conducting the action. The reflections presented in the thesis then tried to combine both my understanding and the action taken.
My focus on understanding empowerment was from the perspective of the health care providers in the facilities I was studying. These included doctors, nurses, laboratory assistants, and also the computer users in the health facilities. In many contexts, especially in the West, empowerment is studied from the perspective of patients, how they are in control of their own medication or posting of data on their health conditions. My thesis did not focus on this form of empowerment from the perspective of the patients for two main reasons. One, it was out of scope of my thesis as my action research project concerned understanding the implications of ICTs on empowerment of health care providers. Two, within the public health system in India, dealing largely with a rural population, the use of ICTs by citizens is literally non-existent. I would thus have not been able to study the ICT-empowerment relation in this group. However, as I have written in the conclusions, my lack of focus on the end-beneficiaries was a limitation of my thesis. I do believe if citizens are empowered to demand for more and better information from the health system, that could have an influence on the behavior of the health care providers in their use of ICTs and how they would value information.

Crang and Cook (2007) in their book on Doing Ethnographies, provide some questions to reflect on while planning and doing this form of research, and also in writing up the results. I discuss my research experience with respect to these conditions defined by Crang and Cook.

**While planning and conducting research:**

*Are you a detached researcher?*: Interpretive researchers are not assumed to make contributions based on objective findings studied through a detached researcher. In my research, I was not a “detached researcher” for various reasons. Firstly, I had been involved in projects in India while I was an employee of HISP India since 2009. Some of these projects became my case studies when I started my PhD work in 2012. Secondly, I played multiple roles in my research, as I have also discussed in section 4.1 of this chapter. Being both a doctoral researcher and a project coordinator, I think my latter role tended to override the former. Maybe, this was because of the various contractual conditions my organization was bound up with the Ministry, which I felt obliged to upholding. Thirdly, as an action researcher, inspired by the HISP tradition, I was working towards the normative goal of strengthening HIS in the states. As a result of these reasons, I describe myself as a non-detached researcher, and my findings should be seen in that light. An implication of this was my narratives were
strongly oriented telling stories from the perspective of the health worker, towards whom I was ‘attached’. I believe that since the systems were impacting the everyday work of the health workers, whom I was meeting, they expressed quite honest opinions. This was more so evident in Himachal and Kenya, where the environment was more open and trusting, compared to Punjab.

Am I studying pure subjects?: Like I was embedded in different contexts and roles, so were the subjects I was studying. For example, the ANMs I studied in Punjab, were not only the users of the mobile phones which I was interested in studying, but they were also care givers to the rural population in the villages they were covering, they were also administrators buying medicines and distributing money, and playing other roles in the health system. Outside this, they were members of the community, of religious groups, head of families and played similar other roles. All these different roles would impact on their identities and their sense of empowerment which I was studying. Like I mentioned, my focus was largely limited to understanding the interaction between them and the technology within the context of work. As a result, I would argue that my conceptualization of the subject was rather incomplete and not “pure”. As a result, my understanding of empowerment could be seen as partial and reflecting largely the work related context.

Am I studying a “pure” culture?: In defining the boundaries of the research, I tried to create discrete groups, often bounded by time and space. For example, health workers were treated as those who were bounded by the community, within a particular state, and conducting activities that were to reported on periodically – daily, monthly etc. However, in practice, these boundaries are never well bounded and discrete. Because of the multiplicity of roles as outlined above, the health staff move between and within different boundaries, and through this process imbibing different cultural traits. In conclusion, while my academic assumptions were simplistic treating the health workers as homogeneous and discrete groups, in practice there was not “one pure” culture.

In writing the research
As an interpretive researcher, I did not aim for developing statistical generalizations. Crang and Cook (2007) point to a set of 5 criteria which could be useful to reflect on during the course of writing the research:
**Substantive contribution:** This relates to the question of does the research contribute to developing a substantial understanding of social life? I have attempted to this in my research in describing the experience of introduction and use of technology into the work life of health workers. While in describing this interaction, I believe my contribution is substantial, I have not touched upon other aspects of the social life of the subjects studied, such as how they provide care or deal with their administrative tasks, all of which would also have a bearing on their interaction with technology. In that sense, my contribution is not substantial, and overall I would argue I have mixed results.

**Aesthetic merit:** This relates to the analytical practices drawn up and do they invite interpretive responses? I believe I have based my analysis on very rich and historical understanding of the empirical world that I studied. While my empirical base was extensive and rich, I believe my analysis was based on more macro-level and salient understandings. I did not subject my empirical data to detailed coding and analysis, but I do believe my analysis was coherent and rich. I have used the techniques of interview quotes and photographs to enrich the analysis, and emphasize the authenticity of the research – trying to develop a narrative where the reader feels transported to the field of study. How well I could do that would be a question the reader would need to answer. I do believe my analysis would invite other and alternative interpretive responses, for example challenging how could I comment on empowerment of health workers without taking the perspective of the end-beneficiaries. Similarly, there can be other alternative interpretations.

**Reflexivity:** How has the author come to write the text, and how have ethical issues been dealt with? In section 4.1 where I detail my role in the research, I have tried to give a background of my roles and perspectives in the research. I have also discussed the ethical issues I was confronted with during the course of my research, and how I tried to deal with it. I have tried to be reflexive in the research, by expressing these issues which I felt needed to be expressed to make transparent my role and background. In my writing, I have tried to write the text in such a way where it is expressed only as my interpretations, and not “the truth”, and one which invites alternative interpretations. Beyond that, I did not have specific techniques that I adopted in conducting the research.
**Impacts**: Does the text effect me and does it open up new research questions? Yes, I believe the research has impacted me profoundly, in terms of how I see the world of ICT4D. While it confirms some of my earlier thoughts on the subject, it also opened up for me new avenues of thinking. I had a strong assumption prior to my research that ICT4D projects over-emphasize technology at the expense of human centred issues. I do believe this view was confirmed in many of my empirical experiences. In some cases, like in Himachal I saw a different story unfolding, and I do believe the Capability Approach helped my to understand that in a rather nuanced way. A key learning for me was that there can be alternative implications possible for ICT4D, and empowerment provides an insightful lens to understand that.

**Express a reality**: Does the text detail a fleshed out lived experience? Like I expressed in the first point on substantive contribution, I do believe I have detailed out an interesting and rich experience of ICT4D projects in the health system of India and Kenya. While it was detailed, it was also lacking key facets of social life, which I had defined as being out of scope for my thesis. For example, I did not study the perspective of the end-beneficiaries. So, overall I do think I have expressed a reality, but a reality which was clearly circumscribed within the scope of my PhD research and thus necessarily limited.
5. Overview of Case Studies

This chapter provides an overview of my three case studies, which will help to put my research findings in better context. First, I discuss the Indian cases, and then Kenya. The India section has two parts, in the first I provide an overview of the health system, and in the next, I provide details of the two empirical sites (states of Himachal Pradesh and Punjab), and then an overview of the case studies. The Kenya section provides broadly details of the case studied. Additionally, I also describe an overview of HISP India, who through being the project implementer in the different cases, was an important actor in my study.

5.1. Service delivery structure of public health system in India

India’s Public Health System follows a 3-tier system – primary, secondary and tertiary levels of health care; and is established primarily following catchment population norms based on the Indian Public Health Standards. Each level also includes the services of the level below, for example, the secondary level also provides for primary services.

Figure 5.1: Map of India
5.1.1. Primary level

Primary level care is operationalized through the Health Sub Centre (HSC) and Primary Health Centres (PHC). The HSC is the most peripheral and first point of contact between the primary health care system and the community, and provides preventive and promotive services, and also a basic level of curative care. The catchment population norm for a HSC is 5000, and by March 2014 there were 152,326 sub-centres in the country. To better deal with the emerging threats coming from non-communicable diseases and the changing epidemiological situation, the HSCs have been divided into two categories based on the prevailing epidemiological situation and resources available. Each HSC is manned by at least one female health worker called Auxiliary Nurse and Midwife (ANM). As a part of the decentralisation efforts, each HSC is given an untied fund and an annual maintenance grant of about USD 200 each.

The ANM has a double-fold work load of both maintaining an OPD at the HSC and also providing outreach services to the households and community for preventive health services. In doing so, every Wednesday is earmarked for immunisation and Thursday for ANC outreach services in the village to ensure none is left out. Given that one ANM is responsible for five-six villages; one village is covered each week in the outreach camp. Taking together this dual responsibility, she has a heavy workload of data recording and reporting, maintaining about 23 recording registers (with name-based information) and sending about 35 reports upwards for various services provided. Each health programme report covers details of service delivery, stocks and adverse effects.

From the perspective of governance, various constraints to service delivery can be inferred. If a single health worker has to cover 250-300 households in a month, complete 8-10 outreach sessions while maintaining a daily OPD, and then fill and send out 35 reports monthly, the quality of service delivery and data recording work will both surely be compromised. While under the NRHM reform process, the reporting formats were rationalised based on principles of integration and maintaining data integrity (recording data only once), the primary registers were not changed. In practice, due to the deeper divide within and between the different programme divisions at the ministry, the processes of integration and data sharing could never be well institutionalised. Today, the ANM is the target of all new ICT efforts such as the MCTS, and of donors or programmes introducing new data collection and reporting formats without discontinuing the existing.
The PHC, the other unit at the primary level, is the cornerstone of rural health services, providing the first port of call to a qualified doctor in rural areas. A typical PHC covers a population of 20,000 in hilly, tribal, or difficult areas and 30,000 population in plain areas and includes 6 indoor/observation beds. Often the actual catchment area the facility caters for far exceeds the stipulated norms. The PHC acts as a referral unit for the 5-6 HSCs under it, and refers out cases to the Community Health Centre (CHC - a 30 bedded hospital) and higher order public hospitals located at the sub-district and district levels. By March 2014, there were 25020 PHCs in the country. To facilitate decentralisation, an annual untied grant of USD 400 and annual maintenance grant of USD 800 are given to each PHC and USD 1600 to the PHC Welfare Committee to help maintain and improve the physical infrastructure.

A PHC is manned by a medical officer supported by 14 paramedical and other staff. There are two categories of PHCs, one who has a load of less than 20 and those with more than 20 deliveries in a month, which determines the posting of staff. For example, the ones with over 20 deliveries in a month and operate 24x7 get three nurses while the other have two. Work at a PHC is generally facility based where the doctor maintains a daily OPD, but to cater to the immediate catchment area of the PHC, an ANM is also posted there to ensure outreach and preventive service delivery. The PHC is responsible for sending about 12 reports, including those received from the HSC. While previously, there used to be a manual aggregation of the HSC reports at the PHC, now data is directly fed into the national web-based system, typically accessed from the PHC. The medical officer remains responsible for the quality of all reports including those from the HSC.

5.1.2. Secondary level

The Community Health Centre (CHCs), also called the First Referral Unit (FRU), provides the secondary level of care which is largely curative in nature. The CHC provides referral as well as specialist health care. Typically, 3-4 PHCs are included under each CHC thus catering to approximately 80,000 population in tribal/hilly/desert areas and about 1,20,000 in the plains. The country, as of March 2014, has 5363 CHCs. The CHC is a 30-bedded hospital providing specialist care in Medicine, Obstetrics and Gynaecology, Surgery, Paediatrics, Dental, emergency and laboratory services. The CHC receives financial assistance in terms of an untied grant of USD 750 and annual maintenance grant of USD 1600, while the CHC Welfare Committee receives a grant of USD 1600. CHC provides monthly reports on the clinical services provided.
5.1.3. Tertiary level

The district hospital (DH) provides for tertiary level care, representing the “hub” in the "hub-and-spoke" arrangement by which the Indian public health system is organized. As the hub, they provide specialist care, and have better-trained personnel and equipment than the peripheral clinics as the spokes. The District Health system, of which the DH is a key component, is the fundamental basis for implementing various health policies, delivery of healthcare and management of health services (including preventive, curative and promotive) for the district population which may range from 2 to 3 million. The DH plays a key role in the local implementation of national programmes and also the development of district health plans. At present, there are 605 district hospitals in 640 districts in the country. Various specialists including, a surgeon, physician, obstetrician, gynaecologist, paediatrician, orthopaedic surgeon, ophthalmologist, anaesthetist, ENT specialist and dentist are mandated to be placed in the DH, which is expected to cater to 85-95% of the medical needs in the districts, including having about 80% hospital bed occupancy rate.

District hospital receives a support grant of USD 40000 annually depending on number of inpatient beds (ranging from 100 to 500). The DH plays an important role in the primary training of health workers, particularly clinical assistants, nurses, and health aides, as well as supporting the provision of continuing medical education. Additionally, as the focal point of outreach for many programs and medical camps, the DH plays a key role to also reach out to the more peripheral levels of care. Above the district hospital are the super specialized medical college hospitals, which typically are under the department of Medical Education.

The District Hospital is key in strengthening the HIS as they are expected to coordinate data collection in the district, while contributing to a large part of data for health systems planning, including reporting on diseases like neonatal tetanus, acute flaccid paralysis, or operative deliveries. The DH is thus a core data source for providing burden-of-disease data at greater resolution than is commonly available. In practice, the hospital HIS tend to be weak, and not well integrated with the overall district database. This has been the reason why many states, such as Himachal Pradesh which I study in my research, have undertaken efforts to computerize their hospital information systems.

During the 2008 reform process of the NRHM, there were specific data sets designed for different facilities at each level of care, based on the services that the facility was expected to
provide based on national norms. This represented a shift from the area based reporting which existed before, and was often the cause of a lot of duplications in reporting. Today, the national database is receiving data from all facilities in the country going down to the HSCs.

After providing a brief overview of the broad administrative structure of how service delivery is organized and the associated data reporting, I describe in more detail the context of the two states I studied in my research – Himachal Pradesh and Punjab, and also an overview of the respective case studies.

5.2. Himachal Pradesh

5.2.1.1. The state context

Himachal Pradesh (HP) is a hilly state located in the north of the country in the Himalayas, with wide variations in altitude ranging from low hills to high mountains with lakes and flowing rivers. HP has 12 districts with a population of 6,856,509 (2011 census), with a population density of 123 persons per square km, with about ninety per-cent of the population living in rural areas. This has contributed to a high dependence of the population on the public health system, and provides the political impetus to the government to continually try and strengthen it.

Himachal Pradesh has the reputation of being stable, inclusive, cohesive, and a well-governed state and more progressive than its neighbours in northern India. It has additionally, achieved remarkable growth, especially in the last
two decades, which has been accompanied by very good human development outcomes. Despite being a predominantly rural society, educational attainment in the state is among the best in the country with 90% literacy rate for males and 76% for females, poverty headcount is nearly one-third of the national average; life expectancy is 3.4 years more than the national average, and, per capita income is the second highest in India. The sex ratio in the state is 974 as compared to 940 in the country. Today, HP ranks as the third highest amongst Indian states on the Human Development Index.

Figure 5.3: Given the Himalayan terrain, few towns are densely populated and those in upper Himalayas are very sparse, making health services delivery there is a challenge

The state’s hilly terrain, low population density which is largely rural has resulted in a unique context of political and economic cohesion in other ways as well. The smallness creates incentives for collaboration, reinforces inter-dependence, helps transcend divisions, and strengthens networking across groups. The Himalayas is a strong part of the Himachali identity, binding citizens in a common social and religious attachment to the mountains, its flora, fauna and water sources. Underlying its strong economic and social development outcomes, the state has shown commitment to expand access to public services to the remotest areas, across tough, hilly terrains. Health indicators in the state have shown steady progress and are yet another testament to a strong state commitment to the public system, and the state has made massive and sustained investments in its health infrastructure, which is one of the best in the country in terms of per capita availability. By 2005, almost three quarters of the children were fully vaccinated, compared to less than half of all Indian children, and
individual vaccine coverage rates exceeded 90 percent. Malnutrition levels are relatively low in HP compared to the national average, but more than one-third of the state’s children continue to be underweight or stunted. The state has not been able to replicate the overall progress in the nutrition area.

Himachal Pradesh has been able to implement health system reforms state-wide up to the village level, and most importantly strengthen health governance. The state commitment to strengthen public services delivery is seen in its efforts to strengthen and decentralize its public HIS, along with the financial and functional powers to the facility level. The state has made investments to leverage the use of technology in overcoming the geographic challenges. Tele-medicine has been institutionalised to connect far-flung health facilities to hospital and medical colleges to general and specialist consultations. The state has deployed a fleet of over 200 hundred GPS enabled ambulances across the districts to ensure efficient referrals. These ambulances have been equipped with trauma-care facilities and automated ECG machines which transmit patient reports to the referral facility before the patients reach the hospital. The state has been pioneering in connecting all district and sub-district hospitals with an electronic medical record system, which is the focus of my case study, which is next described.

5.2.2. The case context and description of the hospital information systems project

At the outset, an overall timeline of how the empirical project was carried out is summarized below, and then elaborated.

Table 5.1 Timeline of project

<table>
<thead>
<tr>
<th>Time line</th>
<th>Milestones/Events</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>State floats a public tender for hospital information system</td>
<td>53 firms apply; for techno-commercial reasons, no vendor selected</td>
</tr>
<tr>
<td>2009</td>
<td>State approaches HISP India to propose HIS project</td>
<td>After negotiations on scope, the project was informally initiated in May 2010, and a formal MOU signed August 2010 for 2 years</td>
</tr>
<tr>
<td>September, 2010</td>
<td>First two modules released and deployed in reference hospital</td>
<td>Extensive capacity building, and building ownership in hospital</td>
</tr>
<tr>
<td>September 2010 to March 11</td>
<td>Remaining modules released incrementally in reference hospital</td>
<td>A period of stabilization of existing modules, and strengthening of infrastructure</td>
</tr>
<tr>
<td>Date</td>
<td>Event Description</td>
<td>Details</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>September 2011</td>
<td>Started process of deployment of integrated system in other hospitals</td>
<td>Intervening period from March was towards building the infrastructure in respective hospitals</td>
</tr>
<tr>
<td>August 2012</td>
<td>MOU extended by 12 months</td>
<td>By this time only 6 of the 20 hospitals were covered due to infrastructure deployment delays, necessitating this extension</td>
</tr>
<tr>
<td>2012-2013</td>
<td>HIS customized and taken to two new states in India, and two new countries</td>
<td>Additionally, a number of other states have shown interest</td>
</tr>
<tr>
<td>August 2013</td>
<td>MOU came p again for extension for one year, verbally agreed, not yet signed</td>
<td>By this time, due to accelerated deployment of infrastructure, 18 of 20 hospitals covered. A stage of consolidation and state ownership planned for next year</td>
</tr>
<tr>
<td>May 2014</td>
<td>All hospitals covered, additional hospitals now under discussion</td>
<td>Also, the possibility of extending system to PHCs under discussion</td>
</tr>
<tr>
<td>August 2014</td>
<td>MOU extended by 12 months</td>
<td>Focus on additional capacity building to increase system usage in all hospitals</td>
</tr>
</tbody>
</table>

As a step towards strengthening overall health systems, and part of the reform agenda initiated under the NRHM, the state decided to introduce a hospital information system—in 20 district and sub-district hospitals of the state. A Request for Proposal was advertised to which 53 companies responded, in which the state specified a ‘perfect and utopian’ system with features including telemedicine, SMS based electronic
appointment scheduling, digitizing of medical images and videos, and various other technological interventions. With no success on the selection of any vendor, a process which spanned over a year, the state approached HISP India, an Indian NGO working in HP already since 2008 on the routine HMIS. A tripartite memorandum of understanding (MoU) was signed between the State, HISP India and the National Health Systems Resource Centre (NHSRC), a national technical support agency to the Ministry of Health to enable the project implementation of the system state-wide.

As discussed earlier, a DH is typically a 100 to 300 bedded hospital with multiple specialties catering to a daily load of about 800–1000 outpatients and 40–50 inpatients. The systems in a DH are largely manual and with minimal computerization, thus making IT related capacity strengthening a formidable challenge. Through negotiations between HISP India and the state, an incremental approach for the project was adopted, where patient registration and billing were selected as the first modules to be implemented, followed by the more complex OPD and IPD modules. The project was to be piloted in a 182-year old hospital which was to serve as the reference site for the whole state.

Right from project initiation, a participatory and incremental approach was adopted, including for modules prioritization, conducting requirements, design and implementation. An important design guideline was not to `just” automate processes, but also to add value by `re-engineering existing processes. This required the design process to be based on strong mutual collaboration and dialogue, where the users were not assumed to be passive providers of requirements, but as actively engaged in co-constructing them. The process followed included the HISP India team observing and understanding the work and information flows in a department, followed by discussions with the department team, returning with mock-up screens representing their understanding of the department requirements for discussions, making revisions as required, presenting final design for signoff and then initiating the

Figure 5.5 : Pharmacists ensured that system gives all the outputs which helped them replace the registers
development of the particular module. The proposed design was very context sensitive, involving hybrid approaches, where the aim was not to fully automate but to combine paper and computer to ease processes of introduction and acceptance of the system.

District hospitals generally represent a complex system, involving various forms of inter-dependencies between departments including of patient flows, information, and different resources and people. For example, a patient is expected to make payments prior to getting investigations done, so billing becomes a central node which the system must support. Similarly, after an OPD encounter, the patient takes the slip to the billing counter, makes payment against investigations advised, and takes receipt of the payment made. With this, the system sends an ‘order’ to the respective laboratory (biochemistry, haematology, x-ray, ultrasound), and the patient name appears on the patient queue for the respective laboratory. For the patient to be queued for any investigation, they must be channelized through billing. Supporting this work flow needed sensitive design and also process related changes in the hospital.

Developing standards was an important aim of the project. For example, in the case of the radiology module, patient observations were hand written, with no practice of use of specific formats. The radiologists argued that this was the case because of their high patient load which did not give time enough to type too much text. The hospital staff now wanted to standardise radiology observations by creating pre-defined formats for each investigation. The hospital radiologist while recognizing the value of such an approach acknowledged such a system did not exist anywhere in the state and this should be developed as a state and not just a hospital initiative. The radiologist was proactive and started discussions with other radiologists in the state to identify all possible use cases, including integrating radiology cases with billing. For each investigation, parameters for observation were defined and also corresponding result options. For example, for an ultrasound for Neck Swelling the result parameters defined were size of swelling, outline, echo texture, and pressing up to a vessel. And then each result option was detailed for computerization, i.e. size of swelling – actual or abnormal, outline – regular or irregular, echo texture – isoechoic/ hypoechoic/ hyperechoic; and pressing on vessel – yes/no. A negotiated process contributed to the design of forms for 36 investigations, and subsequent development of a generic module to be taken to all hospitals in the state.
As the system was made ready for implementation, HISP India initiated processes of capacity building of the hospital user using training-manuals and standard operating procedures for users of each module on how it can be used. Training was customized to the needs of three broad categories of uses: i) those proficient in computers, including the contractual data entry operators for registration and billing; ii) those who had prior experience with computers (doctors and other health providers), but were not significantly proficient; and, iii) those who had never worked before on computers (including nurses, pharmacists, and store clerks). Out of the total 210 hospital staff, only 10 were in first category, 50 in the second and the rest in three. The training design included the first two-days of classroom exercises with aids like presentations and mocks-up, followed by five-days of hands-on exercises on the system. This was followed by a dry-run of the system in the entire department where users were expected to complete their everyday tasks using the system. After about 3 weeks of training, departments went ‘live’. Overall, there was a successful design and development of the system in the reference hospital, and created readiness to scale to other facilities.

It took about one-and-a-half years for HISP India to develop and implement the complete integrated hospital information system and stabilise processes in the reference hospital, and then initiate scaling processes to other hospitals. These hospitals were located in other cities of the state, typically involving a day’s travel from where the reference hospital was located. As a result of these time and resource constraints, it was not possible to replicate the intensive process of support and capacity building carried out in the reference hospital in the other hospitals. An approach was improvised which involved HISP India enrolling staff from the reference hospital like data entry operators and pharmacists to support training of counterpart staff from the other hospitals for example during union meetings. In this way, some networks of learning were enabled to allow for sharing of experiences and capacities to create stronger collectives. Staff felt a strong sense of pride as they helped mobilize broader processes of
learning. Given that there are a lot of transfers of staff across hospitals, in many cases people who had moved from the reference hospital became champions for the adoption of the system in other hospitals they had been transferred to.

In 2014, all hospitals were ‘officially’ live on the system, HISP India undertook an independent evaluation to understand usage patterns, capacity building needs and user feedback across hospitals, starting with the reference hospital. In this evaluation, about 60 patients were met from seven hospitals to understand the benefits they perceived through the system. This would also provide an indication of the effectiveness of the HIS and the need for further capacity strengthening processes.

There were extreme variations seen in the uptake of the system across modules and hospitals. Given that the registration process was obligatory, requiring every patient to go through the counter, get registered, and take a computer generated slip before going to the next counter (the OPD), the module was well used. Similarly, the billing module was in good use as patients needed to pay to receive different services (such as X-rays and lab tests) before actually accessing them. At all facilities, data entry operators were contracted to run the registration and billing modules. Given the obligatory nature of the registration and billing functions, and that they were managed by dedicated resources, the corresponding modules were actively used across all hospitals. This led to patients getting benefits such as smaller queues, clearer computer generated slips without errors of misspelt names or wrong gender entry, no calculation errors on bills, and
room number to be visited being clearly printed. As a result, patients placed pressure on the registration clerks to keep the module operational.

As contrasted to the well-used registration and billing modules, the clinical modules of OPD and IPD were in a state of relative non-use across most hospitals. The common reason given by doctors was that they were too busy and it was more important to spend time with the patient than with the computer. In some OPDs, computers were not functional, and often some components such as the mouse had been misplaced and not fixed leading to the system falling into non-use. Further, doctors felt using computers required skills and speed, and coming from a “transition generation” they were not so adept with computers. A doctor said: "We haven't used computers all our life, now if we have to use them it will slow down the process and will get difficult to examine patient and do entry at the same time". As contrasted with registration and billing, where the patients knew that they must get the computer print outs to move to the next step of treatment, in OPD the patients were not aware of their rights of the doctor giving them the printed OPD slip. Similarly, the IPD system was also in a state of non-use, and the nurse attributed this to: "We are already overburdened with lot of paper work and nurses are too few in hospitals”. Only two nurses were available during a shift for 20-30 patients.” Often systems went into non-use because the supporting infrastructure of paper, printers and UPS were non-functional and technical support was not easily forthcoming.
Despite this broad pattern of limited use of the lab, pharmacy, OPD and IPD modules, there were specific cases of strongly motivated individuals striving to use the system. A junior doctor in Gynaecology department in the reference hospital said, ‘‘learning to work on an EMR system is an advantage, as when I apply for job at a bigger hospital, I will have an advantage of having worked on such system, given that all big hospitals have an HIS.’’ Motivation for a senior nurse in the male medical ward in the reference hospital was that, she found computers very interesting as she saw her children use them. Though she wanted to learn but never really got a chance, but now she could tell her children that ‘even she knew working computers’, which the children thought was something only for youngsters. Similarly the lab technician in another district hospital said that he had been wanting to bring in many changes in this lab and standardise processes, and changing over to the new system gave him the opportunity to do so. A senior doctor at the reference hospital, who had also been very engaged in the process of finalising requirements, was one of the very few doctors using the system, motivated by the potential of being able to analyse disease patterns vis-a-vis age, gender, and area. The system enabled him to search data to analyse his local information better. The data entry operators had not only became proficient in all modules, but some had also had evolved into master trainers capable to training users in their hospital and also others.

Seen from the perspective of empowerment of health staff, I could identify many interesting examples of increased choices which the users have had access to through the system, and also how the potential was not being adequately utilized, and the long time and sustained institutional effort required for making that happen.
5.3. Punjab

5.3.1. The State context

Punjab is a state in north India, with a population of about 27 million (2011 census), making it the 15th most populated state in India. The state is spread over an area of about 50000 sq. km. making it the 19th largest state in the country in terms of area. The population density is 550 per sq. km, which is inevitable given the opportunities of growth and development in the state. The population of the state is rising considerably due to rapid efforts towards development and progress. The literacy rate in the state is about 73% a figure that has improved tremendously in the last few years due to the consistent efforts of the government.

Punjab is a classic example of a fast developing economy with agriculture at its base. It enjoys the credit of ushering the green revolution in the country in the sixties. A progressive mix of irrigation, fertilizers and high-yielding variety seeds laid its foundation; a process, which was further strengthened by agricultural credit societies, rural link roads, village electrification, and a variety of extension services. Punjab today contributes nearly 40 per cent of wheat and 60 per cent of rice procured for distribution through the national public distribution system. The state is also credited with promoting the white revolution, resulting in the highest per capita availability of milk to the people. A strong agro-based industrialization has been a prominent feature of the state economy. The state has made commendable progress in strengthening infrastructure, particularly irrigation and power. The cumulative effect of all this is manifest in the highest per capita income of the state, a position of pride which Punjab has been holding for most of the years since its formation in 1966.
The state economy, which was growing at a faster pace than the national economy until the late seventies and sustaining the pace during the eighties, received a setback in the nineties. During the last decade, the annual growth rate of the state economy was slower (4.7%) than that of the national economy (6.9%). Punjab held the top position in per capita income among the major states at the beginning of the nineties, but came down to the fourth place by the end of the decade.

Despite this high pace of economic growth, the social and health indicators in Punjab tell a different story. Punjab ranks 16th in the country on literacy, and has a low sex ratio (874 per 1000 live births) in the country as compared to national average of 933. This ratio has declined from 882 in 1991 showing a worrying trend. What is more disturbing is the sex ratio of children below six years of age (798 against 927 for India). From the ten lowest ranked districts in India on child sex ratio, seven are from Punjab. The state also has a high proportion of infant mortality (51 per 1000 live births) and a high prevalence of anaemia. Maternal and adolescent girl health is also a cause of concern. There is the paradoxical situation of malnutrition in the state, this land of food abundance, where 24 percent of women from “privileged groups” are undernourished; which rises to 74 percent in the case of “underprivileged sections”. There is deprivation of women across regions, classes and castes. The success of the Green Revolution paradoxically pushed women, who were important contributors, back into the private and invisible domain of the home reduced to the responsibility for supporting men in taking agriculture forward, and largely invisible in decision making processes. On an all India comparison, out of 25 Indian States, Punjab ranks sixth on the Human Development Index (HDI) but 16th on the Gender Development Index (GDI) reflecting a very high negative differential in the HDI and GDI. This indicates that gender equality cannot be linked to income level alone (Punjab Human Development Report 2014).

5.3.2. Health system in Punjab

The public health system in Punjab is a classic example of fragmented vertical parallel structures. There are four parallel structures within the state health system, including:

i. Directorate of Health and Family Welfare – responsible of all health programmes (planning and implementation) across the state
ii. Punjab Health Systems Corporation (PHSC) – responsible for 182 secondary health institutions in the state, including CHCs, sub-district hospitals and district hospitals

iii. National Health Mission – responsible for all health programmes under NRHM

iv. State AIDS Society – responsible for planning and implementation of HIV/AIDS programme in the state

This state of fragmentation also adversely affects accountability of staff for programme outcomes. This is very noticeable in the area of HIS, which is characterized by data duplication, poor sharing and parallel data collection. This fragmentation is highlighted in the table below.

Table 5.2: Data duplication amongst three programme divisions

<table>
<thead>
<tr>
<th>Unit</th>
<th>Type of Data</th>
<th>System</th>
<th>Input Source &amp; Level</th>
<th>Duplications, if any</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSC</td>
<td>Telemedicine</td>
<td>Paper based collection</td>
<td>data sent in excel sheets from Hospitals with telemedicine units</td>
<td>None</td>
</tr>
<tr>
<td>Hospital OPD</td>
<td>E-reporting</td>
<td>Online software capturing daily OPD numbers from each OPD across 176 PHSC supported hospitals against the targets given to each OPD/ doctor</td>
<td>Duplication with NRHM online OPD monitoring system</td>
<td></td>
</tr>
<tr>
<td>Equipment management</td>
<td>E-reporting</td>
<td>Inventory of equipment in each of PHSC supported facility Performance of each of the equipment</td>
<td>Duplication with NRHM online equipment monitoring system</td>
<td></td>
</tr>
<tr>
<td>NRHM</td>
<td>HMIS</td>
<td>DHIS2</td>
<td>GoI facility dataset entered at facility level (for sub-centres entered at block level) Dataset contains data on – RCH, additional facility level services, mortality details (line listing of deaths) Data entered for sub centre HMIS report through mobiles by ANMs</td>
<td>Duplication with similar data collected by respective programme officers on maternal health, child health &amp; family planning</td>
</tr>
<tr>
<td>Hospital Monitoring</td>
<td>OPD reporting</td>
<td>Online software captures: daily OPD numbers from each OPD IPD Surgeries (major/minor) performed</td>
<td>Duplication with PHSC e-reporting system</td>
<td></td>
</tr>
<tr>
<td>Unit</td>
<td>Type of Data</td>
<td>System</td>
<td>Input Source &amp; Level</td>
<td>Duplications, if any</td>
</tr>
<tr>
<td>---------------------</td>
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</tr>
<tr>
<td>HR</td>
<td>HR System</td>
<td>Online software captures: Employee information – joining, transfers, postings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment management</td>
<td>Online equipment management system</td>
<td>Inventory of equipment in each hospital Performance of each of the equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Death Review</td>
<td>MDR System</td>
<td>Line listing of maternal deaths Entering information on maternal death audit for each death Data entry at facility level and block level</td>
<td>Duplication with HMIS data capturing line listing of maternal deaths</td>
<td></td>
</tr>
<tr>
<td>DGHS</td>
<td>Aggregate district level data on district performance</td>
<td>IWDMS</td>
<td>Online software captures: OPD performance Health Programme-wise performance District level aggregate data entered</td>
<td>Data duplication with all the systems</td>
</tr>
<tr>
<td>IDSP &amp; TB</td>
<td>Online GoI system</td>
<td>IDSP data with district level aggregation TB programme data entry at district level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRVS</td>
<td>Online CRVS</td>
<td>Births &amp; Death registration In pilot phase in two districts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other programme reports submitted</td>
<td>Manual paper based system</td>
<td>Excel sheet created at state headquarter level</td>
<td></td>
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</tr>
</tbody>
</table>

The state has over the years been making efforts towards the integration of these vertical systems, and my case description also touches upon this issue.

5.3.3. Case context

The primary case which I focus on is the Mother and Child Tracking System (MCTS). This system is also linked to the use of mobile technology for reporting on the performance of the ANMs with respect to tracking of care to mother and children. Before discussing the MCTS, I provide a small overview relating to the history of use of mobile technology in the state.

In 2009, the Ministry of Health under NRHM, initiated a pilot to test the feasibility of mobile technology to support mobile based reporting of sub-centre data by the field nurses. This pilot was initiated through the National Health Systems Resource Centre (NHSRC), the technical support group for NRHM. NHSRC in turn requested its technical support partner – HISP
India – to carry out the technical development and implementation activities in five sub-district units (called blocks) in five different states across the country. The States were so selected to get a diversity of settings and administrative structures to test the application.

HISP India developed a mobile based application to capture data from the sub-centre mobile phone and transmit it through SMS to the next reporting level for consolidation. The application was designed not as a stand-alone application for sending the report, but the aim was to integrate with the mainstream district HIS to enable national level reporting. By design, the application was envisaged to be similar to the paper formats to maintain the familiarity and identification of the ANMs to the application. The pilot sites were evaluated, and found to be broadly successful in terms of technical feasibility.

Based on the success of national pilot, Punjab decided to adopt the same application at state-wide scale covering 5000 health workers. The state approached HISP India, who had already been working in Punjab since 2008 on the HMIS, for the design, development and implementation of the proposed mobile application. A tripartite MOU was signed between Punjab, HISP India and NHSRC for a project scope spanning 2 years. There were some key technical differences in the Punjab application from the national pilot, and HISP India were supposed to carry out the required changes. The technical product was adapted and implementation carried out using phones that were provided by the State to 5000 health workers. Broadly, it could be inferred that the entire planning for the project and the design of the systems was carried out at the level of the state health Secretary, with minimum participation of other staff.

A positive feature of the project was the strong ability of the ANMs to learn the application, through the one-on-one training sessions. Given that this process started in mid-2010, when the mobile proliferation was not too high, Android phones had not hit the market, and the experience was a first for many ANMs, this learning was a big success. Along with learning to use the phone to send the report, the ANMs wanted to learn how to use this phone for wider use such as sending MMS. The ANMs felt privileged to have received the phone from the state, and were also provided with a CUG connection to directly communicate with other health staff and even the state team.
The uptake of mobile based reporting was very well taken, and reporting levels were high. However, the sustainability of the project was put at risk because the state did not stop the paper based reporting, which added to the existing work load of the ANM. Further, the ANMs were suspicious of the mobile based reporting and somehow the rumour that caught the imagination was that the phones were given by the state to track their everyday movement, rather than expecting them to send reports. This led to a strike by health worker protesting micro-monitoring and asking for single mode of reporting either mobile or paper based. A lot of time was lost in this process.

While the reporting was stabilising, the State’s contract with the mobile service provider expired, which meant re-tendering. After a two month process a new service provider was
given the contract and then started the process of phone number portability (registering the existing phone number with new service provider) and this took over six months. And by now there was a gap of about 8-9 months of reporting through the mobile. During this time, the national ministry had also made changes in the reporting datasets, which meant that the new datasets needed to be installed on the phones to use the mobile based reporting. While all this was hanging in air for decisions on moving forward, the state was starting another intervention using the mobile which was a cancer study.

Punjab is reported to have one of highest incidence of cancer cases in the country. To understand if this is the case, the reasons why, the nature of spread and the associated intensity, the State launched a door-to-door survey covering 100% households in urban and rural areas. State approached HISP India again to design, develop and implement a mobile based tool to be used for the survey. Interesting, the request to use the mobile application came from the ANMs and not the state officials. During one of the questionnaire pre-testing sessions in a district, some ANMs pointed out that filling the paper forms, sending them to the district where someone would need to enter in a computer based system for processing is a lengthy process, and could be easier done through the mobile phone, on which they already had experience and capacity. This bottom-up suggestion was taken up by the State, and the project successfully executed, representing a first in the conduct of a survey at the state level using a mobile phone.

The experience with mobile technology in Punjab provided interesting insights relating to the role of technology, the agency of individuals and the role of participation. The technology of course provided the functionality of enabling the sending of reports from a distance which reduced the pain of travel and the time it takes. However, this functionality was used by the State in a manner which developed the perception amongst the ANMs that it was used for control and surveillance rather than only reporting. This led to the collective action of a protest which led to discontinuance of the demand for daily reporting. Even though there was this “failure”, there was a broader learning amongst the ANMs about the potential of the phone, and their own capacities to use it, reflected in their proactive role in the cancer survey project. The power of participation and local ownership was clearly demonstrated. The other important learning was the phone is not an isolated artefact, but is inextricably linked with other human and non-human actors, such as the HMIS application, service providers and other elements. Empowerment of users then needs to take into consideration these various
elements of structure and agency, and how their ongoing interaction may lead to unplanned for outcomes. This experience with mobile technology can be seen to also feed into the MCTS case, which I now describe.

5.3.4. Case of MCTS
As part of HMIS reforms under NRHM in 2008, an extensive process of redesign of the HMIS was carried out, including revising data recording and reporting formats, and the design of a web-based software platform on which the forms were configured. All states, including Punjab started with reporting district level aggregate figures, and over time as the software evolved, reporting was decentralized to sub-district (blocks) and facility levels (by 2010). While this reform process was ongoing, the health minister announced in 2009 that aggregate numbers are not good enough for monitoring immunization, and hence name-based reporting must start with immediate effect. A Government of India notification announced:

*It has been decided to have a name-based tracking system whereby pregnant women and children can be tracked for their ANCs and immunisation along with a feedback system to ensure that all pregnant women receive their ante-natal care check-ups (ANCs) and post-natal care (PNCs); and further children receive their full immunisation. An online module for the name based tracking system is being developed and direction of use will be given soon.*

A Mother and Child Tracking System (MCTS) was designed by a government agency, and States were mandated to start collecting data on the formats given, and report using the MCTS. Small teams from all states were called to the national level for training to enter names of facilities, health workers, and assigning them relevant codes. Trainings were designed with a cascade model where state trainers further trained district teams, who then trained sub-district teams and then they oriented the ANMs. From April 2010, data started to flow into the software, and system usage was monitored based on ‘number of women and children registered yesterday and expected’, which was communicated daily by SMS to the State health secretary first thing in the morning. These messages over time added state rankings, telling how the state ranked vis-a-vis others on registrations, and typically indicating how the effort was not enough. Approval of state budgets slowly became conditional to the
achievement of registration targets. Along with this, monthly letters to states from the centre for enhancing registration. For example:

*On close analysis of the data available in MCTS, it is noticed that only 77% of the mothers and 12.5% of the live births are registered in MCTS till date. Moreover the services given to mother and child are not seen updated regularly.*

*(Government of India DO Letters, dated 10.02.2012)*

Two years into the implementation, the ministry was still struggling to get full coverage on registration, and the health minister announced:

*Information is collected to track every mother and child by name, address and telephone for which a call centre has been set up in the ministry to verify the data and inform women of the check-ups and the immunization schedule, health minister said. The Minister also made sample verification calls to registered women under the MCTS database to verify the database entries today.*

*(Press Information Bureau, Government of India, October 2011)*

The word ‘verify’ echoed the same ‘trust level’ which was at the foundation of the launching of the massive tracking system. Such press releases were sent by the ministry each month:

*Over 99.5% districts, 96% health blocks, 88% health facilities (other than Sub Health Centres (SHCs) and 94% SHCs are reporting data in MCTS. Total 2.3 lakh ANMS are registered in MCTS, of which 2.2 lakh (ANM are registered with phone number). Total 8.4 lakh ASHAs are registered in MCTS, out of which 6.9 lakh (82.9%) ASHAs are registered with phone number. Everyday approximately 7-8 lakh SMSes are being sent to the beneficiaries.*

*(Press Information Bureau, Government of India, May-2013)*

In November 2013, the ministry advertised a new request for proposal for setting a ‘Mother and Child Tracking Helpdesk (MCTH)’ to strengthen validation of data as well as a single platform for information exchange.
MCTH shall validate records of health worker, pregnant women and children registered under MCTS by making outbound calls to the health beneficiaries and health workers. Errors / deviations that are generated in the validation exercise must be reported back to MCTS so that corrections can be made. Minimum 70-calls (outbound) and minimum 6-hours of actual calling in a day by individual helpdesk agent. The average calling time per call is expected to be 5 minutes.


Four-years into the programme, the ministry was still at the stage of validating the data, and states unable to generate all required reports. The only figures/data the states received was what the ministry sent with them (via morning SMS, letters or press releases). From 2012, the state could generate reports on facilities not entering data, district-wise monthly data entry, verifications done and services tracked. In state review meetings, the issue of insufficient capacity building came-up as a reason for low registration, and the Population Research Centres (PRCs) were notified as the nodal agency for monitoring MCTS data. PRCs are research units set-up by the Ministry of Health, and the country has 19 PRCs nationally.

I discussed with some ANMs on their experience with MCTS application and implications on their work, especially with respect to workload and quality of care. ANMs expressed concerns about their increased workload with each case (pregnant woman or child) needing to be entered in detail. Data entry could not be completed even with a whole day of work, and ANMs needed to line-up at cybercafés close to their homes to update data entries in the evening after work hours, which they go to with family members for reasons of security. Some ANMs even contracted cybercafés to enter data into MCTS with personal usernames and passwords. An ANM said:

I return from work by 5.30pm, rush into kitchen to get dinner ready and finish whatever I can to leave home by 6.45pm to reach cybercafé by 7pm. The shop closes at 8pm. Only if I put in one hour of data entry everyday can I complete my workload for registration. Am not fast at using
computers and my son does not understand the data. So we both try to complete as much, as cannot afford salary cuts.

ANM, Punjab

The letters from the centre to state giving the state ranking snowballed into letters to districts from the state, with district-wise ranking, and further to each ANM with health-worker-wise ranking. No incentives were given if registration was below 90%, and poor performing workers were publicly shamed by names being displayed on notice boards. Letters called for explanations for low registration, and negative performance remarks were recorded in service books which were the basis for annual confidential appraisals and other benefits.

I am always lagging in my registration targets and I am lowest performer in my district. This has been told to everyone in every meeting. But what’s not told is that I have seven big villages under my area with highest load of mother-child registration in my block. It is always a race to complete data entries – my son and daughter help me complete, but they have college in the day and internet shops is far from home, which does not leave much time for them. Now I have contracted internet shop operator to complete my entries. I pay him from my pocket, which of course does not get reimbursed. We are larger joint family to support and diverting the resources is not helping. But all this still does not help, as I have been now been labelled worse performer, which is extremely demotivating.

ANM, Punjab

While the centre made percentage of MCTS entries a condition for state budget approvals, the state made salaries of ANMs conditional to registration percentage:

State has also started with salary cuts for not meeting targets and I have had three continuous salary cuts due to not meeting the targets. I cannot afford this. PHC has only one data entry person and the load is too much so most of us have been asked to find our own ways to completing entries. I am 58 years and I don’t know computers. I don’t have computer shops near my house. I am struggling with my data entry. I need to take my
registers to computer shop which is far and leave the registers they for 3-4 days. But then I have back log of data entry in registers also. I had suggested using untied funds for completing data entry, which has been denied. So, all of us are using our own money to complete data entry. This is not sustainable.

ANM, Punjab

While discussing the issue of low registration, one AMN pointed that while government issued MCTS formats for reporting, the recording registers were not revised. *How do we report on data that we do not capture?* One ANM pointed to something which was at heart of this MCTS-data relationship:

> We have been dealing with pregnant women and children since I joined service (which was 30 years now). We always discussed cases at the PHC with the doctor about cases which we think to be high risk in our monthly meetings, and also discuss how to plan immunisation and nutrition days and other outreach programmes. But for three years now our monthly meetings are only about percentage of names registered in MCTS, show-cause letters issued to those not completing targets and timelines to complete entries. We do not discuss cases, data or workplan anymore.

ANM, Punjab

In the MCTS case, the use of mobile phone was central in enhancing the visibility of the health workers performance, and to serve as a tool through which power and authority was exercised by the State to monitor the ANMs.
5.3. The Kenya case of hospital information systems

5.3.1. The Kenyan Case context

While the work in Himachal on HIS implementation was ongoing, the project came to the notice of a senior official in the Ministry of Health, Kenya. He visited India to see the system in practice and had discussions with the users and the HISP India team. Impressed by what he saw, he recommended to his ministry to consider this system for Kenya. After about a year of non-action, a senior staff from a development partner (DP) in Kenya initiated a process of re-examination of the possibilities of using HIS and saw a Skype demo of it. This led to a formal request for proposal (RFP), developed by the DP’s consultants, for an Electronic Health Record System (EHRS) envisaged to be deployed across multiple hospitals and primary health facilities in the country.

HISP India responded to the RFP and their proposal was accepted. The agreed scope of work included in addition to the specific facility based requirements for the system, the global vision of an information exchange to enable interoperability of data from other systems (such as human resources, logistics and births and deaths) with the proposed system. Additionally, the scope included enabling the development of a national ‘community of practice’ (CoP) to strengthen aspects of sustainability and local ownership. HISP India proposed a socio-technical and deeply participatory methodology with users being seen key in defining their needs and the trajectory of the system. Strengthening user empowerment was key to the approach, and a focus also of my research.
The project started with a four-member HISP India team visiting Kenya for understanding system requirements over a two-week period. In the first meeting, the stakeholders to constitute the CoP were identified, including MoH officials, DP staff, project management consultants (hired by DP), users from hospitals/facilities where the system was to be deployed, and other members from the donor community. The initial discussions with senior MoH officials included developing a mutual understanding of the broader vision and expectations from the system. After this the HISP India team moved to Machakos (the identified county for the pilot) and visited different facility types, and discussed with users there to understand workflows, practices, information and patient flows, and infrastructure needs. In this process, HISP India team also tried to identify ‘champions’ for the CoP.

On return to India, HISP India developed and submitted to DP and the MoH a detailed report summarizing the proposed approach to system design, development and capacity building. The report was approved by the DP and the project was initiated. Based on the approved requirements, HISP India took the Himachal Pradesh system as the base and started to develop the Kenyan requirements on top it. The existing design of the system provided the design frame, with both constraints and opportunities for the development of the new system.
Over the next six-nine months, two parallel processes on system design and capacity building ensued. Important was to define the different stakeholders who would participate as members of the CoP. While DP, MoH and the HISP India team were key members, the consultants played an important role in enrolling other international partners legitimized by the argument of making the process more participatory. This increasing bias towards international partners contributed to a drop in participation of the local officials, and increasingly online sessions started to be driven by their perceptions where they parachuted into discussions with limited prior engagement and understanding of the context. Over time, the online capacity building sessions started to turn into briefing sessions for new members further contributing to a drop in MoH participation.

The prototype development process was discussed with this evolving CoP over various Skype meetings, feedback received and revisions incorporated. Similarly, for capacity building, session plans were made and online Skype sessions were conducted, and later Moodle (an online training management tool) was introduced for audio-video sessions, competency tests, sharing of feedback forms and resource material. Shaping this online capacity building was the decision of scheduling time of when these sessions would start. For the project management consultants, MOH officials and the HISP India the time agreed of 10 am (Kenya time, twice a week) was convenient, but was inconvenient for the hospital staff as it was peak OPD time, leading to their exclusion in the capacity building sessions.

While the system development was ongoing, the DP and MoH team were finalizing the counties for system implementation. MoH was of the view to select contrasting counties – one progressive and more developed, and the other more remote and less developed. Based on this criterion, Machakos and Turkana counties were selected. While Machkos was next to Nairobi,
a two-hour drive, well connected and developed; Turkana was located in the Rift valley, was rather under developed and reaching by road took two days. As the requirement study was conducted in Machakos, the staff there was aware of the deployment of this new system, and they had the opportunity to share with the India team their expectations from the system. The Turkana team was excluded from this process. After the Ministry informed the Turkana county of the decision to pilot there, the HISP India team were asked to conduct Skype based capacity building sessions for them. This turned out to be difficult because of the extremely poor internet connectivity in the county. The HISP India team requested the project management consultants, who had already attended 15 such sessions, to visit Turkana and provide users an overview of the system. However the consultants could not visit the county due to time constraints, and two months were lost in this process. To overcome this challenge, HISP India created an online training portal and prepared audio-visual training material which was uploaded on this portal. This was done with the idea that Turkana team could download the material and use it at their convenience, and write back their concerns on email. Though this disadvantaged the users there from actively engaging with the broader CoP in the making, but it at least provided them access to the system in an asynchronous mode. This process of capacity building of the Turkana county team went on for about eight months, and suddenly just a month before implementation, the MOH replaced Turkana with Baringo County. This decision caught both the HISP India and Baringo county teams by surprise, giving very little time to initiate processes in the new county.

The system design was primarily controlled by the DP, and limited feedback was taken from the MOH and even less so from the facility teams. The DP wanted to also use this system to further global clinical standards based on ICD10 in the country, which was at odds with the standards the doctors had been trained with in their medical college, including related to classification of diseases, standard convention for procedures and drugs. The MOH did not actively intervene in this decision of the DP, and the voice of the users was left unheard.

The focus of my case analysis was on the role of technologies in enabling participatory processes and how that may enable empowerment of the facility users in the county. While the technology indeed had the potential to enable participation, but in practice, I found it was difficult to materialize. These were due to issues of scheduling, the involvement of DPs who closed spaces for the users, and issues of infrastructure. I develop my analysis further in Chapter 7.
5.4. The Society for Health Information Systems Programmes, India (HISP India)

HISP India was a key actor defining the context of my research. Before discussing why, I first provide a brief background of the organization and their key activities.

HISP India is a registered not-for-profit organization, working in the space of public health informatics solutions since 1999. It started as a small informal group, supported by the University of Oslo research funds, and is today a self-sustained organization, independent of external funds, supporting itself and evolving through self-generated project funds from state government, international organizations, and other international NGOs. Today, the organization has about 30 staff, divided broadly into two clusters of technical and health systems, and I have been the lead for the health systems cluster since 2008.

HISP India is part of the global HISP research and development network being coordinated by the Department of Informatics, University of Oslo, Norway, where my research is situated. While the Oslo team is responsible for developing and supporting the core of the flagship product – open source software – District Health Information System Version 2 (DHIS 2), now a de facto global standard for HMIS software, various nodes of the HISP network are engaged in adapting the global software to local national and regional contexts, providing implementation and capacity building support, and also supporting global networks. HISP India is one of these regional nodes, actively working in South Asia, including in India, Bangladesh, Sri Lanka, Nepal and Indonesia. In addition to the DHIS2, HISP India team is also engaged with other products such as for patient based hospital information systems, human resources information systems, MHealth, and various integration tools. In this way, HISP India is trying to provide integrated solutions for public health informatics solutions within a health systems framework.

HISP India is an important actor for shaping the context of my research. First and foremost, all my research case studies were conducted within the framework of projects HISP India were contracted to do. In my case, they related to 2 states in India and one international project, with the Ministry of Health and WHO in Kenya. Secondly, in each of these projects, through the capacity of my position as health systems lead in HISP India,
I have been the Project Coordinator related to the three case studies. In this role, I have been involved in various facets of project implementation – such as requirements analysis, system design, capacity building, advocacy and planning support. As a researcher, I have been studying processes of ICT adoption and use with a focus on trying to understand their implications on health worker empowerment. As I discuss in more detail in my research methods chapter, the two roles I played were sometimes in tension with each other. I would be taking actions which would influence individual empowerment, and then at the same time be interpreting them for the purposes of my research. Thirdly, the attitudes, methodologies, and approaches that the HISP India team took to the field for purposes of system design, development and capacity building, would have a bearing on the processes of empowerment which I studied. For example, if the design approach adopted was largely participative in nature, then the implications on empowerment would be positive. So, one of my papers reflects on these issues.

HISP India could in many ways be seen to shape both the opportunity structure and also the agency of health workers, which provided the conceptual basis for my understanding of empowerment. Together, with the state, they were involved with making technology choices, defining capacity building processes, and advocating the use of open source software and use more decentralized approaches. All these initiatives then became important in defining the opportunity structure. Simultaneously, HISP India were directly engaged with the health staff, promoting technologies, conducting capacity building, providing support, and other activities, which would influence processes of building health worker agency and their empowerment. In that way, HISP India was a key actor in shaping empowerment, and thus an important element of the context of my study.

In summary, this chapter has provided an overview of the cases studied. Each of the cases includes a detailed discussion on the health context, as it helps to understand the existing opportunity structures, and the potential that has for shaping agency of health workers. The case study describes the detailed project level dynamics, which helps me to understand the expression or not of empowerment, and what have been the conditions shaping it. In the next chapter, I discuss research findings from my different papers.
Chapter 6

Summary of Research Findings

In this chapter, I present a summary of the findings coming from my research papers. Five papers form the basis of my contribution. While presenting for each paper what is the specific contribution, I relate them to my overall research questions posed in Chapter 1 of my thesis, and see how they help answer particular facets of these questions. As a summary of the chapter, I present a synthesis of these findings, which looks at the findings collectively. This then provides the basis for Chapter 7, where I develop my theoretical contributions.

6.1. Research questions posed in this thesis

This thesis has tried to understand the relation between ICTs and empowerment within the broader context of development. The empirical basis is provided by the public health sector broadly in the Indian and Kenyan contexts. The overall research objective is to theoretically understand the mutual relation between ICTs and empowerment within the broader context of public health. This objective has been operationalized into the following research questions.

i. How is empowerment of the individual health care provider shaped within the public health system in the context of ICT4D projects?

ii. How can the relationship between empowerment and ICT interventions be strengthened?

The papers included in my Kappa, address different facets of my research questions, and here I discuss the papers:

6.2. Papers included in the Kappa

I provide below a list of the papers that are included in my Kappa.

6.3. Key findings from the research papers

I provide a summary of each of the paper and how each conceptually contributes to my framework.

6.3.1. Judicious Design of Electronic Health Records: Case from Public Health System in India

This paper is based on a long term empirical work in India involving the design, development and implementation of an Electronic Health Record (EHR) system in the public health sector in one state in India. Experiences in Western settings have taught us that introducing EHR systems on a large scale is a complex undertaking. This complexity is many times enhanced in the context of LMICs, given the limitations of resources, weak infrastructure, and limited prior experience with computerization. This paper focuses on how the design approach was
developed to try and deal with these complexities. This approach of “judicious design” as a metaphor was articulated in developing the analysis. This metaphor points to an incremental, modular, flexible and scalable approach which is fundamentally context-sensitive to the paper based systems existing and as well as the work practices of the hospital staff. A key focus of this approach was to try and reduce the complexity of the initiative before starting it, and then scale with an evolutionary and incremental rather than revolutionary approach. Through the empirical research, three sets of “judicious design principles” were inductively articulated:

**Managing the installed base with selective automation:** Given that district hospitals have a large legacy of manual systems, these cannot be easily replaced by automation. The idea is to design for hybrids of computer and paper based solutions, which can ease the change process in a more incremental manner. For example, we found that while the OPD slip could be generated by the system, the tests were all pre-printed which the doctor would tick mark by hand. This helped to deal with resource constraints (printers not available everywhere) and also with the high patient load the doctors had to deal with on an everyday basis.

**Structuring of interdependencies:** A district hospital is full of technical and institutional interdependencies. For example, a patient can only go to the lab after paying for the test in the billing unit. The system support for this involved both technical and institutional solutions to enable more effective structuring of interdependencies. There were institutional changes involved such as having one window for billing, and the system should allow the billing to generate orders for the laboratory department once payment was received.

**Proactive participation:** This concept sees participation not as a process in which users were asked to passively provide answers, but one in which they would proactively try to take ownership of the system, and inscribe their expectations into the design. For example, the Radiologist in our case, not only tried to say what she wanted for her department, but proactively went on to design requirements which could represent a state wide standard for the radiology system.
Overall, this paper helped me to understand the relation between participation and capacity strengthening. These created implications for the system designers to have more choices based on user suggestions. For the users, it created the possibility to understand how the system could potentially improve their work processes. Overall, in this way I could develop an understanding of the relation between participation, capacity strengthening and empowerment through the introduction of hospital information system in a complex context of a district hospital in India.

6.3.2. Capacity strengthening within a development context: Developing and applying a conceptual model

To enable people to participate, their capacity to do so becomes crucial. For example, a nurse with limited IT skills might be left out by the hospital skills enhancement committee due to the lack of IT skills, even though her ideas and experience may provide very useful contributions to the overall hospital development and enhancement. Seen from the perspective of the user, what is the capacity needed, how that may be enabled and what value ensues are some of the key issues this paper addresses.

This paper aims at answering two research questions. The first concerns understanding Sen’s distinction between human capital and human capability, and the second concerns developing a conceptual model to help apply this distinction. To answer these questions, a process model was developed which describes capacity strengthening to go through three stages: (i) understanding the artefact; (ii) applying the technology to the context of use – called the “capacity for use”; (iii) applying the knowhow to other domains (outside the work sphere) which the user may value – called the “capacity for exchange.” These three stages involves different modes of capacity strengthening, and this takes place within an institutional context, shaped by existing structures.

The paper makes three key contributions. Firstly, in conceptualizing capacity strengthening as a process, it goes beyond typical models based on cascade based approaches to training. Such cascade models are based on ‘training of trainers’ wherein master trainers are created who are supposed to cascade the training to the levels below. These are typically based on one-time training and are more static in nature which contrasts with the process approach emphasised in this paper. A second contribution concerns going beyond the primary focus on skill
development which many ICT4D projects don’t go beyond, to also emphasize the role of mentoring in developing capacity for exchange. For example, in the case study, the data entry operators in the hospital were mentored by the HISP India team to build capacity for them to pursue other activities which they valued, such as doing training or supporting staff from other hospitals. The third contribution is that it puts ICTs capacity strengthening within a broader development context. For example: by building capacity of the locally based data entry operators, the sustainability of the project was enhanced.

The process model developed in this paper helps to understand the process of capacity strengthening for enhancing effective introduction and use of new technology. The development of human capacities is vital to generating a positive impact from technology, as technology emerges as both “the subject” and “the object” in an incremental and evolutionary process. Whilst human capacities are needed in the first place to develop the technology, such as to define user requirements, the process of creating the technology itself enhances the same human capacities, which in turn helps develop clearly articulated requirements. People need capacities to understand what technology they need, and an effort to create the technology can, if executed sensitively, help people to gain those capacities. The model developed helps to understand how intrinsic and extrinsic motivation is important in building capacity. While extrinsic motivation is limited to strengthening capacity for use; intrinsic motivation is a pre-requisite for building capacity for exchange.

6.3.3. Understanding empowerment through technology driven power structures: Case from Mother and Child Tracking System in India

In this paper, I examine the question of “how are ICTs implicated in processes of empowerment?” This question has been examined in the context of field health workers in India who are confronted with a new software application (called Mother and Child Tracking System) to help their work in providing outreach care to pregnant women and children for immunization. This paper builds upon James Scott’s (1998) argument of “Seeing like a State” where often the purpose of large-scale state ICT initiatives is to standardize and simplify complex social phenomenon, with broader intentions to control better the population. My empirical analysis concerned the study of a large scale Indian government ICT initiative to track every pregnancy and immunization related activity relating to every mother and new born in the country. The case is studied through the conceptual lens of opportunity structure,
agency and capacity to use the technology viewed as a “conversion factor”. The analysis leads to the inference that the space for empowerment of the health worker was constrained rather than being enhanced through the introduction of the technology, raising questions about the value of the initiative. The technology had the potential to enhance choices to the ANM in providing care, for example, by being given reports relating to follow up of patients, or early identification of high risk pregnancy cases, and to follow up on immunization drop outs. However, shaped by the structure of authoritarian power, the agency of the ANMs to enhance care is stifled, and instead redirected towards dealing with the challenges of reporting and dealing with the fear of reprimand and punitive action from the authorities.

The capacity to use the technology can play a role of a conversion factor to change the state of the individual from disempowered to more empowered. This process is influenced by structure playing the role of ‘power to’ or ‘power over’. Given the power dynamics, the potential of technology may or may not be realized. This insight speaks to the debates in the ICT4D field on how are ICTs implicated in processes of development, which I have tried to understand through the lens of empowerment – whether the individual is empowered or not and why through the introduction of ICTs.

6.3.4. How does power shape participation? the case of south-south collaboration on public health information systems

This paper discusses the process of making decisions (choices) within a participatory design based project, how these decisions enable or disable participation, with technology playing a mediating role shaping processes and providing a platform for participation. Empirically, this paper analyses the role of power in shaping PD processes in the case of a collaborative effort to design, develop and implement a hospital information system in the public health sector of Kenya. My empirical analysis leads to the inference that participation and power play out through mechanisms of agenda control (what is discussed and who decides the agenda), participants (who are invited in), scope (which solutions are possible) and resources (available time and people). Applying these arrangements makes the exercising of power less visible, because it is difficult to identify what is not on the agenda or which solutions (and problems) are not discussed as compared to what was explicitly stated as the agenda.

The ICT4D literature has for long recognized the importance of participation in technology projects, but the role of technology itself in enabling these has not been adequately explored.
However, for ICTs to be effective it is important for people to ‘participate’ and provide the impetus to use technology. Participation can serve as a catalyst that can bring people together in a “community of practice” and help enable broader discussions potentially creating new and different choices. The presumption is that if people come together then there is a potential for them to engage in broader issues as a collective which can help create a critical mass for change. The role of ICTs in serving as an enabling “conversion factor” can be understood as being shaped by the interaction between opportunity structure and agency.

6.3.5. ‘Empowerment’, the “Invisible” element of ICT4D projects: Towards making it visible

The public health sector in developing countries provides a rich landscape of different kinds of ICT interventions for varying purposes. There is the Health Management Information System (HMIS) for supporting routine reporting, Hospital Information Systems for strengthening patient based care in secondary and tertiary care providing health facilities, mobile technology based applications, and various others to support logistics, human resources management, finance, drugs, and various others. In current times, where the move is towards building architecture leveraging on the internet, cloud and mobile computing rather than the earlier standalone systems, there are initiatives like the Open Health Information Exchange, and Integrated Health Information Architecture. As these technologies and supporting applications become increasingly complex and sophisticated, it comes with the promise of both empowering the users and expected beneficiaries, while also carrying with it the danger of being used by the State for improved mechanisms of surveillance and control.

The thesis explored in this paper is that the notion of empowerment in these initiatives remains largely invisible, and that technology focused approaches tend to dominate, contributing to sub-optimal outcomes. This paper argues that making empowerment explicit and visible, is an urgent but neglected priority. First and most importantly, these applications are meant to strengthen the health worker and health institution capacity to improve coverage and quality of care, which is fundamental to strengthen development outcomes. Second, the public health sector in developing countries are dealing with complex and novel challenges such as the recent spread of the Zika virus in Brasil, and the Ebola epidemic in West Africa, and have severe resource constraints to deal with them. Improved information systems will undoubtedly strengthen their capabilities to combat these challenges. Third, the current investments in ICTs represent huge resources, and it becomes a development imperative that
these resources are utilized frugally and effectively. This paper argues that ensuring that the ICT investments seek to explicitly empower the health work force is key in responding to these identified priorities.

Taken together, these different papers have helped to develop different insights around the ICT and empowerment relations. These insights have contributed to the articulation of a theoretical framework which I discuss in the chapter which follows.
Chapter 7

Analysis and Discussions

This chapter contains my analysis and discussions. I start by presenting my theoretical framework which builds upon the concepts presented in Chapter 2, and which are further extended and adapted through my empirical analysis. I also discuss some of the implications of the framework.

7.1. Presenting the theoretical framework of empowerment

I start this chapter by detailing the framework which I have inductively derived from my empirical analysis.

I propose this as a framework rather than a model, because it aims to be descriptive (of the phenomenon of empowerment) rather than a model which will prescriptively seek to predict under which conditions and how will empowerment be more likely to take place. The primary purpose of this framework is to explain the meaning, qualities, and challenges associated with the phenomenon of empowerment. Drawing from the USC Research Guide (2013), I take the description of a framework as consisting of a set of concepts and their definitions from existing scholarly literature, and use them to relate to broader areas of knowledge. My framework is developed drawing upon concepts from the Capability Approach, and further enhanced drawing upon concepts from technology studies of information systems research. The framework helps to understand empowerment, and make certain generalizations about aspects of the phenomenon.

I next schematically depict the framework, and then go on to describe it.
Figure 7.1 – proposed framework on ICT-Empowerment Relationship

Opportunity structure
- Role of the state
- ICTs and Infrastructure
- Role of donors
- Health System Demands

ICTs as resource
- Conversion ability
- Conversion from resource to capability
- Conversion from capability to achieved functioning

Empowerment
- Enhanced Capability

Participation includes
- Agenda setting dynamics
- Levels of decentralization
- Extent of decentralization

Capacity Strengthening includes:
- Balance between focus on capital and capability
- Modes of capacity strengthening

Agency includes
- Intention and will of individual
- The reasoning for action
- Ability to make change
- Situatedness of agency

Legend table:

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<tr>
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<th>Represents the conditions shaping empowerment</th>
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<td>Represents mutual influences between conditions of empowerment</td>
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125
I now briefly describe the above framework. Please note the numbers below relates to the legend indicated in the figure above.

7.1.1. Opportunity Structure

Opportunity structure represents the existing conditions and institutional context in which choices are provided to individuals and exercised (Alsop and Heinsohn 2005), and also sometimes constrained. In an ICT4D context, these include organizational hierarchies, rules and policies of the bureaucracy, control mechanisms, laws, regulatory frameworks, and informal norms governing behaviour.

The case analysis identified four such elements of opportunity structure relevant to the analysis of empowerment:

- Role of the state
- Prior experience with ICT projects
- Role of donors
- Health system demands

*Role of the state:* This is vividly illustrated through the example of the MCTS project in Punjab. The State authorities primarily saw the potential of the mobile phone as a tool to control the health workers, by enhancing visibility of their work. For example, by mandating health workers to submit daily reports through the phone, they could potentially see the everyday achievements of the health workers as contrasted with the earlier existing monthly reports. Elements of control, surveillance and power were important here. Drawing from Kabeer (2009), the state exercised “power over” largely overriding the agency of health workers supported through the medium of the phone, rather than providing them with ‘power to’, representing additional spaces in which the health workers could exercise greater choices to provide care. In the Kenya case, “power over” was also exercised through processes of decision making, in terms of who is included, who is excluded, and how decisions are implemented, for example in the context of defining the conduct of participatory processes. Power also operates in absence of agency, for instance through rules governing social behaviour. By constraining the agency of users, the possibility of choices open to them is curtailed.
In Punjab, the state introduced MCTS coupled with mobile phones for field health workers. Through this, the state sought to bring order, control and standardize the complex practice of provision of maternal and child health care which are made up of detailed (and often invisible) work practices. These are necessarily far too complex to standardize through software, and requires an intimate understanding of how the health workers conduct their everyday work. The MCTS coupled with high capacity servers and mobile phones represent a high modernist ideology (Scott 1998), which is seen capable of addressing the problem of perceived false reporting, an argument used to legitimize the project. The Health Minister had argued that it is necessary to move the system of reporting from aggregate numbers to names, to address the perceived problem of incorrect and false reporting, and requires a more elaborate technical infrastructure to be established. This infrastructure was supported by institutional measures such as daily feedback on cases covered, reprimands, salary cuts, adverse impacts on performance appraisals and shaming of those who did not meet set targets. This solution is modern because it represents a radical break from the traditional manual systems, which was seen as the cause of the earlier problem of incorrect reporting. The health workers tend to be passive and without capacity to resist the designs of the state, and they have historically worked under a strongly centralized and hierarchical bureaucratic structure, are not used to speaking up, and even less so to resist orders. There is “power over” exercised to constrain health worker agency. Power over, in the Kenya case, is exercised by the donors through control of funds, and the consultants hired with it, who tend to take the agenda of participation away from the hospital staff and spread it over other consultants. However, it is not always the case of agency being overridden, as demonstrated in the case of Himachal Pradesh where a positive governance structure and a long term and progressive vision of the State contributed to provide “power to” the health staff and enable the expansion of agency.

ICTs play a key role in shaping processes of control and exercise of authority. In MCTS, high speed servers, with its ability of storing large amounts of data on a real time basis allowed the state to exercise power over by enhancing the visibility of health workers’ work, which would not have been possible in the old days of manual reporting. While of course the ICTs on their own do not possess the transformative potential to exercise power, it provides the possibilities for the state to do so, and it would not have been possible without the necessary functionalities the ICTs provided.
**Prior ICT projects and infrastructure:** Prior experience of health care providers and the health facilities with ICT projects provides the pre-conditions to the project, which arguably has significant implications on shaping health care provider agency with respect to the ICTs and its use. Firstly, the lack of prior experience also means the required infrastructure is not in place and needs to be established. Secondly, as shown in both the hospital cases in India and Kenya, the users did not have the prior background of computerization which impeded to a certain degree their learning processes. However, it also provided opportunities, for example in India the users were eager and proactive to build capacity about the new, which provided the impetus to actively engage in the participatory design process. In Kenya, this was not the case, and the distance possibly aggravated the problem. The weak internet infrastructure in one county in Kenya, meant the users there could not participate in the Skype training sessions, which adversely impacted their learning and resulting agency. In India, the hospitals were primarily based on manual systems, which meant that the system designers did not have to deal with the challenges of legacy systems, which is often the case.

**Role of donors:** In all the Indian cases, the projects were completely funded internally by the state, and there was no external donor influence. This contributed to strengthening processes of local ownership and in the longer run sustainability. As the India hospital case demonstrates, a locally driven system contributed to more active participation of users in the design of the application. The Kenya case was in contrast, where the donor influence dominated, with significant implications on issues of participation of hospital users, the selection of pilot sites, and other related issues. All these were seen to impede the choices the users were provided with, even though the technology could have been used potentially to provide more.

**Health system demands:** In India, the health system demands were intense with a district hospital catering to a daily OPD load of 500-800 patients. For the administrators, the hospital system was seen as a tool to manage better this high work load and get improved information to support their interventions, for example to strengthen OPD services. For the doctors however, who were directly dealing with the patient load, the system was seen to be an additional load to their work, and they resisted by non-use of the system. In India, in the hospital case, the political situation was such that the government had a strong motivation to strengthen the health system, which made the environment more conductive for ICT initiatives. In Kenya, in contrast, the health system responsibilities had been decentralized to
the county and there were ambiguities with whether the donors, the Ministry, or the county who were driving the project. In this unclear setting, the health system needs, arguably, were not well reflected in the system.

In summary, I have identified different elements of opportunity structure from the cases that were relevant in understanding their influence on health care provider agency. In other ICT4D projects, there may be other aspects which can be relevant, such as conflicts between different political interests or the role of global agendas. A general implication is of the need for researchers to identity aspects of opportunity structure relevant to their particular cases, and how they may impact on agency.

7.1.2. Agency

Agency is a foundational component of the framework and concerns how individual themselves are significant actors in processes of change involving not only choice but also resistance, bargaining, negotiation, and reflection, their sense of the power within. Agency is seen to be shaped by four elements which are now discussed.

*The intention and will of individuals:* Agency represents not only the action that people take, but also their reasons and intentions to do so, which may be intrinsically driven or extrinsic. In the hospital case in India, the intentions of the staff seemed to be intrinsically driven, where they were motivated to do good for the hospital. A vivid example in this regard is of the radiologist, who went to design new forms not only for her hospital, but also for all other hospitals, because she thought the state needed the system. In the case of MCTS and also the Kenyan hospital, this intrinsic will was absent and the agenda was extrinsically driven by the state and donors respectively.

*The reasoning for action:* Agency is expressed through the reasoning for action of individuals. Without a reason, agents are not seen to act. In the Himachal hospital case, individuals reasoned that through an integrated system, the quality of care will improve. They reasoned that by linking different departments through an integrated system, it would create better and more choices for providing for continuity of care and improving work processes in the hospital such as through the structuring of patient queues and printing of computerized receipts. However, some of the doctors in the hospitals reasoned the system would add to their work load, and resisted by not using the system. In the MCTS case, the reasoning followed by the health workers was to use the system to escape reprimand and punishment.
Similarly, in the Kenya case, the reasoning came from following of the instructions of the hospital administrators who were shaped primarily by the agenda of the donors.

*Ability to make change:* In my case, this refers to realize the potential offered by the technology and the ability of individuals to materialize this potential to enable achievement of choices they valued. In Punjab, state control and authority exercised through the large technological infrastructure established around the MCTS application, and the extreme emphasis on reporting constrained the ability of the health workers to provide improved care to mothers and children. For the hospital staff in Himachal, while the state provided an enabling opportunity structure by encouraging decentralization, individuals were motivated to take ownership of the system and participate in defining its future vision and trajectory. This was driven by an intrinsic motivation to bring in positive change in the hospital and in the state health system. They were motivated to create new choices on how to do their everyday work and provide improved care to patients. This motivation and will was supported by intensive capacity strengthening efforts to develop the required ability for them to take charge of the ICT project.

*Situatedness of agency:* Agency is always situated shaped by the prevailing structures. In the case of Punjab, the agency of health staff to provide improved care was overridden by the intentions of the state to use the ICTs as an instrument of control, and in response the health workers introduced a form of “resistance agency” expressed through union based strikes to protest against the demand of the state for daily reporting. In Kenya, while there was an intrinsic will amongst staff to bring change in the hospital, this was however constrained by insufficient opportunities to participate in the system design and development process. While increased choices to the users could have been made possible through the new system, these were overridden by the technical systems, the agendas of the donors, and also the distance between the users and system developers.

The discussion above on opportunity structure and agency reflect a mutual relationship with both enabling and constraining influences. However, the influence of agency on structure takes place over a long timeframe, and is harder to observe empirically within the framework of a PhD project.

A key contribution in this regard has been my analysis of the role of ICTs in mediating the opportunity structure and agency relationship. For example, with respect to the hospital
project in India, the functionalities of linking departments with each other through an integrated system, allowed hospital staff to better coordinate their activities and know about the other workflows. This helped in building both the will and ability of individuals to take action for change. The web-based MCTS carried the functionality of enhancing the visibility of health staff work to the authorities, which influenced their agency in directing work primarily towards reporting rather than the provision of care. It also contributed to the articulation of a form of resistance agency.

7.1.3. Participation

The framework conceptualises participation within the broader framework of opportunity structure and agency. Where opportunity structure enabled effective participation it contributed to a fuller expression of agency, and the opposite was the case when the structures were constraining. I analysed the role of participation drawing upon the work of Puri and Sahay (2003) in the context of ICT4D projects in India where they examined the dynamics of agenda setting, and also how to institutional conditions influence effective participation which I understand through the lens of decentralization.

Agenda setting dynamics: A variety of agencies are engaged in ICT4D projects, including donors, Ministries, IT providers, users and others who influence the agenda setting in the following ways: i) externally driven agenda; ii) agenda shared with communities/users; iii) community/users driven agenda; iv) agenda set solely by community/users. These represent different degrees by which the users own the process of agenda setting, with the first representing the least to the most in the last. My different cases represent different levels of this agenda setting dynamics.

In the hospital case in India, the agenda was developed externally by HISP India in consultation with the State but actively shared with the user group. HISP India had this privileged position of agenda setting because they had the required technical knowledge. In the MCTS project in Punjab, the agenda was defined exclusively by the State, in terms of the solution, training approach, and the selection of the vendors. HISP India and the users were relatively passive implementers of the State decisions, representing an agenda setting process which was external to the users, but still within the jurisdiction of the state. In Kenya, it was a largely externally driven agenda outside the health department, by the donors. None of the cases represented a fully driven user agenda, with Himachal representing the closest to this
level. Further, the process of decision making by itself is important in defining the agenda by establishing who is included and excluded, and how the process is implemented. The framework identifies three elements and their combination; who controls the money; who holds the technological expertise; and, the state bureaucracy.

While ICTs can potentially enhance the ability of people to participate, they need the required capacities to be able to do so. In this way, participation and capacity are inter-related. Without required technical and institutional capacity, benefits would remain limited, and the dependence on additional structures may increase rather than decrease. Technology can play an important role in enabling participation, but people must have adequate access to it, and also the capacity to use it effectively. The India hospital case was interesting in this regard, because it acknowledged that users did not have the prior capability to define requirements for the hospital system, and as a result the contract was created in a manner in which defining requirements through a process of participation was part of the contract and was not pre-defined.

Further, ICTs have the potential to drive the process of participation of people on common interests. In the hospital project in India, the process of participation got the entire hospital staff together as one unit, further enhancing their skills and understanding of the computer based systems, its logics and possibilities. Capacity building is not a one sided process, and in this case also required HISP India team to understand the logic and working of hospitals. Participation also created possibilities for user knowledge to become a benchmark and also a deterrent for participation. In both Punjab and Kenya, the users were not engaged in the requirements process on the implicit argument that “users don’t understand technology,” which was contrary to the reality where it was only they who knew how the work systems operated. This non-participatory based design contributed to the initial resistance in uptake and trust in the system, with negative longer-term consequences. When users are not constrained to participate, their sense of ownership of the system is enhanced. Like the Punjab mobile based cancer case demonstrated, the users when not guarded and controlled, and based on their understanding of the potential and experience of the mobile phone suggested the use of it for the cancer survey. This led to the design of an innovative system with positive consequences.
Levels and extent of decentralization: Institutional conditions, representing opportunity structures, are important in shaping processes of participation. The cases demonstrated different institutional conditions reflecting different levels and extent of decentralization and their influences on participation. In the hospital project in India, the state gave full autonomy to hospitals to take design decisions to build a system which was to serve as a reference for the entire state. The state played an enabling and supporting role as and when required by making enabling decisions, providing resources, and giving confidence to the hospitals that they are supporting them. In turn the hospital, gave autonomy to each department to give requirements, a space which was then provided to individual staff. This non-controlling, decentralised and facilitating structure enabled a bottom-up participation of users and a stronger sense of their ownership. In Punjab, the institutional structures were top-down and hierarchical, excluding participation. In the same way, MCTS was a centrally designed programme, and the states were not involved in their conceptualization. Similarly at state level, there was no participation from districts, and levels below. Implications of this has been that the system, after six years of implementation, still has very poor uptake and the usage of data for action is yet to start.

In assessing the extent and level of decentralization, the role of donors is also important to understand. Many ICT4D projects, particularly in African countries are funded through external donors. Donors typically act at the central level, with limited decentralized action. Donors arguably, provide a layer between the system providers and users which have typically adverse implications on participation since most often the donor interests get priority. In Kenya, the process of participation was lost between the development partners and ministry, never really reaching the actual hospital users. Feedback, when coming from the users, tended to be overridden by the donors, using the argument of the need for compliance to global standards, such as the use of ICD 10. And this resulted in poor ownership of the system in the hospital, with further negative implications on participation. In contrast, in the Indian case, all funding came from the state, which facilitated a more direct participation of the health facility staff in the system design and implementation process.

The institutional conditions influence the level and extent of decentralization. Though the decision of adopting the new ICT was taken high up in the hierarchy in all cases, but in the Indian hospital case the system design and implementation including infrastructure procurement was decentralised to the hospital level, which was not so the case in Punjab and
Kenya. In the Indian hospital case, the political and governance structures were progressive and decentralized, and the capacity building processes were largely driven by the users. Other structural conditions were also seen to be relevant to the analysis. For example, in India a senior bureaucrat heads the health department, who typically moves from the position in a couple of years which provides a discontinuity to the implementation efforts. Furthermore, the public sector tends to impose restrictions on recruitments, which meant that the hospital could not hire full time system administrators.

### 7.1.4. Capacity strengthening

**Balance between building capital and capability:** As discussed in Chapter 2, Sen and Dreze (2002), have discussed two broad purposes of capacity strengthening. The first reason, which is most commonly seen in ICT4D projects, is towards the development of capacity for instrumental reasons, such as to build ICT skills to do every day work better. This refers to the building of human capital. The second reason is the development of capacity for the sake of knowledge for its own sake. For example, a person learns to use the computer so as to be able to surf the internet to learn about other countries and cultures. This refers to the development of human capabilities.

In my paper *Capacity strengthening within a development context: Developing and applying a conceptual model*, included in this kappa, I have proposed a conceptual framework which builds upon the above described distinction between human capital and capability where capital refers to people’s ability to use ICTs primarily for instrumental reasons, while “capability” refers to how people are able to use the technology to pursue choices they value. This framework describes capacity strengthening to evolve through a three stage process, the first involving the orientation of the individual to the functionalities the ICT offers, to their building human capital to apply it to do their everyday work better, to the third stage where the capacity gained is also used to pursue choices the individual values, which is to develop capabilities. I have termed the building of human capital to refer to “capacity for use” and capability as “capacity for exchange.” Building human capital and capability is not an either-or, but where one is necessary for the development of the other. Further, capability is not just the function of an individual’s objectives and abilities to meet them, but also on the choices available within the context of the institutional and social conditions in which they operate.
In ICT4D projects, the focus is primarily focussed on building skills with limited attention paid to strengthening capabilities. For example, in the MCTS project in Punjab, the users had to first understand the technology, its different functionalities, and how that could help them in their work. At this stage, the focus of capacity strengthening was exclusively on teaching skills on how to use the mobile phone. In the next stage, the health workers needed to build capacity to apply the technology to support her everyday work of data reporting, and making it more efficient and effective. This was building “capacity for use”. At a higher level, she built enough capacity and expertise to apply it in a new area of area of cancer survey which was intrinsically driven, despite the institutional conditions where they are typically not given much space to voice their opinions. Further, the choice of using the mobile was made amongst many competing choices of technologies. Outside the work domain, one worker used her skills to teach her son how to surf the internet, representing a form of “capacity for exchange.”

In ICT4D projects, it becomes important to find a balance in the capacity building efforts between building human capital and human capabilities. At a basic level, it is important to build human capital by arming individuals with the basic skills to use the ICTs effectively. However, limiting the focus to just this can have adverse implications for the future. It is also important to develop human capabilities whereby individuals can take advantages of the different choices available shaped by the different social conditions in which they operate, to pursue choices they value. There is thus an important need to find the right balance between these two aims.

Modes of capacity strengthening: In the case of the India hospital project, the overall capacity strengthening design was deeply embedded in a participatory approach, right from system requirements, design, deployment, deploying the system, scaling and trouble-shooting. This approach contributed to the building of system ownership and for mutual learning to take place for both the users and HISP India. Two approaches were taken for the capacity strengthening process. Firstly, in the initial stages the focus was on getting the users to better understand the artefact, largely through a skill based training approach. The Kenya hospital case, in which the capacity strengthening took place online, the focus was nearly entirely on skills development. Following this, in India the users started to apply the technology in their everyday work setting, supported through coaching and on-job help. This was also supplemented with frequent group discussions where users shared their respective experiences.
of using the system. This helped to foster capabilities. An example of this was of a senior nurse wanting to learn computers for non-work reasons, in a more exploratory mode – for the sake of learning. In Punjab, the first phase of mobile based reporting was driven top-down and non-participatory. But in the second phase, as seen in the cancer survey, only when the health workers had imbibed the technology and realised the potential value, the process became more bottom-up and participatory, being driven by the health workers. It is important to note that only when the health workers understood the use of artefact and were able to imbibe it in their ‘daily life’, could they influence the hierarchical set-up of capacity strengthening and shape the choice of technology in the survey project.

A key contribution of this thesis in this regard is the articulation of a three stage model of capacity strengthening, moving from the phase of learning about how to use the technology, to applying it for everyday work tasks, and then to build abilities of individuals to apply the technologies to achieve the choices they value.

7.1.5. ICTs

Conversion ability: Drawing from the ensemble view, technology has been conceptualized as an element in a larger socio-technical collective where the different elements of the technical (such as the ICT infrastructure) and the social (such as structures of governance) need to be well aligned. The social comprises of human actors including administrators, facility users, donors, and system developers. The non-human actors include the software being developed, the mobile phones, servers, networks, printers, power supply equipment and others. While the artefact itself serves as a resource, the perception and ability the users have in using the available functionalities of the technology for their everyday work, is described in this thesis as its conversion ability. How the institutions involved such as the Ministry of Health or the donors position the technology also influence how the ICT is perceived and used, acting also as conversion factors. For example, in the Punjab case, the system was perceived by the users as strengthening upward reporting. The perception the health workers about how the phones will be used by the authorities to monitor them, influenced the conversion of the technology from a resource to a capability.

Different technologies provide different functionalities and are used in varying ways by users. The mobile phone allows SMS transfers by which health workers could send their routine
reports. This same functionality was used by the administrators for control and surveillance purposes. The OpenMRS based hospital information system provided a very different form of functionality, for example to link the different departments within the hospital. While for the data entry operators, this functionality was used for conducting the registration and billing functions and in this process enhancing their capacities, the same was seen negatively by the doctors who saw the system adding to their work loads and taking time away from providing care. The MCTS system was used to strengthen the institutional structures of central control, while the hospital system helped introduce new structures that valued information.

The positive consequences of judicious design were an important learning from the hospital project in India. Rather than aiming for complete automation in an environment with limited prior experience of computerization, the judicious design approach aimed for selective automation by the combining of computer and paper. This helped to bring in changes in an incremental manner, minimizing work disruptions for the users.

Conversion: from resource to capability and to functioning: Technology, is firstly a resource which needs conversion to become a capability for an individual. This takes place for example by the State taking a decision to adopt the technology, or the donor providing funds for a project. The perspective that individuals have on how the ICT functionalities can enable their work also contributes to it being converted from a resource to a capability. Next, conversion factors are further needed, for example through capacity strengthening programmes and participation, to convert this capability into an achieved functioning. In some cases, this conversion is effective, while not so in other cases. The mobile project provides an example of the latter influence, while the hospital system serves as an example of the former. The framework does not assume technology in a deterministic mode where it will automatically bring about positive or negative outcomes, but varying kinds of effects are possible. Further, these effects will take place over a period of time, and the nature of influences will vary. Like in the mobile case, the initial influence was not positive, but over time as demonstrated by the cancer survey example, more positive effects were seen.

7.1.6. Empowerment

The aim of the proposed framework is to understand the technology and empowerment relationship, where empowerment is conceptualized as an expansion of capabilities. In the proposed framework, it is argued that ICTs mediate the opportunity structure and agency
relationship. The perception and use of ICTs are shaped by processes of participation and capacity strengthening. Some of the dynamics influencing empowerment are detailed below.

1. While an enabling opportunity structure of decentralization has positive implications on expanding agency, donor agendas are seen to have a contrary influence. Limited prior experience with computerization can be positively influencing in that there is not the legacy to deal with, but creates additional demands on capacity strengthening.

2. ICTs are first a resource and for it to become a capability requires conversion, and then further conversion to reach the stage of achieved functionings. Whether this potential is achieved or not depends on various elements including user capacity, the intentions of users of how they want to use the system, and their prior experience and understanding of ICTs. The hospital system, based on the same technical platform, came to different outcomes in the two settings of Himachal and Kenya. In Himachal, there was an enabling and positive governance environment, which gave users the space to participate and build their capabilities. In Kenya, such an opportunity structure was largely absent.

3. Participation is important in building capacity, but on the other hand also requires capacity to engage with. Opportunity structures significantly influence the possibilities or not for individuals to participate, for example, a decentralized governance structure has positive influences. Technology can also play an important role in enabling participation, but requires many other elements, such as appropriate infrastructure to be in place. System developers, and the ideology and practices they bring, also has a bearing on enabling or not processes of participation. Through participation, users can generate additional choices on how they can do their work differently, and also on how they can do other things which they value. Participation, supported with appropriate technology and capacity, can thus contribute to enabling empowerment. In a non-participatory environment where such choices are curtailed, there will be negative influences on empowerment.

4. Capability needs to be seen in relation to the ability of individuals to use the technology, amongst the choices available and influenced by the institutional and social conditions of the setting. A focus on building human capital focuses on
building skills, capability allows individuals to visualize and pursue new choices that they value. Enhancement of capabilities contributes to empowerment.

In summary, in this chapter I have presented a theoretical framework to better understand the ICT-empowerment relationship. In the Himachal case, it can be argued that ICTs contributed to health staff empowerment through the enhancement of their capabilities. There were enabling opportunity structures which enhanced the expression of agency to make a change. These structures help to convert the hospital system from a resource to a capability. Positive processes of participation and capacity strengthening further enabled the conversion of this capability to a desired functioning. However, these empowering effects were not universal, as the doctors did not have similar will and intention to make a change, and viewed the technology negatively.

The case of the Punjab and Kenya projects, do not show similar expansion of capabilities, and hence limited influence on empowerment. In both the projects, the opportunity structures were not enabling, as they were largely top down and hierarchical, which curtailed rather than enabling agency. In the Kenya project, participatory processes were adversely affected by the time-space separation of the users and developers, and the limitations of infrastructure to effectively use Skype. In Punjab, the extremely top-down approach did not entail the need for participation. Capacity strengthening efforts in both cases tended to focus primarily on building capital and not capabilities. As a result, in both cases the technology remained largely as a resource which could help individuals realize achieved functionings.

These different empirical experiences help to emphasize the multiple elements that make up the ICT-empowerment relationship, as understood through a Capability Approach framework. This framework is descriptive of the phenomenon of the technology-empowerment relationship, and does not have the ambition of being a model which prescribes and predicts how and when empowerment will take place. This framework in its current state has been empirically derived from the public health context, but arguably carries the potential to be expanded to be made relevant to other development domains like education. There would be other kinds of opportunity structures that may be relevant in these new domains, and different intrinsic and extrinsic motivating factors influencing
agency. These new conditions would need to be studied, and the framework appropriately adapted to support further generalization.
Chapter 8

Conclusions

This chapter presents the conclusions of the thesis. I start by discussing how the research questions posed in the thesis have been answered. With respect to the overall contributions, I discuss empowerment as being the “invisible” element of ICT4D projects. I then present a brief set of conclusions from this thesis, including its key contributions, some limitations, and possible future directions.

8.1. Answering the research questions

In this section, I present a synthesis of my research findings around the research questions posed in this thesis.

Research question 1: How is empowerment at the level of the individual shaped within the public health system in the context of ICT4D projects?

This research question is answered through the framework presented in the previous chapter. To summarize, firstly, empowerment is conceptualized as the expansion of capabilities of individuals. ICTs have the potential to enhance these capabilities, but there are various other conditions that influence this relation. At a macro level are issues of context, which have been described in terms of opportunity structures. Four different aspects of such structures have been identified which were discussed in the framework. At the micro level, the focus is on the agency of the health care providers, characterized by the will and intention of the individuals, how they reason their actions, their capacity to take action and make change.

Contributing to the expression of agency are processes related to participation and capacity strengthening which come into play during a ICT implementation project. Participation is shaped by conditions of who defines the agenda for participation, and the level and extent by which processes are decentralized. Capacity strengthening is seen to be largely a process of the balance achieved between focused on building sheer skills to use the ICTs (which is called as capital) and human capabilities which refer to the ability to use the technology for pursuing choices they value. Furthermore, modes of training vary with the focus on capital and
capability development. While in the former, the approach is more on one way training processes, while in the latter the need is more for coaching and mentoring.

At the centre of focus is the ICTs and its role. Within the conceptualization of the Capability Approach, ICTs are firstly a resource which needs to be converted to be seen as a capability for the individuals. Contributing to the process of conversion is the role of the state or the donors who position it appropriately for the individuals. Furthermore, for this to happen, individuals need to see the functionalities and potential offered by the ICTs to be valuable to them to achieve what they want to do. Next, this capability has to be converted into an achieved functioning, representing achieving something the individuals values. Positive processes of participation and capacity strengthening can be seen as conversion factors enabling the enhancement of capabilities.

The described framework involving a web of inter-related elements can help to interpret the varying outcomes of the ICT projects that were studied in the three different project contexts. From my analysis, the case of the hospital project in Himachal was seen as effective in enabling empowerment of the health care providers, while the other two projects were not so. The Himachal case showed the presence of enabling opportunity structures and a positive level of human agency with the intention to make a change in the provision of health care in the state. Participation processes were proactive and the design approach adopted was “judicious” which combined existing paper-based routines, and provided for selective levels of automation. This incremental approach helped to ensure that while new values were created around work, they were done in a manner which allowed users to make a smooth transition to them. Supporting this implementation process was the manner in which capacity strengthening was carried out. It was long term based, intensively engaging the users, enabling them to see the value of the system for their needs. These conversion factors of participation and capacity strengthening could be seen as positively enabling the enhancement of capabilities, contributing to empowerment.

In the other two cases, the same conditions to enable empowerment were not seen. The opportunity structures were constraining to the expression of agency, and this was not helped by inadequately executed processes of capacity strengthening and participation. While the functionalities of the mobile phone were attractive for the health workers in Punjab, they saw it as something which could be used by the administrators to monitor their movements and
work. This was of course not seen in a positive light, and the technology did not get converted into a potential capability. This, coupled with the inadequate processes of capacity strengthening and participation, contributed to the lack of empowerment through the introduction of ICTs.

How useful could this framework be to understand the ICT-empowerment relationship in projects outside the public health setting, and more generally in ICT4D projects? I argue that my framework does have the potential to be useful in other contexts. Opportunity structures and the nature of agency would be different depending on the setting, but they can be identified and the relationship analysed. ICTs, it features can be analysed and how it is perceived by individuals, and actions of the State or the implementing agency to see how effectively is the ICT converted from a resource to a capability. Similarly, conditions of participation and capacity strengthening can be understood in relation to agency and also how they enable or not the ICT to achieve desired functionings. This will provide insights into the ICT-empowerment relationship.

**Research question 2: How can the linkage between empowerment and ICT interventions be strengthened?**

This question is primarily practical in nature, relating to how the relationship between ICT and empowerment can be strengthened. Practically, the following implications can be developed to strengthen this relation:

1. Improving conditions and processes of participation of users in the design and implementation processes. Involving the users in the process of agenda setting will strengthen participation. Enabling conditions of decentralization where users have more of a say in decision making processes will also be a positive enabler in this regard.

2. Capacity is required to participation, and participation strengthens capacity. Capacity strengthening needs to have participation inbuilt in them, such as by getting users involved in defining the content of the training programmes.

3. Use of ICTs like Skype can enable participatory processes. However, proper scheduling of Skype meetings which allows users to participate is important.
4. Enable capacity strengthening processes which not only have instrumental aims of building skills, but also seeks to contribute to achieve individuals achieve their intrinsic motivations. Coaching and mentoring processes are seen important to develop such a motivation, and allow human capabilities to develop.

5. There are various design implications that emerge from my work. Designing the technology in a manner in which it is seen by users to be useful for them, is an important consideration. Key here is for the technology to be easy to use, and well adapted to the work context of the users. Judicious design, reflecting selective automation, and a sensitive combination of computer and paper is another important implication.

The above represents some of the practical implications that can be drawn from my analysis, to aid the process by which ICTs can enable enhanced capabilities and their empowerment.

In the next section, as concluding reflections, I discuss empowerment as an invisible element of ICT4D projects.
8.2. Empowerment: the “invisible element” of ICT4D projects

I start by quoting an example from a discussion I had with a co-researcher on interpretations around the impact of the hospital information system in Himachal. Four years after the system had been initiated in one hospital, I along with my research colleague were trying to assess the usage patterns of the system in the hospital, and what have been the ensuing impacts. My colleague created graphs to compare the number of patients registering in a day with the number of OPD encounters. The low percentage of OPD encounters made him infer two points: i) The registration clerks were not using optimally the search function to identify revisit patients, and so most patients were being registered as new; ii) OPD doctors are not also not optimally using the system as the percentage of patients showing OPD encounters was small relative to the total patients. This made him see the initiative as largely a “failure.” However, further discussions around these interpretations made us identify that this quantitative analysis was inadequate as there were various other contributing conditions. One, the doctors themselves had taken the decision to create system generated encounters only for chronic patients (like those suffering from HIV, TB and Diabetes) who they felt required longitudinal care and could be effectively supported with an electronic medical record. This decision was made to help them manage the extremely high patient load a day (sometimes 70-100 per doctor). This load gave a doctor about 2-3 minutes per patient. During this time, he or she needed to talk to the patient, make a diagnosis, prescribe tests and diagnostics, reassure the patient of recovery, and suggest follow up action. All this had to be recorded on the paper or the electronic medical record as the case may be. As such, they decided not to create an electronic medical record for patients who were making one time visits to the hospital, which was the majority, most often (70-80 percent of the total patients) for treating common ailments like a fever or a cold. For treating them, the doctors did not see the value of an electronic medical record, as it would take away valuable time which they could better direct it to the care of chronic patients. Another reason for the low numbers of OPD encounters in the graphs was the fact that many of the “patients” even though needing to go through registration, had not come for OPD services, but for non-medical hospital services such as obtaining a certificate for medical fitness required for employment or for a driver’s license. These cases do not show up on the OPD counts.
Through this extended example, I make two points. One, the provision of health care through a district hospital facility in the context of a developing country is an extremely complex phenomenon. Contributing to this complexity is the high patient loads which had to be dealt with very limited resources. These hospitals are usually saddled with manual work flows, high amounts of paper files, poor infrastructure – both clinical and non-clinical, high disease burdens, inadequate human resources in terms of high turnover, numbers and skills, and it would not be an uncommon sight to see a doctor carrying out tasks which in better resourced settings would be done through a clerk or a nurse. Introduction of ICTs, such as an electronic medical record system, in such a context becomes a very complex endeavour where various connected planned and unplanned events have to be catered for. For example, in the hospital case, the implementing team had to constantly deal with power outages which would halt the system and lead to the piling up of an angry queuing public. Often the monkeys in the neighbourhood would pull down the network wiring making the local area network unusable, and with it the computer based system. The socio-cultural-institutional complexity provided by the context represents a unique setting for ICT initiatives in which many such elements are “invisible”.

A second point of emphasis is that a sole focus on the visible impacts, such as looking at the graphs in the example above, would lead us to infer that the doctors are not optimally using the system. However, while examining the invisible impacts, one can discern that the doctors had actually been “empowered” by the system, and were now capable of directing the use of the system to where they felt they needed it most – i.e. to manage the care of chronic patients who needed longitudinal information support. Focusing only on the visible impacts of ICTs tends to trivialize the complexity of multi-faceted and inter-connected system. This focus can potentially limit our understandings of the different positive and empowering effects the ICT based systems may have had on individuals. A more optimistic view would be to not only focus on the constraints and shortcomings of the system, but also the positive impacts, seen through the lens of empowerment.

Zooming out from the particular empirical example that I have been engaged with, to the broader literature on ICT4D, and more specifically in ICT for strengthening health systems in developing countries, a dominant theme has been on the failures of these initiatives. For example, Heeks (2002) has provided the dramatic and much quoted figure of 90 percent full or partial failures of ICT initiatives in developing countries. Sahay and Avgerou (2002) have
lamented about the unrealized potential of ICT based strengthening efforts, emphasizing how they have not contributed to improving health outcomes. Various authors (e.g., Latifov 2013) have discussed how HIS efforts in developing countries are primarily data led and not action lead, thus emphasizing how these systems don’t contribute to enabling action and improving health outcomes.

I will like to argue that these assertions of failures and non-optimal use of systems are at best partial truths for two key reasons. One, they focus on defining success or failure in rather binary terms, and are inferred primarily based on visible impacts, such as of systems not scaling (Saebo 2013), or not sustaining after external donor assistance has been withdrawn (Braa et al. 2004), or not being used by managers to aid decision making (Latifov 2013). Heeks’ figure of 90 percent failures surely cannot imply that only less than 10 percent of the organizations and people involved did not learn anything from these initiatives? Or no learning has taken place amongst the staff which could help them in implementing better a similar system in the future? Such learnings, arguably, represents some positive but invisible impacts of the system which, tend to be glossed over by researchers seeking to identify visible indicators of system success or failure. An inference of failure thus arguably represents at best a partial truth of the story of the impacts of the system. A second reason to challenge these assertions of failures is that the authors focus on a very limited set of features provided by the ICTs, those which support a set of rational assumptions, such as improving timeliness and coverage of reporting, and how the decision maker uses the system generated outputs of tables and graphs to make more informed decisions. Such a lens of analysis firstly, ignores those activities that fall outside the frame of data collection, transmission and use of outputs. For example, how a mobile phone being used to collect and send data, is also used as a means of communication between the health worker and the patients or between health workers themselves. Such linkages may help to improve the overall quality of care. Third, the focus of analysis is on the decision maker, the user of the outputs, while ignoring how a local user (the data provider) may be doing “simple” and “local” tasks such as learning to organize his/her desktop or use Excel sheet to make a budget for his home. These impacts become invisible to the gaze of the external eye seeking to discern visible impacts of the system.

Thus it is important to focus; one, on developing a richer analysis of the social-cultural-institutional complexity of ICT4D initiatives. Second, to focus on developing a richer
understanding of how ICT systems enable and constrain invisible uses, users, and work flows.

Through the theoretical and empirical challenges that I have engaged with in this thesis, I have attempted to conceptualize and foreground these invisible impacts as empowerment, alongside presenting the contributing opportunities and constraints of ICTs. I understand empowerment as the ability to make more and better informed choices to achieve desired functionings, which typically are missed out when we look for impacts that are more visible in nature. Further, the lens of empowerment helps to have as the human as the primary focus, as contrasted with a lens that is framed dominantly by technology. A human-centred focus arguably provides for a richer understanding of the socio-cultural-institutional complexity of the phenomenon under study, and also of the opportunities and constraints of ICTs, which are typically hidden away in rationalistic analysis focusing on outputs and efficiencies.

In terms of contributions, my thesis represents an attempt to develop a human-centred approach to understand ICT4D projects. The motivation being that many such projects focus on the “supply side”, implying the provision of technologies to try and address development problems, in my case related to public health. Such a supply focus tends to not provide adequate attention of the users involved who are expected to make use of the technologies to achieve development outcomes, which in this case is to improve health care delivery. To try and redress this supply side bias, of why and how this happens, and what can we do about it, I drew upon Amartya Sen’s Capability Approach. This theory has become an important lens to understand development, and in recent years being increasingly drawn upon to understand ICT4D projects, although more within an evaluative frame of trying to analyze whether the projects met development outcomes. For Sen, development is about removing the barriers or “unfreedoms” that constrain individuals from pursuing the choices that they individually value. For example, if a family values for their child good health or education or the facilities to play, the state then should remove the constraints, such as providing a school, ensuring bus transport, proper roads and provide a playground nearby for enabling valued choices to be pursued. I drew upon this thinking, to focus on empowerment which focuses on the capability of individuals to create choices, and be able to materialize this potential into realized functionings. In this thinking, the creation of choices (such as a computer based system) which did not exist before represents a positive development potential, but also suggests more needs to be done to realize this potential to achieve desired functionings.
Coming from the ICT4D perspective, I wanted to understand empowerment from the perspective of health staff working in the public health system in India and in a project in Kenya, on what role do ICTs play both in the creation of new choices and their materialization into functionings that individuals value. Further, I wanted to understand the conditions under which such transformations are made possible. ICTs undoubtedly carry the potential for strengthening such processes of empowerment, but whether this actually takes place in practice, I found, to be shaped by two key conditions. The first concerned participation which is about the spaces that the health staff have to voice issues they see important with respect to ICTs, how much control they have over the participation process, and how much their voices are heard and acted upon. The second concerned capacity, to use the ICTs to do the work better, create new choices on how work is done, and also create capabilities which may extend beyond domains of immediate work. I believe the novel perspective my analysis brings in is the focus on empowerment, to understand ICT4D implications, and how this is shaped by participation, capacity strengthening, and the role of technology.

In the shaping of both these conditions of participation and capacity, technology plays an important role. Firstly, they provide the object of participation and capacity strengthening, and how processes get shaped around it. Secondly, on its own ICTs only represents a potential, and many things need to be in place for it to help achieve desired functioning. For example, the mobile phone has the potential for the health worker for improving their reporting processes, including timeliness, reducing travel burden, and data quality. However, for this potential to be realized, the health staff should be able to participate in the process of defining the aims of the application, and also have the capacity to use it, such as of the GPRS facilities to send the monthly report. Further, the technology should provide the health staff to pursue individually valued choices, such as using the mobile internet to enhance her knowledge of nursing and seek other employment opportunities.

Further, this process of ICT enabled empowerment, takes place in a context which is shaped by the interaction of opportunity structure and agency. Opportunity structure represents pre-existing conditions that shapes the ICT related processes, such as bureaucratic rules, levels of centralization and decentralization, budgets for training and various others. For example, a strong central structure may only want the health workers to send reports to the central monitoring authority and not encourage other kinds of local uses that the health worker values.
So, opportunity structure can both enable and constrain. Agency, on the other hand, represents the intention and will of the individuals to make a change and what they do in practice. Sometime, in contexts where there are constraining influences of the structure, a strong agency can still contribute to change. The reverse can be also true, where there is an enabling structure, but individuals do not have the required agency to make a change. I thus have tried to understand the mutual interaction between opportunity structure and agency in the shaping of empowerment. In this way, I build on and extend the work of Dorothea Kleine (2013) in the formulation of the “technologies of choice” perspective. While I adopt her view that choice itself can be an indicator of empowerment, I see ICTs more than just a resource. I see it as intervening in the relationship between opportunity structure and human agency, influencing participation processes, and also being an object and means of capacity strengthening.

Thus, taking these different conceptual pieces of agency, opportunity structure, capacity, participation, ICTs, conversion factor, I have tried to develop a framework to understand the theoretical relation between ICT and empowerment within the context of ICT4D projects. This framework can potentially inform processes of design and capacity building in these projects where the human is placed more at the centre than the technology. Further, I reinforce the arguments made by various social science researchers, that ICTs are not ends in themselves but means to attain other things – both instrumental and intrinsically valued. While my framework has been inductively derived based on my empirical engagement in the public health sector, I believe it has broader value to be also useful in other development arenas such as education, food security and others. These would need to be empirically applied and the model further revised.

The framework developed also has various limitations. One key limitation concerns the lack of focus on collectives. I have followed Sen and other researchers like Dorothea Kleine where the focus was on the individual and their choices. However, how these different individuals, in my case health workers, collectively contribute or not to the empowerment of the health facility or health system, I have not considered in my research. This I believe can be a useful area of future research. Another limitation is that I have only considered the empowerment of the individuals, but whether these contribute to improving health outcomes, such as improved child immunization or reduced level of maternal deaths, I have not considered. And this could also be a useful arena for future work. Thirdly, while I have seen the importance and
centrality of the issue of information use in HIS research and practice, I did not consider it explicitly in my research. This I believe will have an important bearing on empowerment, and should be a subject of future research. Fourthly, and a key limitation, has been my lack of focus on the end beneficiaries of health care, which are the citizens themselves. Active beneficiaries will provide a pull to the health staff, and satisfying their needs could be an active driver of health worker empowerment. Future research should also explore this linkage.

These issues identified, I believe can be useful extensions and refinements of the conceptual framework developed in this thesis. Finally, I believe my research can also contribute to the practice of the flagship HISP research programme at the University of Oslo, within which my research is also situated. It can help to balance the focus which largely emphasizes on the technology to also equally consider how the technology is contributing to the empowerment of the health staff, and also to health facilities and the health system more broadly.
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Appendices (My Research Papers)


Judicious design of electronic health records: Case from public health system in India

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Abstract

Introducing EHR systems on a large scale is a complex undertaking. Based on empirical material from a project where we have developed and implemented an open source Electronic Health Record in a challenging context of a district hospital in India, we articulate an approach we term ‘judicious design’. This metaphor points to an incremental, modular and flexibly scalable approach which is fundamentally context-sensitive to the paper–computer hybrid as well as the work practices of the hospital staff. A key focus of this approach is to reduce the complexity of an undertaking before starting it, and scale with an evolutionary rather than revolutionary approach. Our empirical research helps to identify three sets of ‘judicious design principles’. 1. Managing the installed base with selective automation; 2. Structuring of interdependencies; and, 3. Proactive participation. While these principles have been developed based on an Indian case study, we argue that these could also be relevant in other contexts, including in the West.

Introduction

Large-scale Electronic Health Record (EHR) projects tend to be stalled before their ambitious visions are fully realized, for example Denmark’s G-EPJ project [1], Norway’s MEDAKIS project [2], and so also in Great Britain [3,4]. Assessments of Britain’s National Programme for IT by the National Audit Office [5] have indicated that while there are some gains on strengthening infrastructure, visions relating to fully integrated electronic care record systems have not yet been realized, and the Major
Projects Authority Programme’s Assessment Review has stated that “there continues to be under-estimation, by stakeholders and observers, of the magnitude and complexity of the change involved and the resources and commitment required to achieve the longer term aims and benefits” [6, p. 12].

Often failure of strategic projects lead to a redefinition of the project’s aims, which however do not address fundamental issues arising from the complexity that such under-takings constitute. We argue that these issues relate to design, and in this paper we discuss an alternative approach which we term as “judiciously designed EHR.” The judicious metaphor reflects an approach that is incremental, modular and flexibly scalable. This represents a context-sensitive approach, both in relation to the paper–computer hybrid the system should represent and to the existing work practices. Such a judicious approach has a key focus on reducing the complexity of an undertaking before starting it, and then, through an evolutionary rather than revolutionary approach, take on increasingly complex tasks and domains. Along these lines, we have designed, developed and implemented an open-source based EHR system (which we call OS-EHR) for a district hospital in an Indian state. The system is now in the process of being further customized and scaled to other district hospitals within the state as well as other states. Theoretically, our paper draws on insights gained from studies of how large-scale information infrastructures tend to develop and grow, while dealing with the complexities inherent to this process. The empirical narration is based on experiences from a “developing country”, where EHR systems till recently was seen as an utopian dream.

In the next section, we discuss relevant aspects of literature related to information infrastructure, before we turn to our empirical material. The research approach is presented in section three, and our case study in section four. In section five, we elaborate on the “judicious design” approach and draw some general guidelines. Some brief conclusions are then presented.

Information infrastructure and installed base cultivation

Within information systems, the term “information infra-structure” denotes a theoretical perspective targeted to analysing large-scale, interconnected ICT solutions [7–9]. This perspective emphasizes how information infrastructures are
not constructed from scratch, and rather they emerge through a process where the existing “installed base” is extended, changed, replaced and augmented with new components. The installed base should be understood as socio-technical, not just technical; comprising of existing IT and paper systems, and the accompanying people and their work practices. This installed base thus creates an inherent path dependency, which may both constrain and facilitate, and new efforts must always be “wrestling with the inertia of the installed base” [7]. In a hospital, the installed base would be the existing paper-based system for documentation, along with other paper forms, folders, shelves, boards, and the historically embedded work organization and practices [10]. Change efforts need to be gradual and incremental rather than an abrupt switch, to deal with the inherent inertias present in social systems, such as the existing power configurations. This implies that the old and the new system has to co-exist for some period of time, and the transition strategy is captured by the notion of “cultivation of installed base” [11] where the starting point is the installed base rather than a future-oriented and specification-driven project.

**Handling complexity of information infrastructure building**

Cultivating information infrastructures is a complex undertaking as they typically comprise of a high number of heterogeneous and interdependent elements. Therefore, the growth process typically extends over long time, much more than a typical ‘project’ period, requiring longitudinal strategies. Moreover, often an information infrastructure extends beyond a single organization, implying there is no single locus of control or decision-making, and where strategies other than direct mandate are needed to mobilize the stakeholders. On top of this a project may “induce” additional complexity by the strategic decisions that are made [1], such as the changing expectations of stakeholders. This “chosen” or “-project-induced” complexity comes in addition to the “naturally occurring” complexity of the task, and is a likely explanation for many failures.

Avoiding unnecessary complexity is generally a wise strategy, and may involve breaking up (or modularizing) the larger undertaking into smaller parts, and sorting these parts, prioritizing and sequencing them. While the cultivation metaphor
emphasizes a lesser degree of control and a reliance on the ‘inner’ process running its course, it also acknowledges the need for a more active strategy: the judicious selections involved in breeding in order to bring out the best character-istics of plants or animals. It is this notion of “judicious” is what we want to explore in this paper, in the specific context of a district hospital in a developing country.

In such a context, the conditions are quite radically different from the examples described above from high-resource environments of Western countries. In developing countries, a district hospital will typically be seeing more than 1000 patients a day, there are severe resource constraints (i.e. paper, space, doctors, IT infrastructure, power supply, ambulances). While these conditions of installed base may be constraining to the introduction of a EHR, there may be enabling conditions such as the near absence of existing electronic systems, and the ability of the staff to multi-task and “get things done” in trying settings. Undoubtedly, both these constraining and enabling conditions provide complexity to the task at hand, and things are made to happen in a “trial and error” mode with a lot of “muddling through.” It is this process of managing complexity that is described in the empirical part of the paper, to which we now turn.

**Research approach**

Our research approach can be described loosely as an “action-oriented” one, where we are both researchers studying and trying to reflect and make sense of the implementation process, and project members entrusted by an Indian State (for reasons of anonymity referred to as STATE) to design, develop, and implement an EHR in a district hospital which is supposed to have about 200 beds. As project people, we have been involved in negotiating with the STATE on application scope, conducting requirements analysis, carrying out the design and development of the application, and then deploying it, supporting the implementation through various activities such as training, creation of resource material, and providing hand holding and troubleshooting support. As researchers, who have also worked on similar projects in other settings, we reflect on our other experiences and try to see how it can help here, we try to learn from our mistakes and successes, on what works and what does not,
and slowly try to make more general our principles and learnings of how to carry out such tasks in other settings, but also reflect on how we could do the same task better—with the advantage of hindsight. The experiences and engagement is thus rich, intensive and ongoing (in our case since May 2010) and involving a diversity of experiences.

Sources of data collection are varied, and mostly of an informal nature such as meetings, training sessions, prototype demonstrations and troubleshooting acts. There are of course also formal methods of data collection while conducting requirements analysis, documenting them as use cases, carrying out testing and reporting bugs, and also in making formal presentations to both the hospital and to our research colleagues in the university. Data analysis can be seen as an ongoing process which is inextricably intertwined with data collection, for example requirements analysis of the work flow in a department is simultaneously being analysed and converted into mock-up screens which are taken back to the users to get their feedback on as a confirmation of our understandings. Research based reflections and analysis is done in processes such as this, of writing this paper where the co-authors sit together to discuss our interpretations of the case story, and discuss alternative explanations.

**Case study: HIS design for state**

As a step towards strengthening health information systems, part of the reform agenda initiated under the National Rural Health Mission, State decided to introduce an EHR in 20 district hospitals of the state. A Request for Proposal was advertised to which 53 companies responded, in which the State had asked for a ‘perfect’ system with features including Telemedicine, SMS based electronic appointment scheduling, digitizing of medical images and videos, and various other technological interventions. With no success on the selection of any vendor, a process which spanned over a year, State approached a local NGO (referred to INGO), who had been working in STATE for past four years supporting the implementation and use of routine health HIS for primary health care facilities of the State. A tripartite Memorandum of understanding (MoU) was signed between STATE, INGO and a national technical support agency to
the Ministry of Health, with scope of work including the design, development and implementation of integrated EHR for 20 District hospitals. In the public health system in India, a District Hospital (DH) is typically a 250–300 bedded hospital with at least 10 specialties and serves as a referral institution for the entire district (and sometimes neighbouring districts too). A DH tends to cater to a daily load of about 800–1000 outpatients and 40–50 inpatients.

The scope of work defined in the tripartite agreement initiated from September 2010 included ten modules (registration, billing, laboratory, radiology, out-patient, in-patient, pharmacy, inventory, blood bank, and finance management). An incremental approach was consciously adopted from the outset, for example in the prioritization of which modules should be implemented first. Registration and Billing were selected as the first modules as they were relatively easy compared to the others, and since they had higher public visibility. Success here would enhance the broader hospital buy-in. By the same logic, OPD module was seen to be too complex because of the intricate workflow involved and the potential resistance from doctors, and it was decided to take it up towards the end.

The challenge for INGO was not only to make the HIS functional in the hospital, but also to align and integrate it with hospital practices, including both information and patient processes, in order to not alienate users who had been used to paper-based routines. Thus, right from initiation, a participatory and incremental approach was adopted, including for modules prioritization, conducting requirements, design and implementation. Another important guideline was not to ‘just’ automate processes, but also to make suggestions on process ‘re-engineering’ and add value to the overall process of reform.

Without describing this rather extensive process of overall design and development due to space limitations, we focus on providing examples to illustrate our approach to “judicious design.” For this, we focus on three areas – installed base, interdependencies, and participation – to illustrate how the design tried to manage the complexity contributed by them.

**Installed base: selective automation**
This 182-year-old hospital has well established processes, both workflow centric and patient centric, which was primarily paper based. A key design challenge was to ‘adapt’ the HIS to the central functions of management of patients and also their medical records.

Requirements analysis for each module was thus done with focus on: (i) how does the hospital manage each patient within the hospital—from registration, through different departments, till departure; and (ii) how does the hospital maintain the patient medical records including investigation results, medication, and diagnosis. By design, the HIS was aimed at becoming not just a mere repository of data, but also support patient management based on hospital workflow.

An example of how we tried to address this issue is provided by processes of patient registration and the subsequent flow to OPD (Out Patient Department). Patient registration is done centrally for all at the entry point into the hospital, and relevant details recorded include demographic, referral, and patient type. The registration clerk gives to the patient a printout of an OPD slip containing details of patient identifier, selected demographic details, room number of OPD to be visited, and on the left side (see .Figure 1 below), all investigations done at the hospital are pre-printed. With this slip, the patient proceeds to the OPD room identified in the slip and waits for turn to meet the OPD doctor.

On completion of registration, the system sends an ‘order’ to the doctor of the selected OPD who can see the patient name in the “patient queue” of his/her screen. During the encounter with the patient, the doctor clicks on the patient name which takes the system to the ‘clinical dashboard’ where the doctor can enter details of provisional diagnosis, procedures (if any) advised and visit outcomes, including follow-up plan. In case any investigations are advised, doctor ticks against the list on the OPD slip, where also the prescriptions are written. The patient takes this slip to the billing clerk, where payments for advised investigations are made. Billing then sends an ‘order’ to laboratory for investigations paid for against patient name. In case of prescription, patient takes the OPD slip (where drugs are written manually) to pharmacy to procure the drugs.
This example above highlights some key aspects of the design. The installed base of high patient load in the hospital was approached with a “hybrid” model where investigations and prescriptions were detailed on the paper, rather than attempting to automate all. Right from registration, the system supports managing patient processes such as queuing (registration to OPD to billing and then pharmacy), and also clinical records such as of diagnosis in OPD, investigation results in laboratory and medication in pharmacy. Another learning which was not part of initial design but incorporated later, was choice of printers. Initially, laser printers were used but hospital feedback was that this was ‘too expensive’ to sustain, which got us thinking. On analysis we realized, the daily load of printing 800–1000 OPD, 1000 bill receipts, 200–300 laboratory reports contributed to a daily stationery cost of about USD 80 and about USD 100 for laser printer cartridge replacement every second day. A district hospital could not afford this, and we redesigned the system with a dot-matrix printer, which cut the cost to less than USD 40 per month.

Figure: Patient Registration slip printout

**Interdependencies: selective couplings**
Hospitals generally represent a complex system, involving various forms of interdependencies between departments including of patient flows, information, and different resources and people. DHs in developing countries are no exception to these inter-connections, with the added particularity of greater overlap, making it difficult to differentiate between different flow types, such as patient and information. For example, the patient may be required to carry information across departments, while in the Western context, the clinical information would probably be independent of the movement of the patient.

From our example, since a patient is expected to make payments prior to getting investigations done, billing becomes a central node. The EHR needed to be adapted to manage the arising interdependencies and also its implications. As described above, after the OPD encounter, the patient takes the slip to the billing counter, makes payment against investigations advised, and takes receipt of the payment made. With this, the system sends an ‘order’ to the respective laboratory (biochemistry, haematology, X-ray, ultrasound, etc.), and patient name appears on the patient queue for the respective laboratory. For patient to be queued for any investigation, they must be channelized through billing.

Further, this interdependency was designed to be bi-directional, for example the module to which billing was sending an order, should also be able to send information to billing in case a particular service was not being performed. For example: if the biochemical analyzer was not working, the pathologist should be able to inform the billing clerk, so money is not charged from patients for test/services not available that day. Adapting the HIS to the requirement, in case of an unavailable test, the respective laboratory in-charge can click on ‘dysfunctional status’ for the test, which would make that test not appear on the billing screen, and thus cannot be billed for. And once the test became functional, the status can be changed, making it available for billing.

Adapting the system to manage this interdependency helped to reduce the complexity that existed in the earlier arrangement where the patient may first queue in billing and then laboratory before realizing the test is not available, and then make
rounds of the hospital to obtain the due refund for test not done, or come back another day for the test.

**Participatory approach**

A participatory approach was adopted throughout the process, not only to passively elicit requirements of existing work from users, but also to get the users to actively engage with formulating what they would wish from the system in the future.

For example, unlike other departments, working of laboratory is more challenging than say Registration, because the workflow involves more and detailed ‘interactions’ between patients and data. In the paper based workflow, the patient would come to the laboratory after payment and the name of investigations filled on the form by doctor. The Technician collects the blood sample and puts the sample number\(^1\) on the vial and on investigation form of the patient. Once processed, the test result is written on the investigation form and also in the internal register maintained in the laboratory. The patient returns with the bill receipt to be handed over a copy of the test results.

In the HIS designed, the patient is queued in the laboratory after making payment at the billing. At the time of sample collection, the technician clicks on ‘accept patient’ against the patient’s name in the queue to generate a sample number for the respective test. This number is written on the vial, and the sample goes for processing. Now the challenge in design was to make validations for some tests, e.g. if a patient comes for testing haemoglobin and uric acid, then two blood samples are collected which go into two different vials sent to different labs (haemoglobin to haematology and uric acid to biochemistry). If the patient came for uric acid, fasting blood sugar, haemoglobin and widal test, the system should generate only two sample numbers as uric acid, fasting blood sugar and widal test will go biochemistry lab and haemoglobin to haematology lab. Similarly if the patient has come for uric acid, fasting blood sugar, haemoglobin, urine microscopy and semen test, then system should generate four sample numbers for biochemistry, haematology, urine lab and cytology.

Defining sample numbers for each test/vial was interesting learning. Till now the laboratory technician had divided serial numbers across the laboratories, i.e.
haematology was 51–70, biochemistry was 1–50, serology was 71–80, and cytology was 81–100. With this the laboratory restricted itself from doing more tests, as they did not have more numbers for sample vials. Together, we derived the convention for sample numbers, which helped in sampling, while not restricting the lab from taking in more samples. The convention followed was H-DD/MM-1,2,3y(for haematology) where ‘H’ is for haematology, DD is date, MM is month and 1,2,3y is the sequence of haematology tests for the day. Similarly for biochemistry it is—B-DD/MM-1,2,3y, cytology is C-DD/MM-1,2,3y, etc.

Another requirement from the laboratory user was the replacing of manual entry of each patient result into registers, as they wanted to continue with registers for audit purposes, especially till they were confident of the new system. A functionality of work-list was made which gave user list of all patients (with name, id, test, sample number, test result) for the laboratory to print and file.

The process of defining ranges for the test for laboratory module was a challenge. In the paper based system, the laboratory staff was not used to giving test results vis-à-vis the reference ranges, as they just wrote the result on the request form. Hence the process of defining ranges for each test not only helped strengthening the system, but also was a process of standardization of general practices in lab itself. Further, it helped in developing user capacity and sensitivity in interpreting results with respect to reference ranges.

The understanding of these intricate details of test ranges, agreeing on naming conventions, test rescheduling, etc. would not have been possible for external designers without the active involvement of the laboratory technicians, and their engagement in also defining the future

1Sample number is required to match the blood sample with the patient. vision of the system. The strength of the process was that the user engaged in the process not only as part of ‘system requirements’, but also as an opportunity of professionalizing and enriching their work. Hence while requirements for system development were important, hospital used this as an opportunity to have a relook, redefine and learn newer innovations in their respective fields.
The current status of the implementation is that the 10 modules have been deployed in one hospital, and users have reached a high level of self-sufficiency in that they are managing it themselves. INGO gets on an average one call in a month to provide trouble shooting support. The hospital management is satisfied with the status and have requested INGO to scale this system to other 19 hospitals in the state.

**Discussion**

The discussion is around our approach labelled “judicious design” as a strategy to manage the various facets of complexity that are inherent with systems like EHR and their implementation in contexts like a district hospital system in developing countries. Drawing from our empirical examples, we abstract three principles of judicious design, which we elaborate on in this section.

**Selective digitization**

EHR systems are typically accompanied with grandiose and utopian visions of applying sophisticated technologies to achieve “paperless hospitals” or “fully integrated systems”. Even the earlier call issued by the State reflected this vision such as digital archiving of images, use of digital pens, and electronic appointment scheduling. History tells us that such visions are difficult to achieve in practice, contributed to by the influences of the installed base. For example, the existing condition in the hospital studied of about 700–1000 patients a day, and a power supply situation which is not 100% reliable, cautions us against adopting a full automated approach, and instead go for a strategy of selective digitization based on designing for hybrids of computer and paper based systems. Our case provides some examples of this.

Since work practices are historically embedded, they are difficult to change in a radical manner. Further, for a worker following the established work procedure provides the confidence that he/she is doing the assigned work which is the criteria for accountability and evaluation. An approach to designing change thus needs to ensure that this confidence of work is not disruptive. However, while maintaining this, a potential to innovate can help to motivate
the worker in introducing change in small steps. An example from our case is of the doctors who agreed to use the EHR for recording the clinical details of patient diagnosis and procedures, but left the prescription details to be entered in the EHR to the pharmacists. While using the EHR was innovative for the doctor, the work practice was not disrupted while allowing for a first step of change to be introduced.

**Structuring interdependencies**

A hospital system by its very nature is comprised of various forms of interdependencies between their various sub-systems, for example registration and OPD or billing and laboratory. Research on complexity [12] emphasizes that complexity is heightened with increasing number of inter-linkages, and the speed of change. While such complexity cannot be wished away, that is the impossibility of creating a hospital where registration or billing can be made independent of other functions, we argue that it can be more effectively managed. This can help to deal better with the adverse implications arising from when one component of an integrated whole breaking down. We describe our design approach towards this challenge as one of “structuring interdependencies.”

A lesson on this is provided from our example of billing. Previously, only patient services were billed centrally, while the various other bills such as for tenders, ambulance services and student internship fees were collected in different places. From the hospital perspective, wanting consolidated collection figures for a day, this was a very complex undertaking of getting and verifying these different collections from multiple sources. By centralizing billing through the introduction of the concept of “billable services”, and including in it all of the billable services of the hospital, the design could structure the interdependencies and provide higher value to the hospital.

**Proactive participation**

Traditional approaches to participation carried out in information systems design tends to emphasize the involvement of user through employing different techniques (such as mock ups or focus group interviews) to understand the
existing information flows and work practices of the users. While this is of course required, we argue that limited to this it is conservative as it focuses on automation and does not lead to “process re-engineering” or actively contribute to the user becoming engaged in defining the future vision of the system which transcends existing work practices. We define an expanded approach to engage users as “proactive participation” and argue that it is especially relevant in settings like of a district hospital in a developing country where there is a danger of young doctors and technicians feeling obsolete because they feel excluded from new advancements, including those induced by new technologies such as EHR systems.

The laboratory provides us with interesting examples of how the pathologists and technicians were involved in proactive participation to both bring in innovations while ensuring the basic work flow was not disrupted. The example of introducing dysfunctional status came from the technicians who often felt the wrath of patients who had paid and not received the test. They also suggested the introduction of the “work list” which helped their record keeping, and also to provide for an integrated patient report (as compared to the multiple reports which were given previously). These suggestions, which were undoubtedly innovative, could only come from the users who had experienced these problems on a daily basis, and their proactive participation helped to shape the system in a manner they felt most comfortable with

**Conclusion**

The set of judicious design principles formulated in this paper, we argue, are clear and workable strategies of managing the complexity inherent in EHR kind of large and integrated systems. Further, these can also be seen as concrete strategies for scaling and sustaining, fundamental in resource constrained environments. The staff of the hospital described, have now become resource people to train staff in other hospitals to which the system is being scaled in the State. This helps to further enrich their jobs, helps in mobilizing scarce resources, and also makes training more effective as a “technician is speaking to a technician” rather than an outsider. We believe the
learning gained from the State would also have implications for designing of EHRs in the West, as the basic notions of complexity and the need to be judicious are common, although the reasons contributing to complexity would be different which would require adaptation or extension of these principles.

References


Understanding empowerment through technology driven power structures: Case from Mother and Child Tracking System in India

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Abstract

In this paper, I examine the question of “how are ICTs implicated in processes of empowerment?” This question has been examined in the context of field health workers in India who are confronted with a new software application (called Mother and Child Tracking System) to help her work in providing outreach care to pregnant women and children for immunization. This paper builds upon James Scott’s (1998) argument of “Seeing like a State” where often the purpose of large-scale state ICT initiatives is to standardize and simplify complex social phenomenon, with broader intentions to control better the population. My empirical analysis concerns the study of a large scale Indian government ICT initiative to track every pregnancy and immunization related activity relating to every mother and newborn in the country. The case is studied through the conceptual lens of opportunity structure, agency and technology viewed as a “conversion factor”. The analysis leads to the inference that the space for empowerment of the health worker was constrained rather than being enhanced, raising questions about the value of the initiative.

Key words: Empowerment, Opportunity Structure, Agency, Health Worker, India

Introduction

Frontline health workers arguably provide the foundation for health systems and health information systems (HIS) strengthening efforts in most developing countries. They are responsible for providing care to the outreach population under their catchment jurisdiction, fill up multiple registers on services provided, do different administrative tasks (like collecting salaries, forms, registers and drugs and supplies from the nearest health facility) and various others. They have over the last decade been flooded with new kinds of Information and Communication Technologies (ICTs) technologies such as computers, Personal Digital Assistants, mobile phones and in current times, laptops, tablets and smart phones. As these technologies are introduced, they are promised with improvements in their reporting capabilities, reduction in workloads and the ability to provide more effective and focused care. This has been the case also in India where these workers called Auxiliary Nurse Midwife (ANMs) are supposed to carry out a multiplicity of tasks involving large travel over villages covering a catchment population of 5000-7000. Various ICTs have been introduced in their settings, one such being the web-based application called the Mother and Child Tracking System (MCTS) which is the focus of analysis of this paper. To understand the implications of this application, it is first important to understand the everyday work of the ANM, and its underlying informational content.
An ANM manages a daily Out Patient clinic at her facility (called the Sub Centre) with a primary focus on providing preventive care and identifying referrals to the next higher level facility (called Primary Health Centre – PHC). Her primary focus is on the mother and child, providing health services related to antenatal and pregnancy care, and immunization services to the new born. Typically, she provides clinic based services during the first half of the day and in the second half conducts household visits in her assigned villages to provide outreach care. During outreach, she records the services she provides first in her field diary, from where data for each patient is transferred to respective registers (she maintains about 23 registers.), and then aggregates manually the statistics at the end of the month to produce the monthly report which is physically carried to the PHC (often a few hours away of travel) for submission and review. A key element of the review, in addition to verifying data quality by the supervisor, is to keep track of every pregnancy and childbirth for scheduled follow-up check-ups, and ensuring all high risk cases are referred to PHCs in time.

Over the last two decades, governments, NGOs and other actors have introduced different types of ICTs (computers, laptops, PDAs, and mobile phones) to help enhance the work efficiency of the ANM. All these ICT tools are aimed at supporting her recording, reporting and tracking functions including for registering details of patient encounters, generating monthly statistics, enabling searching of patients, organising notes, identifying patients needing follow-up, giving reminders to patients, and attempting to reduce her work burden and improving documentation. However, as Scott (1998) has argued, these efforts framed within structures of bureaucracy (Lewis 2011) often turn out to be as instruments as control (rather than support) as these ICTs tend to enhance visibility of actions of those in the field, which are often resisted by field people to reduce control. In the context of the Indian health system, Ranjini (2009) made an in-depth anthropological study of the introduction of state wide ICT interventions in the context of ANM work, but found this added to their work and fear of control which led to the discontinuing of the system and a huge loss of investment.

Managers have typically been sceptical of the quality of the data being reported by ANMs, believing she would be inflating service numbers in order to show achievements of their targets. The supervisors are themselves under pressure from their superiors to show progress against their respective targets. To break this cycle of lack of ‘trustworthy’ data, newer and more modern ICTs are being deployed.

The outcome of these technological interventions are indeterminate, shaped by the underlying logics or motives for their introduction; to support or control work?. In this paper, I empirically examine how the MCTS initiative played out practically from the perspective of ANM work. Specifically, I draw upon the lens of “empowerment” to understand how ICTs can (or not) become agents of control or are they able to help the ANM break some of existing shackles of control and be empowered. The specific research research questions this paper addresses are:

1. How do large ICT initiatives shape individual processes of empowerment (or not) of ANMs?
2. How can implications of ICTs be positively channelled towards strengthening empowerment?

The rest of the paper is organized as follows. In the next, I discuss relevant literature to the topic of ICTs and empowerment relationship, and the role of power. In section 3, a brief overview of the methods employed in this research is presented. In section 4 on the case study, in the first part I provide a broad sketch of the health context in India with a focus on the maternal and child health status and the background of MCTS. In the second part, I discuss field work carried out with ANMs to understand from their perspective of what difference MCTS made for them. In section 5, I present my analysis and discussions drawing from an empowerment lens. Finally, some conclusions are presented.

2. Relevant literature and conceptual perspective

2.1. Relevant literature

‘Empowerment’ is a widely contested and complex notion, defined by various authors. In his framework of the capability approach, Sen (1999) defines development as the expansion of opportunities (named capabilities) together with process freedoms (agency). Empowerment is conceived as the expansion of agency (Ibrahim & Alkire, 2007). Alsop et al (2006) define empowerment as a process of enhancing capacity to make effective choices, and transform them into desired actions and outcomes. Samman et al (2009) sees empowerment as a multidimensional, culturally grounded and relational concept.

Kabeer (2009) brings power in the frame, seeing it as the ability to make a ‘choice’, and being disempowered is to be denied ‘choice’. Empowerment then is inescapably bound up with conditions of disempowerment and refers to processes by which those denied the ability to make a choice acquire such ability. Empowerment refers to a ‘process of change’. People who exercise a great deal of choice in their lives may be very powerful, but not necessarily be ‘empowered’, because they were never disempowered to start with.

And this process of ‘increasing-power’ and ‘gaining choice’ is conceived as the result of interaction between two building blocks of agency and opportunity structure. While agency is the ability to act on behalf of what we value, opportunity structure reflects preconditions for exercising (or curtailing) effective agency, emphasizing their inter-linkages. Empowerment is hence not only the expansion of agency but also expansion of the “opportunity structure” (formal and informal institutional context in which people operate) and their interaction shapes empowerment (Alsop and Heinsohn 2005). In this light, empowerment is seen as both a process and an outcome.

Sen (1985) defines agency as what a person is free to do and achieve in pursuit of goals or values that he or she regards as important. Alsop and Heinsohn (2005) view agency as a person’s ability to envisage options and make meaningful choices. Opportunity structure represents the formal and informal contexts within which a person operates. Working together, these factors give rise to different degrees of empowerment, which depends on i) whether a
person has the opportunity to make a choice, 2) whether a person actually uses the opportunity to choose, and 3) once this choice is made, whether it brings the desired outcome. Kabeer’s (2009) analysis of choice highlights individual’s possibilities of alternatives, and the ability to have chosen otherwise. And agency concerns whether people themselves are significant actors in processes of change” involving not only choice but also resistance, bargaining and negotiation, and reflection, their sense of the ‘power within’.

Samman et al (2009) sees empowerment as being ‘relational’ and not occurring in vacuum. Groups are empowered or disempowered in relation to others with whom they interact, and involves becoming more capable agents. Alkire’s (2007) categorisation of power enumerates different types of gains from empowerment – whether they have power over (resisting manipulation), power to (creating new possibilities), power with (acting in a group) and power within (enhancing self-respect and self-acceptance). Kabeer (2009) points to both negative and positive meanings of agency, where in a positive sense, ‘power to’, refers to people’s capacity to define their own life choices, while in a negative sense of ‘power over’ is the capacity of an individual or group to override agency of others. Power also operates in absence of agency, for instance norms and rules governing social behaviour.

2b: My conceptual perspective

I seek to understand empowerment as a process by which a person gains ability to make a choice, with a presumption that this ability was earlier denied, qualitatively understood within a concrete domain of action. It is an expansion of human agency that enhances options of ‘choice’, within the framework of agency and structure, shaped by the interplay of power and disempowerment. To be empowered you must have experienced disempowerment, and this process of change takes place in relation to agency of ‘power to’ and ‘power over’.

In line with Walsham's argument about agency, and integration or a thousand flowers (2005), I view technology to enable multiple and co-existing perspectives on agency. On one hand, there are inherent material features of technology (such as the ability to send a SMS through a mobile phone) which can have me seen as a technology or machine determinist. In Sen's vocabulary this material ability can be seen as a "capability," which to be converted into a realized functioning, humans must have the knowledge and expertise to be able to use the SMS facility for something that they inherently value. This represents a social deterministic stance. The perspective of "capability to use ICTs" represents a conversion factor inscribing elements of both machine and social determinism, supporting Walsham’s thousand flowers argument. To illustrate by drawing from Robeyn’s example (2005): we are not only interested in a bicycle because it is an object made from certain materials with a specific shape and colour, but because it can take us to places where we want to go, and in a faster way than walking, to realize a functioning of mobility (or others, like the love of speed). So, I conceptualize the capacity to use technology as a conversion factor with the potential to convert the capability to participate to an actual functioning. So, while technology serves as a resource, the ability to use it towards choices one values is conceptualized as a conversion factor with implications to convert an existing situation from being disempowered to be
empowered. This relies on conditions of ‘power to’ and ‘power over’, for example whether I had a bicycle before, and whether I have resources and access to buy one. In this way, technology serves as a mediating condition between opportunity structure and agency with implications on empowerment.

3. Methods

My study is based on a case study of the use of the MCTS (in one Indian state) drawing on interpretive methods. Firstly, I have tried to understand the broad context of the case, including the challenges faced in the health system of the state and new ICT initiatives being taken, including MCTS. I have been an active participant in the Health Management Information System (HMIS) strengthening processes of this particular state since 2007, which has helped develop a fair understanding of the context of the health system, and the historical processes of change. Since 2007, I have been part of a local NGO involved in strengthening state HMIS, including integration of report formats, software support and capacity building. For this paper, I have carried out 25 interviews with ANMs in their offices or outreach locations asking them specific questions about MCTS and its relation to their work.

While the primary source of data collection for this case has been interviews, I have also drawn upon my extensive experience of working in this state as a frame of reference to make sense of the interviews. In addition, I have had access to letters the state authorities have written to ANMs to promote the use of MCTS, typically including reprimands for not achieving targets. I have drawn upon press clippings about MCTS, which undoubtedly is of national significance. For data analysis, drawing upon my focus on empowerment, and related concepts of agency and structure, I have tried to understand the field data within this conceptual framework to make sense of it. I have shares my interpretations with my NGO colleagues and research supervisors to further enrich my analysis.

4. Case Context

The case study is divided into two broad sections. The first part includes an overview of the case context relevant to the understanding of the intentions and outcomes of the MCTS application. The second part details the interviews with ANMs to understand their perceptions of MCTS and what it has meant for their everyday work. This taken together has helped me to understand the ICT-empowerment relationship and the mediating role of ICTs within an agency-structure perspective.

4a. Maternal and child health in India

India ranks 10th in the world on GDP growth rate, China ranks 2nd and Bangladesh ranks 57 (United Nations Statistics Division, December 2013). Surprisingly, India, a country trying aggressively to become a global economic powerhouse, has extremely weak health indicators, especially relating to maternal and child health, accounting for 19% of global maternal deaths (WHO 2012). The maternal mortality ratio (MMR) is 212 (in 2009) against its MDG target of 109, and compares poorly with Bangladesh (MMR 194 in 2010 from 322 in 2001) and China.
Similarly, infant mortality rate (IMR) in India is 40 (in 2013) against MDG target of 27 and for the same neighbours the figures are 43 and 12.1 respectively. Bangladesh is only one of the 9 countdown countries on track to achieve the primary target of MMR by 2015 (Lancet 2014). Indicators on nutrition in India are not encouraging, with high prevalence of underweight children, which is amongst the highest in the world, and nearly double of some Sub-Saharan African countries.

Only about 4% of the GDP is allocated on health expenditure in India, which while being lower than China (5.6%) and higher than Bangladesh (3.6%), both of whom have superior health indicators than India, supporting Sen (2009) argues that it is not the amount of money which is important, but on how the money is spent and where.

The government of India in 2005 launched the National Rural Health Mission (NRHM) to undertake architectural corrections of the health system to strengthen public health delivery (NRHM Framework 2005). Further the framework document noted: “Designing a fully functional two way communication system leading to effective decision making. Enhance use of information and communication technology to improve health care and health systems performance” (p5). In taking the framework to implementation, the ministry went through an extensive process of redesign of the HMIS, and in 2008 provided states with revised reporting formats, and a web-based software platform on which the forms were configured. States started with reporting district level aggregate figures, and over time as the software evolved, reporting was decentralized to sub-district (blocks) and facility levels (by 2010).

While the HMIS strengthening process was ongoing, the health minister announced in 2009 that aggregate numbers are not good enough for monitoring immunization, and hence name-based reporting must start with immediate effect. A Government of India notification announced:

> It has been decided to have a name-based tracking system whereby pregnant women and children can be tracked for their ANCs and immunisation along with a feedback system to ensure that all pregnant women receive their ante-natal care check-ups (ANCs) and post-natal care (PNCs); and further children receive their full immunisation. An online module for the name based tracking system is being developed and direction of use will be given soon. ....

States were mandated to start collecting data on the formats given, and ANMs were to report this on MCTS. Small teams from all states were called to the national level for training to enter facility names, health worker names, and assigning codes in MCTS. Trainings were designed with a cascade model where state trainers further trained district teams, who then trained sub-district teams and then they the ANMs. From April 2010, data started to flow into the software, and system usage was monitored based on ‘number of women and children registered yesterday and expected’, which was communicated daily by SMS to the State health secretary first thing in the morning. These messages over time added state rankings, telling how your state ranked vis-a-vis others on registrations, and how the effort was not enough. Approval of state budgets slowly became conditional to the achievement of
registration targets. Along with this, monthly letters to states from the centre for enhancing registration. For example:

> On close analysis of the data available in MCTS, it is noticed that only 77% of the mothers and 12.5% of the live births are registered in MCTS till date. More over the services given to mother and child are not seen updated regularly.

*(Government of India DO Letters, dated 10.02.2012)*

Two years into the implementation, the ministry was still struggling to get full registration, and the health minister announced:

> Information is collected to track every mother and child by name, address and telephone for which a call centre has been set up in the ministry to verify the data and inform women of the check-ups and the immunization schedule, health minister said. The Minister also made sample verification calls to registered women under the MCTS database to verify the database entries today.

*(Press Information Bureau, Government of India, October 2011)*

The word ‘verify’ echoed the same ‘trust level’ which was at the foundation of the launching of the massive tracking system. Such press releases were sent by the ministry each month:

> Over 99.5% districts, 96% health blocks, 88% health facilities (other than Sub Health Centres (SHCs) and 94% SHCs are reporting data in MCTS. Total 2.3 lakh ANMS are registered in MCTS, of which 2.2 lakh (ANM are registered with phone number). Total 8.4 lakh ASHAs are registered in MCTS, out of which 6.9 lakh (82.9%) ASHAs are registered with phone number. Everyday approximately 7-8 lakh SMSes are being sent to the beneficiaries.

*(Press Information Bureau, Government of India, May-2013)*

In November 2013, the ministry advertised a new request for proposal for setting a ‘Mother and Child Tracking Helpdesk (MCTH)’ to strengthen validation of data as well as a single platform for information exchange.

> MCTH shall validate records of health worker, pregnant women and children registered under MCTS by making outbound calls to the health beneficiaries and health workers. Errors / deviations that are generated in the validation exercise must be reported back to MCTS so that corrections can be made. Minimum 70-calls (outbound) and minimum 6-hours of actual calling in a day by individual helpdesk agent. The average calling time per call is expected to be 5 minutes.
Four-years into the programme, the ministry was still at the stage of validating the data, and states unable to generate all required reports. The only figures/data the states received was what the ministry sent with them (via morning SMS, letters or press releases). From 2012, the state could generate reports on facilities not entering data, district-wise monthly data entry, verifications done and services tracked. In state review meetings, the issue of insufficient capacity building came-up as a reason for low registration, and the Population Research Centres (PRCs) were notified as the nodal agency for monitoring MCTS. PRCs are research units set-up by the Ministry of Health, and the country has 19 PRCs covering 29 states and 7 union territories. The PRCs immediately started the process of review for each district. Here are some excerpts from the a few states:

The MCTS coverage is almost complete in all the centres under study. Most of the staff involved in HMIS/MCTS data entry complained about the inadequacy of number of available computers and slow internet connection.

Wayanad district, Kerala

District monitoring and evaluation officer is in charge of the MCTS. The status of proportion of pregnant women information uploaded in MCTS is 66 percent till September while that of the children is 48 percent.

Hissar district, Haryana State

Under the MCTS in every sub-centre, there is a separate register for MCTS. There is big problem of internet connectivity.

Mandi district, Himachal Pradesh

At district hospital there is no separate computer for HMIS/MCTS entry. It is found that data entry operators required training for HMIS entry. PHC ANMs are used the MCTS generated report to track mother and child. As expressed by the DPMO all ANMs have received the training on HMIS/MCTS, still they are unable to perform the task efficiently due to multi reasons.

Bidar district, Karnataka

4b. What has the MCTS meant for the ANMs?

I discussed with some ANMs on their experience with MCTS application and implications on their work, especially with respect to workload and quality of care. ANMs expressed concerns about their increased workload with each case (pregnant woman or child) needing to be entered in detail. Data entry could not be completed even with a whole day of work, and
ANMs needed to line-up at cybercafés close to their homes to update data entries in the evening after work hours, which they go to with family members for reasons of security. Some ANMs even contracted cybercafés to enter data into MCTS with personal usernames and passwords. An ANM said:

*I return from work by 5.30pm, rush into kitchen to get dinner ready and finish whatever I can to leave home by 6.45pm to reach cybercafé by 7pm. The shop closes at 8pm. Only if I put in one hour of data entry everyday can I complete my workload for registration. Am not fast at using computers and my son does not understand the data. So we both try to complete as much, as cannot afford salary cuts.*

*ANM, Punjab*

The letters from centre to state giving the state ranking snowballed into letters to districts from the state, with district-wise ranking, and further to each ANM with health-worker-wise ranking. No incentives were given if registration was below 90%, and poor performing workers were publicly shamed by names being displayed on notice boards, letters called for explanations for low registration, and negative performance remarks were recorded in service books which are the basis for annual confidential appraisals and other benefits.

*I am always lagging in my registration targets and I am lowest performer in my district. This has been told to everyone in every meeting. But what’s not told is that I have seven big villages under my area with highest load of mother-child registration in my block. It is always a race to complete data entries – my son and daughter help me complete, but they have college in the day and internet shops is far from home, which does not leave much time for them. Now I have contracted internet shop operator to complete my entries. I pay him from my pocket, which of course does not get reimbursed. We are larger joint family to support and diverting the resources is not helping. But all this still does not help, as I have been now been labelled worse performer, which is extremely demotivating.*

*ANM, Punjab*

While the centre made percentage of MCTS entries a condition for state budget approvals, the state made salaries of ANMs conditional to registration percentage:

*State has also started with salary cuts for not meeting targets and I have had three continuous salary cuts due to not meeting the targets. I cannot afford this. PHC has only one data entry person and the load is too much so most of us have been asked to find our own ways to completing entries. I am 58 years and I don’t know computers. I don't have computer shops near my house. I am struggling with my data entry. I need to take my*
registers to computer shop which is far and leave the registers they for 3-4 days. But then I have back log of data entry in registers also. I had suggested using untied funds for completing data entry, which has been denied. So, all of us are using our own money to complete data entry. This is not sustainable.

ANM, Punjab

While discussing the issue of low registration, one AMN pointed that while government issued the MCTS formats for reporting, the recording registers were not revised. How do we report on data that we do not capture?

One ANM pointed to something which was at heart of this MCTS-data relationship:

We have been dealing with pregnant women and children since I joined service (which was 30 years now). We always discussed cases at the PHC with the doctor about cases which we think to be high risk in our monthly meetings, and also discuss how to plan immunisation and nutrition days and other outreach programmes. But for three years now our monthly meetings are only about percentage of names registered in MCTS, show-cause letters issued to those not completing targets and timelines to complete entries. We do not discuss cases, data or workplan anymore.

ANM, Punjab

After presenting both macro and micro level dynamics around the MCTS, I analyse it in relation to the implications on ANM empowerment.

5. Analysis and discussion

What has experience of ANMs been with regards their work, is the empirical question I have tried to explore. I analyze this with respect to my conceptual framework using key concepts relating to opportunity structure, agency, technology as conversion factor and implications on empowerment.

Opportunity structure: While the MCTS has inherent potential to support improvement of maternal and child health, the various structures employed to institutionalize it reflect those of “power over” the ‘participants’ in the programme itself. For instance, the design of the programme was based on entry of each pregnancy and new born into an online system, but there limited assessment of computer hardware available, internet connectivity, electricity availability, staff availability to enter data, their work loads and computer literacy levels. Whoever could work on computers were assigned to data entry work, and pressure to register data in absence of the required resources resulted into staff being pushed into using personal resources and time. While huge investments were made into software development, procurement of servers and hardware, support to ANMs (eg travel allowance, improved
registers) was not given due importance, and implementation took place in a vertical manner within the logic of top-down control.

The intervention did not take into cognizance the existing reporting workload on the ANMs, while the new forms were introduced without rationalization of existing forms. There was duplication of data, as information asked for in these new formats were already sent as aggregates into the HMIS. This also undermined the HMIS strengthening process across the country which was fast gaining maturity and stability by taking away attention and resources to the more visible MCTS. Letters of reprimand, threats of salary cuts, constant attention being drawn to the “low performing” ANMs strengthened structures of “power over”, providing limited scope for ANMs to use technology to exercise agency to enhance care, even though there was the existing potential to do so.

**Agency**: A desired agency would be to enhance the capability of the ANM to strengthen care processes to help address key maternal and child health problems the country was experiencing. However, empirically seen, this capability was not enhanced, but on the contrary was arguably undermined. The MCTS became a tool used by ANMs to control and undermine them. Data entered with great effort and cost by ANMs into the MCTS became a tool for them to be monitored leading to her own reprimand and salary cuts. Even if we assume that ‘control’ was not the stated objective of the system, the sheer visibility MCTS created enabled control (external and self), leading to the agency of the ‘lowest level’ being dominated by that of the technology and its supporting structures.

The ANM operates within her community based social system, and the MCTS may have undermined her status in that set up. For example, the MCTS format has a field for collecting phone number of the women/child and/or of the neighbour. Once the call centre got functional, verification calls often were made to the neighbour, in case the first number was unavailable. In case of a pregnant woman, the question was on the verification of the pregnancy and personal details which any women will not like to disclose on phone to a stranger. In case the woman refused to answer, this was sometimes recorded as case of false reporting by ANM. Not only did the AMN lose credibility in her community, people could not confide in her anymore, as they feared she will give their details to strangers in a call centre. The system design overlooked some important contextual/cultural details, for instance, in India a child is often not given a ‘name’ immediately at birth, and naming takes place after 11-days (to 2weeks) as part of a small ceremony at home. But for the entry into MCTS, the name was the first field, without which system would not let you proceed. Also each name based entry (mother and child), had to be tagged to ‘husband’ (for women) and ‘father’ (for child), and the database was often full of duplicates.

**Technology as a conversion factor**? The capability to use technology could potentially serve as a conversion factor to help materialize the capabilities of the ANM into functionings (providing better care). Arguably, the reverse happened, as the data she reported was used to control her, rather than facilitating her agency to strengthen care. The system design of the MCTS provided a feature of generating a monthly ‘work-plan’ giving details of cases, which
needed to be followed-up by the ANM, based on the data she provided. However, since the computer and printer were available at the block (sub-district) level, the ANM could not have proper access to her work-lists. Further, the work list used colour codes (red, green, yellow etc) for follow up, and this was not visible to the ANM when she received the (black and white) printout, which undermined the conversion capability of the system. Further, all print outs were in English, while the ANMs were more familiar with Hindi/vernacular which further undermined the conversion capabilities of the technology.

The primary purpose to which the technology was deployed related to the registering of a new birth or pregnancy, and various forms of verification of those numbers. While registering a new case, is indeed an important element of the work, and based on which care can potentially be enhanced, but to stay limited to that was indeed not a full realization of the conversion capabilities of the technology. Inadequate design, like examples mentioned above, went against existing social and work related practices which raised ANM’s resistance towards the system. The printouts were not made available to the ANMs in time and in the right colour for her to be able to take effective action in strengthening care. Further, her workload was enhanced, as she now had to fill data for both the HMIS and MCTS and there was the added burden on her to show the figures matched, and attracted reprimand if they did not.

In conclusion, how to understand the implications of MCTS on ANM empowerment? Did the system provide additional and different kinds of choices to the ANM for providing care? The answer at this point seems to be a clear “no” as the interaction between opportunity structure and agency were clearly aligned towards strengthening “power over” and reducing the existing spaces in which the ANM acted to strengthen care in the community.

Conclusion

The field of IT for Development has been concerned about better understanding of how technology is implicated in processes of development. I have in this paper tried to understand this relationship through the lens of empowerment. While there is of course the potential that technology has to enhance development processes, whether it does so depends largely on the interaction between opportunity structure and agency, where technology and capability to use it plays the role of a “conversion factor” or a mediating influence with the potential to enhance agency and convert capability into functioning. In this case, I found technology to be not fulfilling the potential of positive conversion, and strengthening structures of “power over” the ANMs. In my future research, I will seek to further apply this framework to other empirical settings, and to further enhance and refine it.
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ROLE OF POWER IN SHAPING PARTICIPATORY DESIGN PROCESSES: THE CASE OF COLLABORATIVE SYSTEM DESIGN

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Abstract: This paper analyses the role of power in shaping participatory design (PD) processes in the case of a collaborative effort to design, develop and implement a hospital information system in the public health sector of a developing country. The paper discusses the process of making decisions (choices) within this PD based project, how these decisions enable or disable participation, with technology playing a mediating role shaping processes of participation. My empirical analysis studied through the conceptual lens of opportunity structure, agency, technology and participation, leads to the inference that participation and power play out through mechanisms of agenda control (what is discussed and who decides the themes), participants (who are invited in), scope (which solutions are possible) and resources (available time and people). Applying these arrangements makes the exercising of power less visible, because it is difficult to identify what is not on the agenda or which solutions (and problems) are not discussed as compared to what was explicitly stated as the agenda.

Keywords: Empowerment, Participation, Power Opportunity Structure, Agency, HIS

INTRODUCTION

The aim of this paper is to understand the role of participation in shaping the Information and Communication Technology (ICT) and empowerment relationship in the context of a south-south collaboration effort involving an Indian NGO (called INGO) engaged in the design, development and implementation of a hospital information system (called HospIS) for the Ministry of Health in an East African Country (called EAC). Taking the view that power is deeply implicated in this ICT-empowerment relationship, I analyse how shaping participation can both serve to exercise power, and also enable human agency to gain power from an existing position of disadvantage. Further, I seek to understand the role that ICTs play in enabling or constraining participation.

The paper seeks to contribute to the ICT4D literature in two ways. First, while participation has been a fundamental aspect of systems design and development in Western contexts (Bratteteig and Wagner 2012), its role in shaping systems in low and middle-income countries (LMICs) has remained largely unexplored (Puri 2007). I seek to understand better how processes of participation in such contexts play out through the framework of decisions and the role of power in shaping them (Bratteteig and Wagner 2012). Through this analysis, I try to expand my understanding of the ICT and empowerment relation, more specifically, the
question of “how are processes of participation shaping the ICT and empowerment relation”? The specific research questions I seek to analyse in this paper include:

What are the dynamics of participation, including of inclusion and exclusion of voices, in three key decision areas of visioning, technological choices and implementation?

What is the role of ICTs in shaping dynamics of participation, and how these inform our broader understanding of the ICT and empowerment relation?

The rest of the paper is organized as follows. In the section 2 which follows, I discuss relevant literature, including relating to participatory design in IS projects in LMICs, leading up to the articulation of the conceptual perspective to guide my analysis; In section 3, I present briefly the methods employed, followed by the case study in section 4. After presenting the analysis in section 5, I provide brief conclusions.

2. Relevant literature and conceptual framework

This section has three parts. First, I discuss more broadly the literature of ICT and empowerment in LMICs, which provides the background of my analysis. Two, I look at the literature on participation in ICT4D projects through the lens of decisions and the role of power. Third, I develop a framework, which situates participation in the ICT and empowerment relation.

2.1 ICT and empowerment

The term ‘empowerment’ is a widely contested and a complex notion. In his framework of the capability approach, Sen (1999) defines development as the expansion of opportunities (capabilities) together with the expansion of process freedoms (agency). Empowerment is conceived as the expansion of agency (Ibrahim & Alkire, 2007). Alsop et al (2006) define empowerment as a process of enhancing capacity to make effective choices, and then to transform them into desired actions and outcomes. Samman et al (2009) add that empowerment is multidimensional, culturally grounded and relational.

Kabeer (2009) provides an interesting conceptualization relating power as the ability to make a ‘choice’, implying that to be disempowered is to be denied a ‘choice’. Empowerment is inescapably bound up with the condition of disempowerment and refers to the processes by which those denied the ability to make a choice acquire such ability. Empowerment refers to a ‘process of change’. Powerful people with access to a range of choices might not be ‘empowered’, because they were never disempowered.

‘Increasing-power’ and ‘gaining choice’ is as the result of the interaction between agency and opportunity structure. While agency is the ability to act on behalf of what we value, opportunity structure reflects the preconditions for exercising (or curtailing) effective agency. Empowerment is hence not only the expansion of agency but also of the “opportunity
structure” (formal and informal) and their interaction enables or not empowerment (Alsop and Heinsohn 2005). Empowerment is thus seen as both a process and outcome, involving three varying degrees: i) whether a person has the opportunity to make a choice, 2) whether a person actually uses the opportunity to choose, and, 3) once this choice is made, whether it brings the desired outcome.

Kabeer’s (2009) analysis of empowerment though the lens of power implies the possibilities of alternatives, the ability to have chosen otherwise. And second, agency, the ability to define one’s goal, meaning that “people themselves must be significant actors in the process of change” involving not only decision-making and choice but also resistance, bargaining and negotiation, and reflection, their sense of agency or the ‘power within’.

Samman et al (2009) calls agency and empowerment to be ‘relational’, implying that certain groups are empowered or disempowered in relation to others with whom they interact. Empowering people implies helping them to become more capable agents. Alkire (2007) classifies empowerment as a process in which people gain power over (resisting manipulation), power to (creating new possibilities), power with (acting in a group) and power from within (enhancing self-respect and self-acceptance). Kabeer (2009) points to both negative and positive meanings of agency with respect to power. ‘Power to’ refers to people’s capacity to define their own life choices, while ‘power over’, refers to the capacity of an individual or a group to override agency of others. Power can also operate in absence of any agency, for instance norms and rules governing social behaviour which are not explicit but socially accepted.

Sen defines ‘functioning’ as “beings and doings” of a person. A functioning is an achievement, whereas a capability is the ability to achieve (Sen 1987). He further discusses ‘goods and services’ as resources which can be leveraged to serve as means to achieve a person’s potential functionings. The ability to leverage is enabled through three types of ‘conversion factors’: personal (e.g. metabolism, physical condition, reading skills, intelligence) which influence how a person can convert the characteristics of the commodity into a functioning; social (e.g. public policies, social norms); and, environmental factors (e.g. climate, geography).. The role of technology in this process of conversion has largely been under-explored, which I try to understand through the lens of decisions and power.

2.2 Participation of IS in LMICs: understanding through decisions and power

I discuss this in two parts. Firstly, I provide a brief overview of how the literature has discussed participation in ICT4D projects. Following from this, I argue how the dynamics of participation can be understood through the lens of decisions and power.

Participation in IS projects in LMICs
Health system reform efforts across developing countries hinge more and more on technology. The use of ICTs has been expanding during the last decade or so in the developing world as well. Some donor agencies, like the World Bank, for example, have argued for much greater penetration and use of ICTs by developing countries to usher knowledge intensive societies for ensuring their economic survival in the current era of globalization (World Development Report 1999). By and large, in most of the western approaches, participation of intended users is seen as a precondition for good design and increases the likelihood of integrating the new system into the organization (Saarinen 1990). In the western context the focus of such participatory approaches is in organizational/corporate contexts. When related to community development programs the argument for participation is based on a more intuitive and ethical basis rather than on empirical grounds.

However, it also argued by some that models of participation cannot be adopted as it is in the developing countries. A special issue of The Information Society emphasized that IS from the “developed” world cannot be replicated in developing countries and addressed the question of how to adapt these IS in such a way to balance “… global solutions, technologies, and practices on one hand, and local requirements and institutional dynamics on the other” (Sahay and Avgerou 2002). Braa and Hedberg, in an article in this issue, (Braa and Hedberg 2002) examined the participatory prototyping of a health IS in South Africa emphasizing the link between systems development and participation.

Kensing and Blomberg (1998) have identified three main issues in participatory IS design, viz., the politics of design, the nature of participation, and the methods, tools and techniques for carrying out design projects. The term ‘participation’ has different meanings for different people. “The term has been used to build local capacity and self-reliance, but also to justify the extension of state control. It has been used to devolve power and decision making away from external agencies, but also to justify external decisions” (PLA Notes 1998, p.79). Puri et al (2004) also note that what is important in participation is who decides what data to collect, who collects it, who interprets the information and uses the finding and how participation can make decision-making a more democratic process. Participation in IS projects should be a social process of bringing people together to understand different views and share decision-making so a sustainable IS is designed that is culturally and locally specific.

**Power, decision making and participation**

Power has been studied by various IS and organization studies researchers involving multiple definitions and approaches (Silva 1997). I take a more focussed view by examining power in relation to decision making and participation in systems development processes. For this discussion, I primarily draw upon Brattateig and Wagner (2012) who argue that systems design is about making decisions which represents making choices between possibilities towards the creation of an artefact, and selecting one of them, while eliminating some others. This implies that decision-making represents an exercise of power as it is bound up in questions of who takes the decision, whose opinions are solicited, and whose are not, and what kind of process is adopted to arrive at the decision.
Brattateig and Wagner (2012) also point out that a core ambition of participatory design in systems development is to empower users who should take part in all types of decisions, be given a voice, and enabled with the power to participate in decision-making. This requires decision makers to share their decision-making power with users who should accept to share this power and take required responsibility. Both giving and accepting of power can be difficult (Bjerknes & Bratteteig 1988). Braa and Sahay (2012) describe the core of the Scandinavian tradition in systems development was advocating workplace democracy where through legislation workers were given more power to participate in decisions involving the introduction of new technology in the workplace. This involved fundamentally a renegotiation of power relationship between the managers and workers.

**Conceptualizing power**

Max Weber (1964), conceptualized power as structuring dominance and order in organizations. Foucault though has a more dialectic notion of power, stressed that the exercise of power is ‘not simply a relationship between partners, individual or collective; it is a way in which certain actions modify others’ (1982, p. 788). In his analyses of power he has stressed the ‘disciplining’ of individuals (and societies) arguing for a transference to the self of ‘the rules of law, the techniques of management, and also the ethics, the ethos, the practice of self, which would allow these games of power to be played with a minimum of domination’ (1987, p. 18).

Giddens (1984) moves power away from dominance, equaling it with agency and ‘transformative capacity’; power is the capacity to achieve outcomes. He identifies four types of power in societies: authoritative (based on position, knowledge); allocative (based on economic and technical resources); signification (based on patterns of thinking and interpretations); and legitimization (based on belief systems or a vision, norms and values).

Power is a key concept in the literature on decision-making. Based on empirical studies of decision-making practices in systems development projects, Borum and Enderud (1981) look at conflicts and how different ways of structuring and controlling help avoid addressing these conflicts. The mechanisms they identified are: agenda control (what is discussed and who decides the themes), participants (who are invited in), scope (which solutions are possible and hence, which problems are defined and seen as relevant and therefore addressed), and resources (available time and people). Applying these arrangements makes the exercising of power less visible, because it is more difficult to identify what is not on the agenda than what is. Bachrach and Baratz (1963) introduce the notion of non-decision-making as a strategy of silencing potentially controversial issues which are often presented in a 'biased' or ambiguous way.

Participation, seen from the perspective of decision making and power, represents both structural and behavioural conditions (Puri 2007). Structure concerns the existing arrangements for making decisions, for instance, a bureaucratic style typically followed in public sector organizations in LMICs, where seniority is key. A decision process involves the case details and relevant paper work being put in the file, and the relevant person puts his/her
notings and opinions on the file and sends it to the next person to do the same. Finally a “decision” is taken or deferred by the senior officer, involving a process which may take months, not days to complete. These structural conditions then define who participates and who does not, and the underlying conditions and expectations of action. The behavioural conditions reflect attitudes of those taking the decisions (not concerned about time taken which can be defended by the institutional process) and those affected by it (resigned to the process). These attitudes shape processes of exercise of and giving up of power and with it the exercise of human agency. There is thus an intimate relationship between decision making, power and participation which I next present in the form of a conceptual perspective.

2.3 Building a conceptual perspective

In my conceptual perspective I relate notions of empowerment with those of power, decision making and participation, within the broader framework of opportunity structure and agency. Firstly, I understand empowerment as a process by which a person gains ability to make a choice, with a presumption that this ability was earlier denied. Empowerment represents an expansion of human agency that enhances ‘choice’, understood within the framework of agency and structure. Further, I seek to understand the interplay of power and disempowerment, as to be empowered you must have experienced disempowerment. I see power in relation to agency as ‘power to’ and ‘power over’. Decision making provides an analytical lens to understand how this power to and power over dynamics play out in concrete situations where choices have to be made.

I draw upon Brattateig and Wagner’s (2012) framework to understand the decision making and power relationship to study participation in systems design. They describe five types of decisions relevant to systems development projects: big and small; external and internal; and, non-decisions. Within each, they examine at different phases of the systems development project, issues of who decides and who is part or not, and the process of decision making followed.

Further, my framework seeks to understand the role of ICTs in enabling or not processes of participation. Drawing from the work of Robeyns (2005), I build on the notion of ‘conversion factor’ to understand how certain conditions can help convert capabilities that individuals have to enhance functioning. The capability to effectively use CTs can serve as a ‘conversion factor’ as illustrated through this example:

We are not interested in a bicycle because it is an object made from certain materials with a specific shape and colour, but because it can take us to places where we want to go, and in a faster way than if we were walking. These characteristics are of a good to enable a functioning (Robeyns, 2005, 99).

In this example, the bicycle enables the functioning of mobility, to be able to move freely and more rapidly than walking. There are different functionings that individuals can value, such as to attain status or to fulfil the love for speed. While the bicycle provides the resources, the capacity to ride it provides a “conversion factor” to convert a capability to a desired
functioning. In this way, ICTs serve as a mediating resource between opportunity structure and agency with implications on empowerment. Through the case in this paper, I analyse how ICT mediated participation may include or exclude certain people to participate which influences the choices made.

In summary, my conceptual framework includes the following points:

I. A key focus is to understand the relationship between decision-making, power, and processes of participation which may be technology enabled.
II. This helps to understand better the relationship between technology and empowerment shaped by the agency-structure relationship.

3. Methods

I describe broadly the methods used in this study to be based on a case study approach within an action research framework. The analytical focus was on the system design, development and capacity building processes around HospIS for EAC. The development was carried out by INGO, and the interactions between the two groups were based on three face-to-face visits of INGO to EAC, and a number of online (Skype, email, and chats) mediated interactions.

Alongside with being a researcher, I have coordinated the project, as part of the INGO team, wherein I have actively participated (both through face-to-face meetings and ICT enabled) in various decisions concerned with systems design and development, gaining an insider view of how these decisions played out, and the power dynamics involved. As researcher, I have reflected on these experiences to understand on what works and what does not, to slowly infer more general principles on the different relationships studied. While these action research efforts have contributed practically to the development of the system, research outputs have included the theorization of the power and participation relationship, and the role of ICTs.

Data collection involved different modes of engagement with users in EAC – Ministry of Health, development partners, county government, hospital and facility users – including, requirement understanding meetings, training sessions, prototype demonstrations, workshops, letters notifications, documents, minutes of meeting, and conduct of capacity building sessions. These meetings took place both in a face to face mode, and emails, Skype sessions and chats mediated through ICTs.

My data analysis was guided by the decision-power-participation framework presented in the theory section. Based on the empirical case, I have identified certain key decisions at certain stages of the project, have analysed the dynamics of power and participation around them, and the role of ICTs in this process.

4. Case overview

In 2010, INGO initiated a process of design, development and implementation of an integrated hospital information system (called HospIS) based on open-source platform for the context of district hospitals in the public health system in India. The success of this project came to the notice of a senior official in the Ministry of Health, EAC, who visited India to see
the system in practice and had discussions with the users and the INGO team. Impressed by what he saw, he recommended to his ministry to consider this system for EAC. After about a year of non-action, a senior staff from a development partner (called DP) based in EAC initiated a process of re-examination of the possibilities of HospIS and saw a Skype demo of it. This led to a formal request for proposal (RFP), developed by the DP’s consultants, being advertised by the DP for the Electronic Health Record System (EHRS) envisaged to be deployed across multiple hospitals and primary health facilities in the country.

INGO responded to the RFP and their proposal was accepted. The agreed scope of work included in addition to the specific facility based requirements for HospIS the global vision of an information exchange which would enable interoperability of data from other systems (such as human resources, logistics and births and deaths) with HospIS. Additionally, the scope included enabling the development of a national ‘community of practice’ (CoP) in EAC to strengthen aspects of sustainability and local ownership. The suggested INGO approach was grounded in a socio-technical and deeply participatory methodology with users being seen key in defining their needs and the trajectory of the system, which resonated with the CoP vision proposed.

The project started with a four-member INGO team visiting the EAC for understanding system requirements over a two-week period. In the first meeting, the stakeholders to constitute the CoP were identified, including MoH officials, DP staff, consultants (hired by DP), users working in hospitals/facilities where the system was to be deployed, and other members from the donor community. The initial discussions with senior MoH officials, based in the country capital, included developing a mutual understanding of the broader vision and expectations from the system. After this the INGO team moved to one of the counties (planned to be the pilot site) and visited different facility types, and worked with local users to understand workflows, practices, information and patient flows, and infrastructure needs. In the process of working with facility users, INGO team also tried to identify ‘champions’ for the CoP.

On return to India, INGO developed and submitted to EAC a detailed report summarizing the proposed approach to system design, development and capacity building. The report was approved by EAC and the project was initiated.

One of the big decisions in this project concerned the use of the existing HospIS built by INGO in India as the frame of reference for the EAC system. This decision was basically taken by DP, supported by their consultants, based on the INGO proposal. The MOH were not directly visible in this big decision as the existing design of HospIS provided to be a strong guiding frame, providing both constraints and opportunities, for the development of the new system.

Over the next six-nine months, two parallel processes on system design and capacity building ensued. Important was to define the different stakeholders who would participate as members of the CoP. While DP, MOH and the INGO team were key members, the consultants played an important role in enrolling other international partners legitimized by the argument of
making the process more participatory. This increasing bias towards international partners contributed to a drop in participation of the local officials, and increasingly online sessions started to be driven by their perceptions where they parachuted into discussions with limited prior engagement and understanding of the requirements. Over time, the online capacity building sessions started to turn into briefing sessions for new members further contributing to a drop in MoH participation.

The prototype development process was discussed with this evolving CoP over various Skype meetings, feedback received and revisions incorporated. Similarly, for capacity building, session plans were made and online sessions on Skype were conducted, and later Moodle (an online training management tool) was introduced for audio-video sessions, competency tests, sharing of feedback forms and resource material. Shaping this online capacity building was the decision of scheduling time of when these sessions would start. For the EAC consultants, MOH officials and the INGO the time agreed of 10 am (EAC time, twice a week) was convenient, but was not convenient for the hospital staff for whom it was the peak OPD time. This led to a near exclusion of facility users in the capacity building sessions, and severely constrained user participation.

Another big decision concerned the selection of the county for deployment, with implications on assessment of hardware and user capacity building needs. The MOH had earlier selected two contrasting counties (called County1 and County2), with County1 having well developed infrastructure and was closer to the capital, and County2 the reverse on both. However, as a result of this choice, the users in County2 were excluded from the online capacity building processes because of their very poor access to internet. To circumvent this, INGO made a complete audio-visual training material package based on the Moodle platform which was then downloaded by the DP consultants and made into CDs and given manually to County2 for self-training. This disadvantaged the users there from actively engaging with the broader CoP in the making. While this process went on for about eight months, suddenly just a month before implementation, the MOH replaced County 2 with another (County3) who were caught completely unprepared with respect to readiness for the project. Their late entry meant they were not part of many important project decisions already taken.

A small-decision related to clinical standards to be used in the system. DP wanted to implement global standards for diagnosis ICD 10, something they had been advocating for long; while hospital clinicians wanted to follow the MoH standards for classification of diseases. This meant that the clinical modules capturing patient illness, diagnosis, and history had to be designed based on this global design, rather than the local requirements which, had been part of the curriculum taught in EAC medical colleges. Hence, though the clinicians had participated in articulating requirements, these were overridden by these global standards and the power of the DP.

Another small decision was on prioritization of modules for development, which was primarily taken by INGO. The DP or MoH team were not consulted and only informed about
the decision. Though the MoH team did give feedback on prioritization, the INGO decision held.

In conclusion, I have provided a curtailed account of the case study which is currently in progress, with a focus to highlight some key decision points, and analyse them from the perspective of participation and power. This is now presented.

5. Case analysis

The case analysis is presented in two parts. In the first, I discuss four illustrative decisions to understand their dynamics and how they shaped the project. In the second, I extend the analysis to consider implications of these on participation, and the role of technology.

Four illustrative decisions

In this section on analysis, I discuss four key decisions which relate to the project. The first is on defining of the project vision, the second around a technological choice, the third on the adoption of clinical standards and the final one on module prioritization. Around each, I try to understand who participated and who did not, to help make inferences around power related issues. In the table below, I summarize these decisions and then discuss them.

<table>
<thead>
<tr>
<th>Decision</th>
<th>Key characteristics of decision content</th>
<th>Who participated in the decision</th>
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<tbody>
<tr>
<td>Defining the vision of the project</td>
<td>Openness to enable scalability to a national system based on health information exchange platform</td>
<td>DP driven by vision of an Integrated Architecture formulated by international consultants</td>
<td>The MOH and facility users</td>
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<td>Making technological choices</td>
<td>Open source platform based on Indian system – reuse of code and build on something that works</td>
<td>INGO proposed the platform, accepted by DP</td>
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</tr>
<tr>
<td>Defining clinical standards to be implemented in the system</td>
<td>The use of global standards for nomenclature on cause of deaths and clinical practice</td>
<td>DP</td>
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<tr>
<td>Module prioritization</td>
<td>Prioritization of modules for development</td>
<td>INGO</td>
<td>MoH</td>
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</tbody>
</table>
**Decision relating to defining the project vision:** A key characteristic of this decision was to develop HospIS with an open and license-free platform to enable national level scaling. This vision was primarily driven DP informed by consultants who had prepared the RFP which reflected a global vision of a health information exchange. This exchange entailed an integrated system in which HospIS would be the hub and would also transfer data to the national level data warehouse. Such an integrated architecture is inherently complex and even not successfully achieved in various resource-rich environments. This state of art vision assumed various technical and institutional pre-conditions, which were largely absent in EAC. However, given the dominant position of the DP and their consultants, this modernist and technical vision was inscribed in the system requirements.

**Decision related to making of technological choices:** Two elements were key. The first was to use the OpenMRS platform for the development, which was a global leader in this domain, and a key component of the health information exchange architecture. The second was to build upon the system developed by INGO for an Indian state, and customize and extend it further for the EAC context. The INGO proposal was in synch with the initial DP requirements document, which did not include explicit MoH inputs, though could be seen as having their tacit approval. INGO as technical experts of HospIS were the holders of the expert power and knowledge based on their prior implementation experience, while the MoH and facility staff were largely excluded from these evolving conversations.

**Decision related to implementation of clinical standards:** DP, for many years had advocated the use of global cause of death and clinical standards in the country, but had not been successful due to the manual and fragmented nature of the systems. The use of the OpenMRS platform however provided a vehicle for the same, and legitimized the requirements of adopting a health information exchange approach. The clinicians had for long resisted the use of these global standards as they had been schooled under a different paradigm that were specific to their country. However, though the clinicians participated in articulating requirements, they were overridden by the global standards, now facilitated through HospIS, and were forced to accept.

Decision related to prioritization of modules for development: The modules prioritization was based on a development logic defined by INGO. This decision did over-ride the MoH prioritization of the clinical and inpatient modules which they felt would gain a stronger buy-in. Though the project professed a ‘participatory design’ approach, in practice it did not consider key participatory inputs due to varying priorities of other stakeholders.

Next, I draw on Wagner and Brattateig’s (2012) framework to discuss the implications of these decisions on participation and the role of technology and empowerment.

**Implications of decisions on participation and the role of ICTs**

Central to an understanding of ‘design decisions’ is the concept of power. I start with a brief introduction to the concept of power aiming at a more conceptual analysis of the design decisions.
Power related to the decision-makers

The DP head and INGO coordinator took the lead in the decisions on values and concepts of the system, based on their varying interests. The decision to use the open-source system came from DP head being grounded in research experience and prior knowledge of how global vendors locked African governments with proprietary systems. While his main strategy concerning decision-making was a mixture of influence oriented towards persuasion and 'creating mutual understanding', DP also used power by eliminating other alternative choices.

The INGO team was responsible for the technology development. The technical design decisions regarding the use and further development of the system was based on a mixture of influence and trust. Neither the MoH team nor the facility team could seriously contest decisions requiring specialized technical expertise; they could only challenge the outcomes of these decisions.

The decisions on values and openness of the system were clearly based on a vision of participation to enable scalability to a national system based on a health information exchange platform. Its acceptance was due to the mutual recognition of expertise. But different interpretations created conflicts such as over issues of prioritization of modules. Both the DP head and the INGO team used influence based on their expertise in these discussions, but aiming at having a mutual understanding, formulated in conditions of the contract. The DP and INGO used their respective powers eliminating alternative choices from the beginning, exercising agenda control and scope (Borum and Enderud 1981; Bachrach and Baratz 1962, 1963).

The decisions on how to implement the vision were based on specific research interests in creating a national level CoP, enabled through technical tools like Skype, Moddle, and email. The decision to introduce larger groups of DPs and scheduling of the online sessions, was taken by the DP consultants, with the INGO team complying to these timings. While scheduling was based on finding a ‘convenient’ time for the MOH officials and the INGO team, it led to exclusion (even though unintended) of hospital/facility users (who needed the sessions the most). As Bratteteig and Wagner discuss, these decisions were open to alternative solutions and turned out to have implications that were unclear at the time they were taken.

Finally, participation and power play out through the mechanisms of agenda control (what is discussed and who decides the themes), participants (who are invited in), scope (which solutions are possible) and resources (available time and people). Applying these arrangements makes the exercising of power less visible, because it is more difficult to identify what is not on the agenda or which solutions (and problems) are not discussed as compared to what was explicitly stated as the agenda. In summary, it can be argued that participation plays a key role in defining the IT and empowerment relationship, and decision making provides an important lens to study how this plays out.

6. Conclusion
The analysis of the relation between participation, power and decision making helps me to develop the following broader implications: deepening of my understanding of the IT and empowerment relationship; developing a more nuanced understanding of role of technology in enabling or disabling participation.

With respect to the first, participation can potentially enhance empowerment of users, by allowing them to express what they want with the system, including supporting clinical choices during patient care. However, sometimes their voices are not adequately expressed and heard.

While technology plays a key role in supporting or constraining participation, for example Skype would potentially allow people in remote facilities to participate in the CoP capacity development sessions, but actual participation was constrained by connectivity constraints and scheduling considerations. What technology is chosen also helps to define who holds the expert power, and whose knowledge gets suppressed. As Wagner and Brattateig’s (2012) say, sharing power is not straightforward, as it is grounded in fundamental asymmetries.
References


PAPER 4

Capacity strengthening within a development context: Developing and applying a conceptual model

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Abstract

This paper aims at answering two research questions. The first concerns understanding Sen’s distinction between human capital and human capability in the context of capacity strengthening of a hospital information systems context in the public health sector context of a State in India. The second concerns developing a conceptual model that can help to apply this distinction. To answer these questions, a process model has been developed which describes capacity strengthening to go through three stages – understanding the artefact; applying the technology to the context of use – called the “capacity for use”; and, applying the knowhow to other domains (outside the work sphere) which the user may value – called the “capacity for exchange.” These three stages involve different modes of capacity strengthening, and takes place within an institutional context, shaped by existing structures. The paper makes at least three key contributions. Firstly, in conceptualizing capacity strengthening as a process, it goes beyond typical models that emphasize cascade training approaches. A second contribution concerns going beyond the primary focus on skill development which most such projects have, and emphasizing the role of mentoring in developing capacity for exchange. The third and most important contribution is that it puts ICTs capacity strengthening within a broader development context, to emphasize the value of such projects to help improve the quality of development outcomes.

Key Words: Development, Human Capital, Capability Approach, Capacity Strengthening, Participation, ICT4D
Capacity strengthening within a development context: Developing and applying a conceptual model

Mohammed Younus in his Nobel prize acceptance interview to the CNN (December 10, 2006) criticized the World Bank model of support to developing countries, taking the example of building bridges in Bangladesh where the plans and money gets limited to the World Bank and senior government officials. When asked about alternative models he said "of course we want a bridge, but we also want to have knowledge locally on how to build more bridges.” He was looking at the bridge beyond an artefact with limited “use value” (to allow the crossing of the river) to something which supports the building of “exchange value” (know how to create more bridges). Similarly, taking this perspective to mobiles in developing countries, Amartya Sen (2010, pp-1) writes that “a telephone owned by a person helps others to call the person up, as well as to receive calls from him or her, and so the increased freedom of the phone owner adds to the freedom of others.” The mobile phone, thus Sen argues, is generally freedom-enhancing which goes beyond the more instrumental use of the artefact.

Amartya Sen (1997) thus makes this important distinction between human capital and human capability, suggesting that while the former focuses on the “use” aspect the other on “exchange.” However, while Sen’s distinction is powerful to understand the difference between capital and capability, he does not go into details of how such capacity strengthening efforts can be operationalized in these two situations. Arguably, this distinction is important in informing theoretical and practical approaches to approach capacity strengthening efforts in the context of IT for Development (IT4D) efforts. In this paper, I try to understand these issues through the following research questions:

What are the implications of the distinction between human capital and human capability in the context of capacity strengthening efforts in IT4D initiatives?

What conceptual models can help to theoretically and practically inform capacity strengthening efforts in IT4D projects?

My empirical basis concerns the capacity strengthening efforts in the context of design, development and implementation hospital information system project within the public sector in an Indian state. For example, while an individual health care worker should have the capacity to use ICTs for supporting their everyday work (to carry out monthly reporting), they should also develop the ability to apply the knowhow to other domains which they value, such as seek better employment possibilities or use Excel sheets to make home budgets. This requires a shift from building capacity for enhancing instrumental use (sending reports) to developing value added uses. Models of capacity strengthening need to be reconceptualised to enable this shift. This paper explores how this can be done.

The rest of the paper is organised as follows. In the next section, I first review relevant literature based on development and capacity, and next articulate a theoretical framework
drawing upon Sen’s distinction of human capital and capability. In section three, I describe my research approach and the case study in section four. In section five, I analyse the case study based on Sen’s framework. Finally I present discussions and conclusions.

2. Literature Review and Conceptual Framework

This section has two broad parts. In the first, I discuss the intricate relation between development and capacity, and the need for strengthening the linkage. Following which, I present my conceptual framework.

2.1 The intricate linkage between development and capacity

Development inscribes notions of progress for example related to increasing life expectancy or reducing levels of poverty. While there has been progress on various dimensions, this is not inevitable, universal or unidimensional, emphasized by the frustrations expressed in a voluminous literature emphasizing the need for change and new directions. Sen’s has been a strident voice in these calls, built around his notions of human development, which goes beyond simple fixations on economic growth. Instead, he argues for a broader and more inclusive view of people’s capacities, and their potential and challenges to enlarge their choices, to know more and do more, and have the vigour to lead fuller and more satisfying lives. For Sen, development embodies a process of expanding the real freedoms that people enjoy, which requires the removal of major sources of unfreedoms such as poor facilities for education and health.

Historically, the dominant approach to development has emphasized economic parameters, where poor countries were expected to follow trajectories of the rich, with increasing injections of technology and money to reach the same destination more quickly (Fukuda-Parr, et al 2013). This approach also shaped capacity strengthening models, with thousands of experts and consultants fanning out around the world, taking up residence in ministries and project offices, partly to supervise aid projects and to provide consultancies on new technologies. Capacity strengthening models defined these experts as the holders of knowledge, the users as passive recipients, and a clear focus on teaching techniques to run the new technologies.

Sen’s approach has in recent years found increasing application in IS research. For example, Zheng (2007) argues that the capability approach has a latent focus on the well-being aspects of individuals, and a simplistic correlation between ICT acquisition and diffusion and the improvement of people’s well-being. The word “capability”, under such circumstances, usually refers to people’s ability to use ICTs, such as computer skills. In comparison, the capability approach considers “capability” as the freedom to achieve well-being and agency. In other words, it would be concerned with life opportunities and the range of options for people to access and use ICTs to both improve the quality of life and to accomplish their goals.
Capacity building efforts in development projects are largely shaped by various development partners. Fanany et al describe capacity as an ‘amorphous’ term referring to the ability of individuals and organisations to cope with all aspects of their existence, and building capacity seeks to nurture these qualities (Fanany et al 2011; Potter and Brough, 2004). While capacity building in general is an important component of development programmes (UNDP, 2009; Otoo et al. 2009), there are limited “IT only” projects and IT is an aspect of wider programmes (Gevaert, 2012), such as health systems strengthening. Limited success of such efforts makes developing national and institutional capacity as the one particularly elusive goal, requiring an urgent rethink of capacity strengthening models within a broader development framework.

Strengthening capacity will contribute positively to broader development outcomes. Capacity is a convenient way to help make sense and organise the world(s) of development, and the conditions that influence them. Capacity is more than simply descriptions or guidebooks as to what to do; they represent theories of how development works, and evolve over time. Capacity models assist in framing issues of development, including the work of individuals or groups and institutions.

After arguing for the intricate linkage between development and capacity strengthening, I seek to develop a conceptual framework to help operationalize this linkage. Drawing from Sen, I identify 4 questions that help me do so:

Why do people engage in capacity strengthening?
What approaches are taken to capacity strengthening?
How institutional conditions and agency shape capacity strengthening processes?
What value ensues to individual through capacity strengthening?

The first question speaks to Sen’s concerns of development and what individual’s value. This relates to the “why” of participating in capacity strengthening. The second question seeks to understand “how” capacity strengthening approaches encourage how individuals can enhance value to them. The third question examines “what” institutional conditions shape capacity strengthening processes, and the last question examines the “so-what” factor, in terms of what value ensues for the individual.

2.1.1. Why do people engage in capacity strengthening?

For Sen, development is about enabling individuals to follow the choices they value, which requires an understanding of why individuals want to engage in capacity strengthening? Drèze and Sen (2002) argue people engage in learning and education for several reasons, and Robyen (2006) discusses intrinsic and instrumental roles. Intrinsic learning is when a person
values knowing something simply for the sake of knowledge, say learning different languages or poetry. In contrast, instrumental roles are economic or non-economic taking place at personal and collective levels. At the personal level, such learning can for example help the person to find a job, and reduce their vulnerability in the labour market. The instrumental collective economic role refers to when learning or education of people at large helps in building a market for example for books and newspapers. In contrast, the non-economic instrumental learning may be to enable the individual to become knowledgeable to communicate and understand others better. For example, a person may learn to access internet to read about other places in the world, which can contribute to creating a more knowledgeable and tolerant society (Robyen 2006).

In the public sector in developing countries, ‘training programmes’ are mostly designed on furthering the ‘instrumental role’ from the perspectives of both demand and supply sides. While the supply side refers to those who provide training (for example, the State or development partners), demand side concerns recipients of the same. From my work experience within the Indian public health sector, I have observed projects like the EU funded Sector Investment Programme and World Bank’s Health System Strengthening initiative, both aimed at strengthening the referral system in a state, which included the establishment of the supporting infrastructure. The capacity strengthening efforts from the supply side were shaped by this focus, on the ability to use the medical equipment, rather than from the demand side need of the care givers on strengthening primary health care systems. Often, health departments develop a ‘training calendar’ which tends to replicate the previous year’s calendar, ignoring demand side needs and shaped largely by supply side considerations. Patterns of participation in training programme typically reflect the nomination of senior staff for foreign or ‘big’ city trainings, where access to per-diem payment is an important instrumental motivation. Sanner and Sæbø (2014) argue that payment of per diems induces civil servants to expect something extra simply for doing their regular job and encourages them to monopolize participation at the expense of lower-level colleagues for whom the training may be more appropriate.

Summarizing, to understand why individuals participate in capacity strengthening processes, both the supply and demand side considerations need to be understood, and whether instrumental or intrinsic motivations dominate.

2.1.2. What are approaches taken to capacity strengthening?

As Eade (2007) argues, capacity building is not a ‘thing’ or a commodity that can be reduced to a set of ingredients for a universal recipe prescribing ‘how to do it’. Sen’s work helps to understand capacity strengthening approaches under two broad domains of “human capital”
and “human capability”. While human capital concentrates on the development of skills, knowledge and effort in augmenting production possibilities, human capability focuses on the ability of human beings to lead lives they have reason to value and to enhance their substantive choices.

Dominant approaches to capacity strengthening follow human capital development models with the underlying assumption of a “knowledgeable outsider” playing the role of strengthening capacity of people to manage their interests. This assumption plays out in using primarily ‘skill based’ approaches emphasising methodology, technology or infrastructure promoted under the aid project. Further, these models are inscribed deeply in “cascade models” of training where external ‘experts’ train national teams as ‘master trainers’ who train state trainers and they district and then field functionaries. This training model by design seeks to fit maximum ‘learning’ in a short time frame, making it heavy for a newcomer to imbibe as much learning. For example, the national training institute for the Ministry of Health, India recently organised a four-day ‘training course on logistics and supply management system’ for central level officers (NIHFW Training Calendar 2015) to support the introduction of new online logistics supplies software. Master trainers from this national training are made responsible for conducting two-day training at the state level for district officers, who then will do the same for their sub-district staff. While this model will help develop required operational skills to run the software, it will be inadequate to support transition of users to new ways of working from manual systems as they fail to adequately integrate with the evolving social context and priorities of the user.

Potter and Brough (2004) propose a capacity pyramid model that sets out interdependencies between tools, skills, staff and infrastructure, and structure, systems and roles. This model came from the dissatisfaction of the authors whilst working on a large development project in India where capacity development carried out was described “as a pompous term for training.” Their model emphasized that a hierarchy of capacities was significant, where each depended on the presence of other capacities in the pyramid. However, in developing countries, such access to supporting resources is often limited, and gaps are often filled by donors. At the top of the pyramid is skills, where most often capacity building reinforces notions of ICTs as tools/devices, ignoring the larger organizational and systemic concerns that need to be addressed for the ICTs to bring value to the individual and organization.

Another approach under human capital can be seen to be the model of coaching, where a senior provides hand-holding to the trainee in an on-the-job setting, helping them to deal with situational exigencies. This is similar to role of the coach in football who supports his team members in dealing with the particularities of the match situation. The on-job focus of
coaching is different from the cascade model which typically involves a one-time training approach, but they both have similar focus on skill development.

The human capability approach in contrast to human capital emphasizes a more holistic view of capacity strengthening, going beyond just technical skills development approach emphasized by training and coaching. Mentoring will seek to understand deeply the mental models of the trainee, explain what desired organizational models are and the processes of change that needs to accompany this. In this way, mentoring seeks to support trainees to make significant transitions in knowledge or work, and goes beyond limited on-job training approaches to a more ‘holistic’ vision of development. This is necessarily long term in nature, involving fundamental changes in mental models.

To summarise, the why of people participating in capacity strengthening, can be understood through Sen’s distinction between human capital and capability. Training and coaching takes a skill based perspective and is inscribed in cascade training models promotes a human capital approach. Mentoring approaches which seek to understand mental models of trainees and to bring deep rooted change to align with organizational models reflect approaches to human capability strengthening. The next question examines how can this be done?

2.1.3. How institutional conditions and agency shape capacity strengthening processes?

Guided by Sen’s framework, this section examines the question of how conditions of institutional structure and agency shape capacity strengthening processes. While structure represents existing institutional conditions of power, norms and legitimacy, agency concerns what a person is free to do and achieve in pursuit of goals or values that he or she regards as important (Sen 1985). Agency concerns the intention and capability that individual agents have to make a difference in the domain within which a person operates. As Kimaro, (2006) argues, human capacity building depends on the institutional conditions to provide a conducive environment for learning. Institutions with unclear objectives, inadequate structures and resources, lack of incentives or weak practices are unlikely to achieve a productive and motivated work force because these factors do not lead to a conducive working and learning environment.

Given that capacity strengthening in development projects takes place within a public sector defined institutional framework, three structural conditions influence capacity strengthening: bureaucracy; agenda of development partners; and, the power of knowledge.

Bureaucratic structures in public sector setting represent rigidly hierarchical conditions, exemplifying top-down approaches, with little involvement and participation vertically or horizontally within the organisation (Sahay and Walsham 1996). These structures are defined by rules and resources such as who makes decisions (the senior most), and the process
followed which shapes who is excluded or included in the process. Sahay and Walsham quote Naipaul to describe how cleaning in a hotel in India is carried out by multiple people each specializing in particular tasks (bringing the water, cleaning, taking away the dirty water etc) rather than one person taking responsibility for the overall task. Such compartmentalization and fragmentation becomes a core part of the existing structures which promote a skill-based approach to capacity strengthening. These structures of top-down, non-participatory and compartmentalized approaches then shape budgetary processes, and the overall framework in which capacity strengthening takes place, as also reflected in the national training institute example provided above.

Recognising these bureaucratic bottlenecks, various development projects have been initiated by agencies like the World Bank and UNDP to initiate governance and administrative reforms. These reforms however take a considerable length of time given the nature of issues that need to addressed: policies, structures, attitudes, values and political interests. Addressing these reform issues typically fall out of the timeframes and ‘tangible’ deliverable framework in which such projects are structured. Political structures in developing countries tend to be short term, and frequent changes in government are not conducive to give the stability of environment that such long-term reform efforts require.

Agenda of development partners: Development partners are an integral component in defining the structures that shape capacity strengthening process. This shaping comes through the provision of funds, technologies and methodologies, technical support, including the capacity building strategy. This agenda of development partners are operationalized in terms of “projects” which have limited timeframes and deliverables. Given that the agenda is controlled by the development agency, by design they control the balance of power in decision making, making asymmetries inevitable in relation to the beneficiaries of development interventions (Girgis 2007).

Development ‘projects’ are framed within ‘measurable deliverables’ framework of the project, which becomes the output of the project, taking focus away from the outcomes. For example, Sahay et al (2015) report from a capacity strengthening IT project for the Ministry of Food in Bangladesh. In the initial phase of this project, the “number of workshops held” was a key deliverable or “output”, rather than the broader strengthening of food security systems which can be seen as a project “outcome”. However, achieving outcomes within a finite timeframe and framework of concrete deliverables is extremely problematic. This raises the key dilemma of how to promote capacity strengthening with human capability considerations within a project framework that promotes human capital.
Power of knowledge: Since capacity strengthening involves the transfer of knowledge, they are bound up in structural conditions of who holds the power, what is the process by which knowledge is shared, and how this is evaluated. Girgis (2007) refers to knowledge and experience as secondary sources of power in the capacity strengthening relationship, with finances being the primary. The technical expert hired to train and build capacity of the locals, by definition assumes a position of power, training those who ‘do not know’. Eade (2007) also argues that capacity strengthening is ultimately about retaining power through knowledge, rather than empowering the recipients. Given these asymmetries, efforts of capacity strengthening don’t really help to transfer knowledge—or at least not in the catalytic way that might ignite a positive chain reaction throughout the institutional structures.

Capacity strengthening when based on a one-way transfer of resources, financial or intellectual, will remain profoundly asymmetrical, which will tend to distort the functioning and dignity of the weaker partner, as well as fostering the hubris of the stronger one (Eyben 2006). To address this asymmetry, Sahay et al (2015) argue for a perspective of mutual learning in capacity strengthening exercise, where both the providers and recipients of capacity should seek to learn from each other, where neither one is placed on the pedestal of power. However, this is challenging given that this relationship has money supply at its foundation which makes power games and dependency to lie at its heart, and development ‘experts’ seek to retain power, rather than empowering their partners (Eyben 2006). Powell (2010) argues that too often, the evaluation of capacity strengthening under development projects focus narrowly on training of individuals without giving adequate attention to organizational issues, broader processes of empowerment or relevant factors in the ‘enabling’ environment.

The ICT artefact, which is the object of capacity strengthening, can also reinforce the power asymmetries between the providers and recipients of capacity. Puri (2003) has argued that a large part (even more than 70%) of development aid tends to feed back to the development agency in terms of the technology, the expertise around it and the hiring of consultants. There is thus a vested interest of the providers to keep control over the knowledge of the technology and the artefact itself, which then becomes important considerations in shaping capacity strengthening models. Avgerou (2002; 2003) points out that ICT has become an institutional actor in developing countries, supported by the power alliance of the institutions of “development”.

While structures as discussed above are important factors shaping capacity strengthening processes, they must confront individual agency who have the potential to act otherwise. Participation then becomes an important element which can help redefine institutional structures (Puri and Sahay, 2007). This can be done in two ways: shaping the agenda; and, building local knowledge.
Strong participation of recipients can help redefine agenda of capacity strengthening established by the donors. For example, in the Bangladesh case (Sahay et al., 2015), while the first phase of capacity building was through the vehicle of workshops, it was realized that this was inadequate as this forum did not give the platform to express their views in presence of seniors. This led to a change in the model of capacity strengthening to one-to-one, where the users had more space to express themselves to the trainers.

Puri (2007) provides an insightful example of how local knowledge is relevant and should be incorporated into IT based capacity strengthening models. In an example of water regeneration projects in rural India, GIS was being used by scientists to model optimal locations for digging new wells. It was soon realized that elders in the village had important local knowledge that could guide these efforts. So, a participatory mapping exercise was carried out where maps were drawn in the ground, and the village elders were asked to point out in the map what they thought was the optimal location of the well. This information was then drawn into the GIS models by the scientists, and also provided the basis of capacity strengthening efforts.

In summary, the interaction between structure and agency is important in shaping the content and process of capacity strengthening. In the next question I discuss what value ensues to participants of these exercises.

2.1.4. What value ensues to individuals through capacity strengthening?

This question concerns what value individuals’ gain from capacity strengthening exercises. Sen’s arguments provide important insights to address this question. In the introduction of the paper, I had through the example of the bridge quoted by Younus and of mobile phones by Sen, had discussed two types of value – use and exchange. While use value refers to the ability of the user to be able to use the artefact to doing his/her existing work better, exchange value concerns the ability of accessing benefits in other domains which the individual values. This distinction helps us to understand the different kinds of values that an individual can access through ICT related capacity strengthening. The assumption being made here is that an individual will be more motivated towards engaging in capacity strengthening if it provides him/her both kinds of values.

However, how to structure capacity strengthening efforts to ensure both these sets of value ensue is a non-trivial challenge for reasons of both structure and agency which was discussed
above. Often after training in a particular skill, the recipient does not get an opportunity to apply the skills, then the value is lost. For example, a doctor may be trained in conducting C-section surgeries to deal with the shortage of experts in this area, but after this due to structural conditions of transfers existing in the health system, the doctor may be placed in a clinic where the facilities to conduct C-section surgeries are not available. This is lost value with respect to use. However, the doctor may exercise individual agency to open a private clinic to be able to provide this service. This is exchange value gained.

In this section, I have discussed the why, how, what and so what of capacity strengthening seen within a development backdrop. This then provides a basis to articulate a conceptual framework which I now discuss.

A conceptual framework to analyse capacity strengthening

My theoretical perspective on capacity building draws upon Sen’s ‘capability approach’ and specifically his distinction between human capital and human capability (Sen, 1997). The capability approach is comprehensive and inter-disciplinary, and provides a broad normative framework for the evaluation and assessment of individual well-being and social arrangements, the design of policies, and proposals about social change in society. The capability approach encompasses societal arrangements which help to evaluate a social arrangement or policy, and also the well-being of people (Robeyns, 2005). The capability approach has been criticized for lacking a degree of operationalization, as it only outlines what is important to evaluate, but does not guide to additional theories related to the topic being analysed (Robeyns, 2003).

I approach operationalising Sen’s ideas based on the four questions discussed above. The question of “why” people engage in capacity strengthening can be understood through the distinction of instrumental and intrinsic reasons. This implies whether individual seeks to learn only to enhance their commodity value, or also want to build broader overall knowledge in the context in which they operate. This shapes the approach to capacity strengthening – as a means or an end (Robeyns 2003). The second question of “how” capacity strengthening is carried out can be approached through the distinction of human capital and capability. While the first encourages skill based approaches through training and coaching, the latter identifies mentoring as a means to understand mental models and to address deep rooted changes. The third question of “what” factors shape capacity building makes us place the capacity strengthening within the context of the institutional structures, and how individual agency through participation can reinforce or change these structures. Finally, in the last question I seek to understand what value ensues to the individual; whether it extends beyond “use”
reflecting the ability to do existing things better to “exchange” where other choices can be pursued which the individual has reason to value.

In summary, this 4 question framework helps me to analyse capacity strengthening processes, within a broader development framework. After discussing the research approach and case study in subsequent sections, I draw upon this conceptual framework for the case analysis.

Research approach

Three elements broadly characterize the research approach: a) action research, b) a multi-level analysis and c) longitudinal project. These are discussed before presenting the methods details.

The methods guiding this research can be classified as action research, drawing upon the “networks of action” perspective (Braa et al. 2004) which seeks to direct action in networking different units engaging in similar development efforts. In this case, it was the design and development of the integrated hospital information system in a state (called NSTATE) in India. The process started in one reference hospital, and then extended to 19 other hospitals. Action around capacity strengthening involved building training material and methodologies for the reference hospital and then expanding to other hospitals. INGO (a local NGO) were responsible for this whole initiative, and were the catalyst to create this “network of action.”

Alongside with being a researcher, I have also coordinated the project, as part of the INGO team. As coordinator, I have negotiated with NSTATE on the application scope, conducting requirements analysis and design, carrying out capacity building including doing training, creation of resource material, and providing hand holding and troubleshooting support. As a researcher, having worked on similar projects in other settings, I have reflected on these experiences and tried to learn from mistakes and successes, and incrementally develop more general and theoretical principles around capacity building. The experiences and engagement is thus rich, intensive and ongoing (in this case since May 2010) and involving a diversity of learnings. As the project coordinator, I have had the privilege of being part of the extended state IT team which provided me insights into the vision, policy planning approaches and challenges within the public sector and their expectations from technology.

The project started in May 2010-current, where I have visiting each of the sites at least once a month till early 2014, for meetings, discussions with both the state and the INGO team. Email and phone contact was maintained continuously. Since 2014, I have had limited visits to each hospital, though team members have been continuing with visits, and engaging in hands-on
and trouble-shooting support as and when required. My engagement with the hospitals has been continuing through emails, phone and other correspondence. The longitudinal design has helped to develop a process perspective towards capacity building, and how needs and expectations change at different stages.

The multiple design focus involved building user capacity at multiple levels of state, districts and hospitals. At the state level, capacity building involved programme and ICT managers focused on issues of managing state-wide infrastructure, designing policies and standards on patient confidentially data sharing, and how to organize and institutionalize capacity strengthening efforts. At another level of the district, the focus on the programme managers and outreach officers, and how they could use data from hospital for area planning, disease reporting, and how they could help manage infrastructure. The capacity building efforts at the hospital level covered 100% of the staff including doctors, nurses and service providers. The staff covered administrators and system users. While the focus of capacity building of administrators was on the overall system logic and workflow, various reports on hospital performance, diseases, planning, and how the system could support it. For the systems users, the focus was on explaining them how the manual workflow was incorporated into the system, the concept of privileges that each user has been given based on their hierarchy.

Capacity building techniques employed were a mix of formal and informal methods, including class room training sessions, pre and post training evaluations, competency tests, on-job hands on training, group discussions for requirements analysis, one-on-one discussions and support, and discussions with staff members over umpteen cups of tea. Also, important was the role of mentoring and coaching those proactive users who wanted to learn more, for example, the data entry operators who also wanted to learn about servers.

All the above modes of engagement helped me to collect data through requirement understanding sessions, meetings, training sessions, prototype demonstrations, trouble-shooting sessions, workshops, letters notifications, documents, conduct of capacity building, and building of user manuals, standard operating procedures, and presentations for these sessions. The capacity strengthening process was a rich source of ‘data,’ starting from understanding requirements from each department, including current and proposed workflows, creating mock-ups and visualization of working screens. Users had difficulty to articulate their requirements, and helping them do so served as an important source of understanding their mental models and also future aspirations around their work life.

The above process of understanding involved having discussions on requirements, then INGO designing mock-up screens keeping the workflow and re-engineering suggested by users. A
group discussion was then held with each department team along with hospital administrator (medical superintendent) when each screen was discussed with the department team defending and convincing the hospital administrator their needs, while INGO team explained the technical logic, and the hospital administrator emphasizing the legal and statutory requirements. Such sessions helped INGO to finalize the module design, for the department to prepare for and ‘own’ their system, and for the administrator to ensure understanding of the overall design and enable approvals where required.

In summary, there has been a rich, ongoing and intensive process of data collection involving various means and actors. These may not correspond to traditional data collection methods (such as interviews and observations), as data was collected with a priority of contributing to the project rather than for this specific paper, which was conceived later.

The data collection and analysis processes were intertwined, rather than taking place in sequential steps. As these various project level interventions were carried out, the INGO team would discuss it amongst themselves and with the state to show how these would contribute to potential improvements. For purposes of analysis for this paper, I have tried to place the data within a broader theoretical framework of my PhD work, which focuses on the relation between IT and empowerment based on Sen’s capability approach, I have identified capacity strengthening as a core of this capability approach, and in this paper have tried to develop a theoretical framework to understand it.

Case Study

The case study concerns the design, development, and implementation of an Electronic Health Record (EHR) system in a set of 20 district hospitals within the public health system of an Indian state (called NSTATE). In this project, which started in 2010 and is still ongoing, capacity building of different staff in the hospital was an integral component. While this project involved various complexities such as system design and infrastructure support, this case study focuses primarily on the capacity building issues.

4.1 NSTATE context

NSTATE has the reputation of being stable, inclusive, cohesive and well-governed and it stands apart in many respects from its neighbours in northern India. It has additionally, achieved remarkable growth, especially in the last two decades, which has been accompanied by very good human development outcomes. Despite being a predominantly rural society, educational attainment in NSTATE for instance, is among the best in the country; poverty headcount is nearly one-third of the national average; life expectancy is 3.4 years longer than the number of years an average Indian expects to live; and, per capita income is the second highest in India. NSTATE’s formal and informal institutions have remained robust to change. Underlying its strong economic and social development outcomes is NSTATE’s commitment to expand access to public services to the remotest areas, across tough, hilly terrain and its
strong institutional foundations. The governance model has been very responsive and decentralised. (Bordia Das, et al, 2015).

4.2 Case context

Health system reform efforts across developing countries hinge more and more on technology. As a step towards strengthening health information systems, part of the national reform initiated under the National Health Mission (NHM), NSTATE decided in 2008 to introduce an EHR in 20 district hospitals of the state. A Request for Proposal was advertised to which 53 companies responded, in which NSTATE specified a ‘perfect and utopian’ system with features including telemedicine, SMS based electronic appointment scheduling, digitizing of medical images and videos, and various other technological interventions. With no success on the selection of any vendor, a process which spanned over a year, NSTATE approached a local NGO (referred to INGO), who had been working in the state since 2008 supporting the implementation and use of the routine health HIS for the primary health care facilities of the State. A tripartite memorandum of understanding (MoU) was signed between NSTATE, INGO and a national technical support agency to the Ministry of Health, with the scope of work over a two-year project included the design, development, and implementation of the EHR in the 20 District hospitals (DH). An interesting part of the MOU was that the requirements were not pre-specified as is typical in public sector IT projects, but defining them was a part of the MOU.

In the public health system in India, a DH is typically a 150–250 bedded hospital with at least 10 specialties and serves as a referral institution for the entire district facilities. A DH tends to cater to a daily load of about 800–1000 outpatients and 40–50 inpatients. The systems in a DH are largely manual and with minimal computerization, thus making IT related capacity strengthening a formidable challenge.

4.3 Defining the scope of the system

The scope of work defined in the MOU initiated in September 2010 included ten modules (registration, billing, laboratory, radiology, out-patient, in-patient, pharmacy, inventory, blood bank, and finance management). An incremental approach was consciously adopted from the outset, for example in the prioritization of which modules should be implemented first. Patient registration and billing were selected as the first modules as they were relatively easy to design and implement compared to the others, and since they had higher public visibility. It was seen that success here would enhance the broader buy-in of the system in the hospital. By the same logic, the OPD and IPD modules were seen to be complex because of the intricate workflows involved and the potential resistance expected from doctors, and it was decided to take them up towards the end. Further, NSTATE decided to take the DH in the
capital city as the reference hospital for design, development and implementation of the system, and once successfully implemented successfully, would be taken to the other 19 hospitals in a phased manner. This approach was also envisaged as a way to standardise the system and practices, including relating to capacity building across the state.

4.4 Participatory design as a strategy for capacity building

With respect to capacity building, INGO had three key challenges: to make the system functional in hospitals; to align and integrate the system and processes with hospital practices, including both information and patient processes, in a context where users had limited to no experience with computer based systems; and, make the processes sustainable, so that the state could independently own and run the system once INGO exited from the project (envisaged initially at two-years, and then extended twice). The focus of the initial capacity building efforts was therefore twofold. Firstly, the hospital team needed to learn about the technology and the associated new ways of working, and secondly the INGO team who had no prior experience with EHRs had to learn about the functioning and practices of the hospital.

As a strategy, INGO decided to adopt an approach deeply grounded in participatory design principles. This was compatible with this need to define requirements as the project evolved rather than implementing pre-defined requirements, and where the staff found difficult to articulate comprehensive requirements. This required the design process to be based on strong mutual collaboration and dialogue, where the users were not assumed to be passive providers of requirements, but as actively engaged in co-constructing them, including defining their future expectations from the system. The process followed included the INGO team observing and understanding the work and information flows in a department, followed by discussions with the department team, returning with mock-up screens representing their understanding of the requirements for discussions with the department teams, making revisions as required, presenting final design for signoff and then initiating the development of the particular module. A couple of examples are provided to illustrate this process.

For example, in patient registration, the hospital wanted to improve upon the patient information being captured at registration. Under the manual system during registration, information captured included patient name, age and gender. Further, the registration clerk would ask ‘what’s the ailment’ and judge to which OPD the patient should be sent to (for eg: in case of complaint of joint pain patient is sent to orthopaedic OPD or stomach ache to medicine or general OPD). These details were hand written on OPD slip – which came in three colours – yellow for poor patients (below the poverty line-BPL), pink for senior citizens (above 65-years) and blue for the rest. Patients took these slips and queued outside the OPD room marked on the respective slips. Patients with pink slips got preference over the others.
For the discussions on patient registration module, the team included one member from registration, lab, nursing, accounts, radiology and medical records department, five senior doctors, hospital administrator, district epidemiologist, chief medical officer of the district and the INGO team. Each member was asked to give their suggestion on patient details to be captured, and the response to this was overwhelming. Accounts department requested to add information called ‘patient category’, to identify whether the patient was from a paying or non-paying category, for example BPL the treatment was free, and government employees covered under health insurance schemes. This would help them to put the count of each category of patient to get daily cash collection details. The Chief Medical Officer (CMO) of the district suggested capturing patient address upto the sub-district level in order to correlate epidemiological data with patient address in order to develop morbidity and mortality profiles of an area. The analysis of this referral data will help analyse if patients from certain areas suffering from a particular ailment are requiring travelling to far away district hospitals for treatment rather than getting care at their nearby primary care facilities. This analysis would provide inputs to designing interventions for strengthening the referral systems, such as the posting of specialists or establishing outreach health camps.

The INGO team expressed the challenge to continue with three colour OPD slip paper, which would require the clerk to keep changing the paper in the printer each time with different colours. The suggestion was to print prominently on the OPD slip the age and payment category of the patient, such as senior citizens, which would then be highlighted in the electronic queue of patients on the doctors’ screen. Such engagement provided much learning for both sides. For the hospital team this was a new first to think of using data and information for better planning, discussing issues beyond administrative matters. And for the INGO team it was a learning about the inter-connectedness within the hospital and need for public health analytics.

Another interesting example of participatory learning was the design of the OPD module. The process followed under the manual system was that the patient queued outside the OPD room (as mentioned in the OPD slip), and was served on a first come-first serve basis where the queue was moderated by the OPD assistant. Based on the consultation, the doctor noted the patient’s history, symptoms, treatment on the OPD slip, and advised investigations on the same slip, and the assistant noted the consultation details in in the OPD register. The discussions included 12 doctors representing all specialities, hospital administrator, the district CMO, the state epidemiologist and the INGO team. The doctors pointed to loss of information in case the patient loses the OPD slips or forgets to bring it on follow up visits, especially in case of chronic patients. The CMO pointed to a statutory requirement of the provisional diagnosis being given to every patient, which was not being followed. With these two basic requirements we started to compile a minimum dataset for the OPD module.
Another process re-engineering suggestion from the doctors was that sometimes after consultation the patient, re-registered at the registration counter for a new OPD (instead of using the same OPD slip). This was not seen a good practice as the new doctor would not be aware of the details of a patient already on a certain treatment. Based on these major requirements, the INGO team returned with design of mock-up screens in three weeks for a workshop which also included doctors from other district hospitals and medical college to help build broader buy-in of the medical community in the state towards the system. In the workshop, the INGO team presented the module prototype, which attracted many comments from the doctors. Interestingly, the INGO team did not need to defend their technical choices, but it was doctors from the reference hospital doctors who made the defence.

The doctors at the reference hospital had already taken the capacity building role for the module, seen by their response to apprehensions raised by doctors of filling out details for each patient (history, provisional diagnosis, procedures, internal referral, and visit outcomes) given their high patient loads. To this the reference hospital doctor suggested to make only provisional diagnosis and visit outcome as mandatory fields, and also suggested a process re-engineering by introducing the general OPD as primary for all new patients. The suggested process was that the registration clerk would direct all new patients to general OPD, where the doctors will screen and check the patients, only if required the patients should be referred to the specialist OPDs. This suggestion was overwhelmingly accepted by all the doctors.

In the case of the radiology module, there were additional complexities. In the existing system, the patient observations were hand written, with no practice of specific format for recording radiology observations. The radiologist had reservations as they would not have as much time to type so much text, especially given the limited typing speed and patient load. They suggested standardising radiology observations with pre-defined format for each investigation. The hospital radiologist while recognizing the value of such an approach acknowledged such a system did not exist anywhere in NSTATE, and should be developed as a state and not just a hospital initiative. She thus started discussions with other radiologists, while INGO started to document the maximum set of radiology investigations done in the hospital, as such a list was unavailable. Further, this needed to be integrated with billing as earlier all radiology investigations were at one standard price. Then for each such investigation, parameters for observation were defined and also corresponding result options. For example, for an ultrasound for Neck Swelling the result parameters defined were size of swelling, outline, echo texture, and pressing up to a vessel. And then each result option was detailed, i.e. size of swelling – actual or abnormal, outline – regular or irregular, echo texture – isoechoic/ hypoechoic/ hyperechoic; and pressing upto a vessel – yes/no. A negotiated process contributed to the design of forms for 36 investigations, leading to INGO developing a generic module where a user could define new forms as the need arose.
The effect this standardisation had was that all 20 hospitals agreed to a standard list of 36 investigations and their supporting formats. Understanding the reasons for not adding earlier if the service was available, the answer given by one hospital manager was ‘no really thought of it. Though it could have been done earlier, but none ever thought of it’. The process of understanding requirements was never linear, and was always intertwined with processes of capacity building of individuals and teams, within and across hospitals. INGO played the role of a facilitator in creating these networks of capacity strengthening.

To further highlight the engagement of the entire state at all levels with this process of ‘building their own system’, I bring in example from state level discussions. While the project was in the third year of implementation, the state health secretary (bureaucrat head of the health department in the state) was approached by a software vendor for implementing their system in the newly built medical college. The secretary invited the team from the medical college, state IT officer and INGO project coordinator. After the vendor gave exhaustive demonstration of the system, the secretary initiated a discussion on costs to which the vendor gave a very high figure. The Secretary responded saying that the state has experience in design, developing and implementing an EHR system across 20 hospitals which were done at a cost 20 times less than the quoted amount. The vendor never returned. This example the learnings highlight the learning the state had gained from the INGO project, a form of capacity building of the senior functionaries.

As the system was made ready for implementation, INGO initiated processes of capacity building of the hospital user, following the module prioritisation plan. Capacity building tools included user-manuals and standard operating procedures for users of each module on how it can be used. Training was customized to the needs of three broad categories of uses: i) those proficient in computers, which included the five data entry operators hired on a contract basis for registration and billing entries; ii) those who had prior experience with computers (doctors, staff in blood bank and laboratory), but were not significantly proficient; and, iii) those who had never worked before on computers (including nurses, pharmacists, and store clerks). Customization of training approaches and content included having extra training on basics of computers such as on how to switch on the computer and use the mouse and keyboard for the third category of users, and for doctors to show how the system may reduce their workload of recording high number of patients every day.

Out of the total hospital staff of about 210 members, only 10 were in first category, 50 in the second and the rest in category three. The training design and schedule, was made based on user needs and their work schedules. The training design included the first two-days of classroom exercises with aids like presentations and mocks-up, followed by five-days of hands-on exercises on the system while the INGO team facilitated the process. This was
followed by a dry-run of the system in the entire department where users were expected to complete all their everyday tasks using the system. Once the users and department was confident of the system, typically involving the support of two INGO team members for about three weeks, the department went ‘live’ with the system.

4.5 Rolling out: from reference hospitals to others

It took about one-and-a-half years for INGO to develop and implement the complete integrated EHR and stabilise processes in the reference hospital, and then initiate the process of scaling the system to the other hospitals. These hospitals were located in other cities of the state, typically involving a day’s travel from where the reference hospital was and where the INGO team were based. As a result of these time and resource constraints, it was not possible to replicate the intensive process of support and capacity building carried out in the reference hospital in the other hospitals.

To develop an approach for capacity building in the other 19 hospitals, the INGO team discussed this issue with users from the reference hospital (in an all department meeting) and elicited their suggestions. The response was overwhelming. The team of data entry operators offered to join the INGO team to train users in the nearby hospitals, while the pharmacists and laboratory technicians volunteered to take discussions of the system and its use in their ‘union’ meetings. Typically, different cadres (pharmacists, pathologists, doctors, lab technicians) from across the facilities in the state were members of a state level union, and they had periodic meetings. With this support, INGO initiated the scaling process with data entry operators joining in for training of data entry operators in new hospitals, and, pharmacists and lab technicians updating their counterparts on the system and the advantages and challenges they experienced. Typically, the implementation and capacity building process in a new hospital involved the following activities. INGO conducting a one-day orientation for the hospital team, followed by parallel class room sessions for three departments; and then hands on sessions for each department with three teams working in parallel, and then on-job training and hand-holding support typically done remotely due to distance constraints. The class room capacity building process in each hospital was for about 20-days, after which the hospital was live with the system and hands-on on-job capacity building was done. This standard process was followed across the other hospitals.

The team in the second hospital in which the system was implemented was very dynamic and proactive. The hospital administration ensured that the team from each department, including lab, pharmacy, stores and clinicians, visited the reference hospital to understand the system and its working. This made the hospital team much better prepared for the implementation. During the capacity strengthening process in the hospital, the administrator personally
intervened, asked questions to the staff by posing them mock situations, relating to how the
system would help them in these situation. He himself attended the capacity building sessions,
and emphasised his staff on ‘using’ the system beyond the given flow, so that they could
make the transition to the new system at the earliest; and become the ‘reference’ hospital for
the state. Only when he felt convinced that his staff could manage the system on their own,
did he let the INGO team stop with the capacity strengthening sessions. As the hospital was
ready to go live with the new system, the hospital administrator proposed that the health
minister inaugurate the system in his hospital, which was done with the minister becoming the
first patient to be registered in the hospital. He simulated the regular process that an OPD
patient would follow. On asking about his motivation to take the extra steps of ensuring the
system works, he said that it was his ‘professional pride’ which drives him.

A few months later the hospital administrator was transferred to a bigger hospital, but located
in much difficult geographical terrain, which was cut off due to heavy snow from the rest of
the state for the winter months. By the time the INGO team arrived in this hospital for
implementation, the hospital was very well prepared to receive the system.

During this process of scaling to other hospitals, the INGO team could not visit the reference
hospital much. The visits were made only when there was a call from the hospital and the
support could not be resolved telephonically. This compared poorly with the initial one-and-a-
half year where umpteen visits were made by the INGO team, and maintained a roster for first
two months with one member visited the hospital daily to identify and address issues that
needed support. Daily ‘ensuring system working’ visits turned to bi-weekly and then weekly
by six months. This complete absence of INGO team was felt strongly by the hospital team.

4.6 Evaluation of system use and efficacy of capacity strengthening

In 2014, more than 3 years after inception, all hospitals were ‘officially’ live on the EHR,
INGO undertook an independent evaluation to understand usage patterns, capacity building
needs and user feedback across hospitals, starting with the reference hospital. In this
evaluation, about 60 patients were met from seven hospitals to understand their perspective on
the benefits they perceived through the EHR. This would also provide an indication of the
effectiveness of the EHR and also the underlying capacity strengthening processes.

There were extreme variations seen in the uptake of the system across modules and hospitals.
Given that the registration process was obligatory, requiring every patient to go through the
counter, get registered, and take a computer generated slip before going to the next counter
(the OPD), the module was well used. Similarly, the Billing module was seen to be in good
use as patients needed to pay to receive different services (such as X-rays and lab tests) before
actually accessing them. At all facilities, data entry operators had been contracted to run the
registration and billing modules. Given the obligatory nature of the registration and billing
functions, and that they were managed by dedicated resources, the corresponding modules were actively used across all hospitals. This led to patients getting benefits such as smaller queues, clearer computer generated slips without errors of misspelt names or wrong gender entry, no calculation errors on bills, and room number to be visited being clearly printed. As a result of these benefits, the patients would place pressure on the registration clerks to keep the module operational.

As contrasted to the well-used registration and billing modules, the clinical modules of OPD and IPD were in general in a state of non-use across the hospitals. The common reason given by doctors was that they were too busy and it was more important to spend time with the patient than with the computer. In some OPDs, computers were not functional, and often some parts (such as the mouse) had been misplaced and not fixed leading to the system falling into non-use. Further, doctors felt using computers required skills and speed, and coming from a “transition generation” they were not so adept with computers. A doctor said: "We haven’t used computers all our life, now if we have to use them it will slow down the process and will get difficult to examine patient and do entry at the same time". As contrasted with registration and billing, where the patients knew that they must get the computer print outs to move to the next step of treatment, in OPD the patients were not aware of their rights of the doctor giving them the printed OPD slip. Similarly, the IPD system was also in a state of non-use, and the nurse attributed this to: "We are already overburdened with lot of paper work and nurses are too few in hospitals". Only two nurses were available during a shift for 20-30 patients.” Often systems went into non-use because the supporting infrastructure of paper, printers and UPS were non-functional and technical support was not easily forthcoming.

Despite this broad pattern of limited use of the lab, pharmacy, OPD and IPD modules, we identified specific cases of strongly motivated individuals who were striving to use the system.

A junior doctor in Gynaecology department in reference hospital said, “learning to work on an EHR system is an advantage, as when I apply for job at a bigger hospital, I will have an advantage of having worked on such system, given that all big hospitals have an EHR.” Motivation for a senior nurse in male medical ward in the reference hospital was that, she found computers very interesting as she saw her children use. Though she wanted to learn but never really got a chance to learn, but now she could tell her children that ‘even she knew working computers’…which the children thought was a new technology only for youngsters. Similarly the lab technician in another district hospital, said that he had been wanting to bringing in many changes in this lab and standardise processes, and changing over to the EHR system have him the opportunity to streamline and standardise workflows in his department. A senior doctor in medicine department at reference hospital, who had also been most engaged in the process of finalising requirements, was one of the very few doctors using the system. His motivation came from the ability the system provided him to analyse patient information to understand disease patterns vis-a-vis age, gender, and area. In case there were
more of similar cases coming from one area then he would alert the public health department for intervention. Given this research focus, the system enabled him to search data to analyse his local information better. Another positive noted was the role the data entry operators had taken. They not only became proficient in all the modules, but also had evolved into taking the role of ‘master trainers’ within and across hospitals, and were helping in managing the IT infrastructure in hospitals, providing trouble-shooting support including for the servers.

In summary, the case has described the process by which the EHR system was introduced across a network of 20 district hospitals in a state, and the processes of capacity strengthening that accompanied it. In the next section, an analysis of the case is presented through the lens of the conceptual framework presented in section 2.

**Case Analysis**

In this section, I draw upon the theoretical framework developed in section 2 to analyse the case study presented in the previous section. My conceptualization of capacity strengthening related to ICTs is based on Sen’s Capability Approach which provides for a distinction between human capital and capability. This distinction helps me to build a typology of capacity relating to “capacity for use” and “capacity for exchange”. This is further related to types of capacity strengthening approaches (training, coaching, and mentoring), which is conceptualized to take place within an institutional context defined by particular structures, which shape agency related to capacity providing and receiving.

This section has two broad parts. In the first, I outline an overall process model of capacity strengthening, and second, I discuss the more detailed questions of why, how, what and so—what of capacity strengthening identified in my conceptual framework.

**5.1 A process based model of capacity strengthening**

In the figure below, I first schematically describe my analytical model, which is then subsequently discussed.
Fig 1: Conceptual framework of “capacity of use” and “capacity for exchange”

My model conceptualizes capacity building as a process which is comprised of three inter-related stages: 1. Capacity strengthening to build understanding of the artefact; 2. Capacity strengthening to help apply the technology by the user in h/her everyday work – “capacity for use”; and, 3. Capacity strengthening to help the user in applying the expertise gained to also generate new possibilities for use which the user values – “capacity for exchange”. These are now discussed.

5.1.1 Capacity strengthening to understand the artefact

As a first step, the focus of capacity strengthening needs to be on building an understanding of the artefact. Here the focus is on orienting the users with the different features of the technology, how it relates to their everyday work and can help them do it better. For example, if mobile phones are given to health workers for sending reports, as a first it is important for them to understand how the mobile phone works, including the SMS, and how these facilities can help her do her job better – eg sending her monthly reports without time delay. In my case it was important for the hospital staff to understand computers, the hospital information system, its particular features (eg connection to internet, linking of all modules in an integrated system) and how it can help them to complete their everyday work better. This For example, for the registration clerks to register the patients, doctors to record patient consultation, the stores clerk to manage stocks, the pharmacist to manage drug dispensing to patients, and similarly others. A strong period of such orientation, carried out through class room skill development sessions, was important to understand the artefact given the users’ limited experience with computers and the existing manual systems. With such an understanding, we could help build the confidence of users that the new system would be useful to them, and it would not be too complicated for them to adapt to this new way of working.

5.1.2 Capacity strengthening to apply the technology in everyday work – “capacity for use”

Once the individual was oriented to the hospital information system and the different features relevant to his/her work, we found the user gaining in confidence. There were of course some exceptions, such as some aged doctors who remained skeptical to the technology. In the next step, we focused on capacity strengthening to help users apply the technology for their daily work. This involved sitting for example by the registration clerk and helping him/her register a patient in the system. In the initial stages there were many questions the clerk had, for example how to register a revisit payment, or what to do when the printer did not print. On the job, the clerk was “coached” to solve the problems and do the work more smoothly. Such coaching, on site and on-the-job which would not have been possible only through class room
training, as the user needed the skills to do the job in a live environment. While the example of the registration clerk is of a “direct” application of technology to their work, there were some other, however limited, examples of users trying to explore other more “indirect users.” For example, one senior doctor in the medicine department learnt through coaching not only to enter clinical summaries of the patient in the system, he started to pursue analysis of disease patterns of his patients, based on individual patient records. This “indirect use” further developed his confidence and the system and also strengthened his direct use. Such capacity I call “capacity for use.”

5.1.3 Capacity strengthening to apply the technology to other areas of value – “capacity for exchange”.

Till stage two, capacity strengthening focused on the user being able to apply the technology to direct and indirect uses relevant to them, and in doing so being able to master the nuts and bolts which would allow them to enhance their work. To go beyond this work sphere domain, it was important for users to be mentored to allow the expertise gained to become part of their new mental models and knowledge in order for them to pursue other choices which they valued. While examples of such expansion of pursuits were limited, I saw a few. For example in the case of a senior nurse in the medical ward, who had no prior knowledge of computers, first learnt how computers worked, and then how to operate the hospital system application for direct and indirect uses such as generating reports and making leave applications which she previously did on paper. However, she was intrinsically motivated to learn more, for she spent additional time with us being mentored on how to make home budgets in order to have a higher status at home, spreading beyond her work sphere. Such mentoring helped her to redefine her existing mental models, and be able to identify use choices which she valued. This capacity is conceptualised as ‘capacity for exchange’.

In summary, I have described the three stages of the capacity strengthening process model, and how these involved different capacity focus and the underlying capacity strengthening approaches (training, coaching and mentoring). After this, I revert to my conceptual framework that sought to answer the four questions relating to the why, how, what and so what of capacity strengthening.

5.2 The four question of my capacity strengthening framework

5.2.1 Why do people engage in capacity strengthening?

Given Sen’s focus on individual choices, it is important to understand why users engaged in the capacity strengthening process. Decisions were made by senior administrators (health ministry and secretary) to introduce the system state-wide, and the supporting capacity strengthening processes. This meant that the reason for staff to participate in the process was driven supply driven and extrinsic, a product of the institutional structure. At the demand level of the individual staff, the primary purpose of engaging was driven by instrumental
reasons – both economic and noneconomic. The data entry operators saw the economic value they could derive from building capacity for use for direct purposes (doing data entry), but also saw indirect uses such as learning how to learn about servers to provide support to the hospitals. The economic reason was more contracts and money. For the junior doctor in Gynaecology department, there was the instrumental economic motivation of enhancing job prospects. There were also some motivated by instrumental non-economic motivation. The senior doctor in medicine not only wanted to learn for direct use, but also the instrumental non-economic reason of providing better care through improved data analysis, and the radiologist wanting to provide better radiologist related care to the patient. In both these cases, the drivers for capacity strengthening could be seen to enhance self-esteem or improving health of the population. And in the case of the senior nurse in male medical ward, her engagement and motivation in the process of capacity strengthening and learning was largely intrinsic, wanting to learn computers because she liked and valued it, for non-economic or production enhancing reasons.

5.2.2. What approaches are taken to capacity strengthening?

The overall capacity strengthening design was deeply embedded in a participatory approach, right from system requirements, design, deployment, learning the system, scaling and trouble-shooting. This approach contributed to the building of system ownership of system, especially in the reference hospital, and for mutual learning to take place – the INGO team to learn about hospital working and the users to learn about the artefact and its application. Additionally and largely, two approaches were taken for the capacity strengthening process. Firstly, in the initial stage of the process of understanding the artefact, a skill based approach of training was carried out where in group settings, users were introduced to the technology. Following this stage, when users started to apply the technology in their everyday work setting, a skill development approach was used through coaching. However, unlike the training approach, here the focus was on providing on-job help to enable users to effectively apply the technology to do their everyday work. This was also supplemented with frequent group discussions where users shared their respective experiences. The mentoring approach to capacity strengthening was far more limited, for example to the senior nurse who wanted to learn computers for non-work reasons, in a more exploratory mode – for the sake of learning.

5.2.3. How institutional conditions and agency shape capacity strengthening processes?

The entire capacity strengthening process took place in an institutional context of a public sector bureaucracy, and was thus influenced by the existing structures. Though the decision of adopting the new technology was taken high up in the hierarchy, the system design and implementation including infrastructure were procurement was decentralised to hospital level. Many of the structural conditions were supportive of new initiatives, such as ongoing processes of decentralised governance being adopted by the state. Further, as the political structures were progressive with the state ranking high in the human development index in the state, there were strong political accountability mechanisms for the bureaucrats in the health
departments towards the elected representatives. As a part of the decentralization process, the decision of purchase the infrastructure (including computers, servers, printers, local area networking etc) was left to the discretion of the hospital who were transferred a lump-sum amount from the state. However in some cases, the hospital did not have the structures in place to carry out this procurement, leading to implementation delays, including relating to the capacity strengthening. Another structural condition which shaped the process was the system of a senior bureaucrat heading the health department. However, this person typically was moved within a couple of years from health to another department, which provided a discontinuity to the overall efforts. Furthermore, the public sector had restrictions of recruitments, which meant the hospital could not hire full time system administrators, making the hospital to depend on INGO for capacity strengthening, which limited strengthening processes of coaching and mentoring, which was an ongoing process depending on intimate engagement with the user community over time. The favourable structural conditions enabled strengthening of agency of users through participatory processes, which was a key approach followed to strengthen capacity. But the levels to which different users and hospitals took it up varied, often due to particular conditions in hospitals or under the leadership of a new bureaucrat.

5.2.4. What value ensues to individual through capacity strengthening?

Largely, value ensued to the users through the human capital approach where they learned new skills to be applied for skill enhancement and understanding technology to contribute better to production and improving patient services and enhance hospital efficiency. Value obtained through human capability strengthening, was rather limited, and arguably it takes place over longer time period, representing the third stage of the process model. However, it can be seen that the seeds of materializing such value has been sown in the hospital, and as there are more examples of people gaining such value, there will be others also being encouraged. Also, to create such value, there has to be an intensification of mentoring approaches, based on a sensitive leadership that engages with individual users and understanding what is valued in their mental models, and how such value can be developed. However, structural conditions of temporary leadership and the absence of full time staff dedicated to mentoring impede these processes.

In summary, in this analysis section, firstly I have provided an overall process of capacity strengthening within a broader development framework informed by Sen. Secondly, drawing from this process, I have tried to examine 4 questions which provides greater insights to the micro-level capacity strengthening process. Next, I present overall discussions and conclusions.

1. Discussions and conclusions

This paper aimed at answering two research questions. The first concerned understanding the distinction between human capital and human capability in the context of capacity
strengthening of ICT related initiatives in a developing country context. The second concerns developing a conceptual model that can help to apply this distinction. In this paper, a process model has been developed which describes capacity strengthening to go through three stages, based on Sen’s distinction. These three stages involve different modes of capacity strengthening, and takes place within an institutional context, shaped by existing structures.

The paper makes at least three key contributions. Firstly, in conceptualizing capacity strengthening as a process, it goes beyond typical models that emphasize cascade training approaches, where a group of people is trained, who then train another group and so on. This approach makes the assumption that the group trained once don’t need further support, implying capacity strengthening is static. As our process model indicates, this assumption is problematic. A second contribution concerns the primary focus on skill development, which has been argued as being problematic by many authors (Sahay et al 2015). This paper emphasizes the important role that mentoring plays which goes beyond ordinary skill development. The third and most important contribution is that it puts ICTs capacity strengthening within a broader development context, which most such project tends to ignore. We not only want to enhance ICT skills but to improve the quality of development outcomes. By situating capacity strengthening within a broader development context, this link between capacity strengthening and development is emphasized.

I believe this approach to capacity strengthening can be applied to IT4D projects more broadly, not just health. I have had experience with working in public sector projects in different countries spanning domains of food security and nutrition, primary health and also secondary health care. While the technologies may be different, approaches to capacity strengthening tends to remain the same – short term, skill focused, and instrumental. Reconceptualization of these approaches, as argued for in this paper, can help to strengthen the effectiveness of capacity strengthening efforts.
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Abstract

The public health sector in developing countries provides a rich landscape of different kinds of ICT interventions for varying purposes. There is the Health Management Information System (HMIS) for supporting routine reporting, Hospital Information Systems for strengthening patient based care in secondary and tertiary care providing health facilities, mobile technology based applications, and various other types of applications to support logistics, human resources management, finance, drugs, and various others. In current times, where the move is towards building architecture leveraging on the internet, cloud and mobile computing rather than the earlier standalone systems, there are initiatives like the Open Health Information Exchange, and Integrated Health Information Architecture. As these technologies and supporting applications become increasingly complex and sophisticated, it comes with the promise of both empowering the users and expected beneficiaries, while also carrying with it the danger of being used by the State for improved mechanisms of surveillance and control. The thesis explored in this paper is that the notion of empowerment in these initiatives remains largely “invisible”, and the technology focused approaches tend to dominate, contributing to sub-optimal outcomes. This paper argues that making empowerment explicit and visible in ICT4D projects, particularly in the public health sector, is an urgent but neglected priority. First and most importantly, these applications are meant to strengthen the health worker and health institution capacity to improve coverage and quality of care, which is fundamental to strengthen development outcomes. Second, the public health sector in developing countries.

Key words: ICT4D, Public Health, Invisible, Empowerment, Development
1. Introduction

Very often in ICT4D research projects, researchers lament on the dominance of technology focused approaches adopted, and how this leads to the unrealized potential of technology with respect to strengthening development outcomes. Mathias (2013) has described the landscape of ICT4D projects by drawing upon the metaphor of a conveyor belt, where developing countries are faced with a range of technologies coming down this conveyor belt, and they make choices based on the qualities the technology promises, the supply side, rather than on the demand side of what their information needs and development challenges are. James Scott (1998) describes one of the conditions which contribute to unsuccessful State sponsored ICT initiatives is the intention of the state to use the technology for purposes of surveillance and control, rather than support the citizens, and the citizens tend to remain as passive recipients of this technology. My paper focuses on the aspect of the perspective of the recipients of the technology, and how can they be “empowered” in order to strengthen them taking ownership of the technology, and driving it to address local concerns. While empowerment is a subjective term, carrying multiple meanings, in this paper, I try to theorize it within the context of the public health sector in developing countries.

The public health sector in developing countries provides a rich landscape of different kinds of ICT interventions for varying purposes. There is the Health Management Information System (HMIS) for supporting routine reporting, Hospital Information Systems for strengthening patient based care in secondary and tertiary care providing health facilities, Mobile technology based applications, and various other types of applications to support logistics, human resources management, finance, drugs, and various others. In current times, where the move is towards building architecture leveraging on the internet, cloud and mobile computing rather than the earlier standalone systems, there are initiatives like the Open Health
Information Exchange, and Integrated Health Information Architecture (Braa and Sahay 2012). As these technologies and supporting applications become increasingly complex and sophisticated, it comes with the promise of both empowering the users and expected beneficiaries, while also carrying with it the danger of being used by the State for improved mechanisms of surveillance and control. The thesis explored in this paper is that the notion of empowerment in these initiatives remains largely “invisible”, and the technology focused approaches tend to dominate, contributing to sub-optimal outcomes.

This paper argues that making empowerment explicit and visible in ICT4D projects, particularly in the public health sector, is an urgent but neglected priority. First and most importantly, these applications are meant to strengthen the health worker and health institution capacity to improve coverage and quality of care, which is fundamental to strengthen development outcomes. Second, the public health sector in developing countries are dealing with complex and novel challenges such as the recent spread of the Zika virus in Brasil, and the Ebola epidemic in West Africa, and have severe resource constraints to deal with them. Improved information systems will undoubtedly strengthen their capabilities to combat these challenges. Third, the current investments in ICTs represent huge resources, and it becomes a development imperative that these resources are utilized frugally and effectively.

This paper argues that ensuring that the ICT investments seek to explicitly empower the health work force is key in responding to these identified priorities. Given the normative focus of this paper on empowerment and how to forefront it, this paper addresses the following research questions:

i. How can empowerment be theoretically understood in the context of ICT4D projects within the public health sector?

ii. How can empowerment be made explicit in design and implementation strategies underlying ICT4D projects in the public health sector?

Answering these research questions will help me develop contributions that are relevant to the JAIS special issue on mainstreaming ICT4D research. Firstly, in theorizing empowerment, it contributes to this JAIS call of building novel approaches to conceptualize development. Secondly, the theoretical approach I develop based on Amartya Sen’s Capability Approach (2001), arguably has not been taken up substantially in “mainstream” IS research, and thus
potentially can act as a “reverse” innovation, which is another aim of this special issue. The rest of the paper is organized as follows. In the next section on “Theorizing Empowerment”, I review relevant literature and also build on it to develop an initial theoretical framework to guide my empirical work and data analysis. The “Research Methods” section then follows where I present my research design, empirical settings, data collection approaches, and of data analysis. The fourth section on “Case Studies” presents the narratives of the two cases which provide the core of my empirical work. The “Case Analysis” section presents my theoretical framework and how it helps to answer the research questions. In the “Discussion and Conclusions” section which follows, I discuss the notion of empowerment as the invisible of ICT4D projects, and the contributions that makes to the special issue.

2. Theorizing empowerment: in the context of ICT4D

2.1 Contextualizing development

This paper is firmly situated within the context of development. Health is fundamental to development, and strengthening of health information systems has the explicit objective of enhancing the coverage, quality and decision making in the public health context of developing countries.

Development has multiple perspectives and meanings associated with it. As Peet and Hartwick (2009) argue, development means making a better life for everyone. The world in which we live in grossly unequal, so naturally what “better” means will vary with people and geographies. This unevenness is especially true in the context of public health, while for many of the poor, basic services such as for child birth and immunization are not easily accessible, while the rich are engaged in accessing high cost medical tourism services, delivered in five-star like hospitals. These inequalities exist both within and across countries. For the deprived in developing countries which is my focus of my thesis, better health for development would mean meeting basic health needs, sufficient food to maintain good health, a safe and healthy place to live, and being treated with dignity and respect.

Policy responses to achieving these basic needs in developing countries most often have ICTs centrally implicated. The nature of ICT interventions vary ranging from the focus on the
individual patient to improve continuity of care to other which focus on programme based monitoring and evaluation, and strengthening of population health including relating to quality and coverage of services. Whatever the technologies may be, they carry a strong emotive appeal as they promise development implying a better life for all (Peet and Hartwick 2009), and reinforce the neo-liberal ideology of freedom and rationality. However, these ideologies may not be shared by the health workers who are expected to use these technologies to improve health and strengthen development. Despite this, they are constantly confronted with increasingly modern technologies to solve historically existing problems. Every so often, a new technology, such as the smartphone or the tablet, is presented as a silver bullet for solving existing public health problems, and adopted by administrators given its promise of being more modern, without seriously considering the perspective of the health staff, and whether it improves their work, and empowers them to provide better care, and capabilities to do things they personally value. In trying to understand this perspective takes me to Amartya Sen and his Capability Approach, which I introduce in the next section.

2.2. The Capability Approach

My overall theoretical perspective is informed by Amartya Sen’s Capability Approach (1999), and its application to ICT4D. The Capability Approach has been developed as Sen’s response to the limitations of utilitarian conceptualizations of development, is comprehensive and interdisciplinary, and provides a broad normative framework for the evaluation and assessment of individual well-being and social arrangements, the design of policies, and proposals about social change in society, including the well-being of people (Robeyns, 2005). It has in recent years been used as the conceptual basis for the calculation of the Human Development Index (HDI) by the United Nations to measure the status of development of countries.

Sen defines development as a process of expanding the freedoms that people enjoy. And if freedom is what development is about then it makes sense to concentrate on that rather than on some of the means or instruments of achieving it. Freedoms depend also on other determinants e.g. social and economic arrangements, and require removing the major sources of unfreedom, such as poverty and limited economic opportunities. This then helps to focus on what people are able to do and be, and provide them with the freedom to live the kind of life that they have reason to value.
Two key notions in the Capability Approach are of functionings and capabilities, representing people’s capabilities to function, that is, on their effective opportunities to undertake the actions and activities that they want to engage in, and be whom they want to be (Robeyns, 2005). Functionings include working, resting, being literate, being healthy, being part of a community, being respected, representing the “beings and doings” of a person (Sen 1992). Thus, while travelling is a functioning, the opportunity to travel is the corresponding capability. This distinction is between the realized and effectively possible, in other words, between achievements, on the one hand, and freedoms or opportunities, on the other (Robeyns, 2011, Sen 1987)). Once people have the freedoms (capabilities) to lead the kind of lives they want to lead, they can choose to act on those freedoms in line with their own ideas on what they value. This broad perspective provides me the basis to conceptualize empowerment, as a basis to develop a human centred approach to ICT4D.

2.3. Conceptualizing empowerment

A generic view of empowerment is as ‘any process by which people’s control (individual or collective) over their lives is increased’ (Somerville, 1998, p. 233). Empowerment is related to terms such as agency, autonomy, self-direction, self-determination, liberation, participation, mobilization and self-confidence. It is much debated, and ascribed a wide variety of definitions and meanings in various socio-economic contexts (Ibrahim & Alkire, 2007). A World Bank (2001) report sees empowerment as the process of “enhancing the capacity of poor people to influence the state institutions that affect their lives, by strengthening their participation in political processes and local decision-making. And it means removing the barriers—political, legal and social—that work against particular groups and building the assets of poor people to enable them to engage effectively in markets” (p. 39).

Alsop and Heinsohn (2005) define empowerment as a person’s capacity to make effective choices, that is, as the capacity to transform choices into desired actions and outcomes. They further add that empowerment is both a process (of empowering or disempowering people) and also as an outcome of the process (a person/group is empowered or not). Further, empowerment is relational where empowerment of one comes with disempowerment of another, a relation shaped by conditions of power and how it plays out. Robert Chambers (1993) describes empowerment as a process that gave the poor more control over their lives. The Norwegian Agency for Development Cooperation (1999) sees empowerment as increasing the opportunities for men and women to control their lives, giving them the power
to make decisions, have their voices heard, to define agendas, negotiate, and find ‘the power within themselves to challenge past customs.’

Ibrahim and Alkire (2007) list 29 different interpretations of empowerment, and argue all have an underlying concept of gaining power in some way, dependent on two common factors: agency and opportunity structure. While agency is the ability to act on behalf of what we value, opportunity structure reflects the preconditions for exercising effective agency, emphasizing their inter-linkages, where neither is mutually exclusive. Clearly, a process of empowerment is incomplete unless it attends to people’s abilities to act, the institutional structure, and the various changes required to enhance agency (Ibrahim and Alkire 2007). While human development entails enlarging choices, empowerment is the process of acquiring the ability to choose among these enlarged choices (Bartlett, 2004, p. 59).

In summary, my conceptualisation of empowerment concerns an expansion of human agency that enhances options of ‘choice’, within the framework of existing opportunities and the capacities to exercise them. This is based on three underlying concepts: (i) expansion of a person’s agency; (ii) in relation to power and choice; and (iii) in relation to participation.

In ICT4D, Dorothea Kleine (2013) has drawn upon Sen to understand the relationship between ICT and empowerment through the notion of choice. For Kleine, the creation of choices in itself represents empowerment, which in turn can contribute to improved development outcomes. While a focus on choice is relevant, I argue that ICTs have not been adequately conceptualized, as it is treated as a resource, while not considering the process by which ICTs can lead to empowerment, and why in certain cases the reverse happens. Next, I discuss the manner in which I have conceptualized technology.

2.4 Conceptualizing technology

In the opening of this section, I have argued that ICTs are a central actor in the development space, and this paper explicitly investigates how are ICTs implicated in processes of empowerment of health staff. It thus becomes central to conceptualize ICTs and its role, positive and negative, within the development context, and what are the conditions under which these roles are shaped.

In mainstream IS literature, Orlikowski and Iacono’s (2001) well cited paper “Desperately seeking the “IT” in IT Research – A call to theorizing the IT Artifact” provides a relevant
point of departure to be “specific about technology” (Monteiro and Hanseth 1995) in their paper “on being specific about the technology.” A central argument made by Orlikowski and Iacono is that researchers focus primarily on the context, things surrounding the technology, while the ICTs itself becomes invisible. Alternatively, the capabilities of technologies are seen as independent or dependent variables, where again the overall technology slips from view. Without going into details of each of these views, I draw upon the ensemble view of technology, and add to it further concepts to reinforce the development context.

In the ensemble view, technology is seen as only one element in a “package,” which also includes the components required to apply that technical artifact to some socio-economic activity. Kling and Scacchi (1982) had earlier developed this insight into what they called the “web of computing,” and Latour (1999) made the statement that “airplanes don’t fly, airlines do” emphasizing that technology is only one element in a broader socio-technical network. Important in Latour’s view was how are alliances, including the technology, created and maintained over the course of a project.

The two concepts I add on to the ensemble view are that of conversion factor and affordance.

**Conversion factor:** In the Capability Approach, conversion factor refers to the ability of individuals to translate their capabilities into functionings, representing the realization of their potential. ICTs can potentially play a role in this, as a resource, for example by allowing an individual to access through distance learning, knowledge which he/she previously could not. However, at times ICTs can also constrain the realization of this potential, for example if the individual does not have adequate access to the Internet to pursue his/her educational aims. Robeyn (2005) provides an example in this regard. We are not only interested in a bicycle because it is an object made from certain materials with a specific shape and colour, but because it can take us to places where we want to go, and in a faster way than walking, to realize a functioning of mobility (or for others, who love speed). Technology acts as a conversion factor in the form of a resource to realize the potential or capability of mobility into an actual functioning. The ability to use the technology towards creating and materializing choices one values can be seen to represent a conversion factor. In this way, technology becomes an important element in understanding empowerment as it helps to both create and achieve choices an individual values.
**Affordance**: The notion of affordance comes from the fact that ICTs vary in their material properties, and may thus have different implications on the choices they create for individuals and how these are exercised. Affordance refers to the relation between the technical object and a specified user (or user group) that identifies what the user may be able to do with the object, given the user’s capabilities and goals (Markus and Silver 2008). Markus and Silver, describes affordance over two dimensions of functional affordances and symbolic expressions. This aspect of materiality is understood through the notion of affordance. Markus and Silver (2008) describe affordance as the social perception than an individual has towards how a technology can support him or her in carrying out a desired goal oriented action. For example, the mobile phone provides the functionality of sending text messages, but this affordance is realized when for example, a health worker sees its value in helping her to send a report directly from the village when she delivers a service to the district. The same functionality can be seen by the administrator to allow for improved control over the health worker, by now demanding daily instead of monthly reports. Affordances from the same functionality will vary for different groups of people depending on the actions they want to achieve.

Within my conceptualization of empowerment, technology can be seen as providing the potential to enable empowerment through creating more choices for the individual to do their work and to pursue other goals that they personally value. Since in the health system, different kinds of ICTs are being introduced and for varying groups of people, the concept of affordance becomes important to understand how particular technologies provide for different functionalities and new choices, and how people perceive their use to fulfilling their desired actions. These technologies are inherently implicated in empowerment, depending on whether or not individuals have the conversion ability to translate the potential of the technology to help them create and exercise choices that they individually value.

**Summarizing the initial theoretical perspective**

After defining key concepts of empowerment and technology within the Capability Approach framework, I approach the central question of paper which is to understand the mutual relationship between technology and empowerment. Empowerment is seen as the expansion and exercise of choices, which is shaped by the interaction of existing contextual conditions (such as power relations) and the capacities and intention (or agency) an individual has and
exercises to pursue the choices he or she values. Technology plays an important role in this shaping empowerment by the choices it can provide, and the capacity the individual has to convert their capabilities into realized functionings. Key aspects of my framework include:

6. For Sen, development is about removing the unfreedoms an individual experiences in pursuing the choices they value. Empowerment, an indicator of development, is shaped by the contextual conditions (opportunity structure) which an individual experiences in creating and exercising choices they value (agency). These conditions (for example, bureaucracy or donor policies) can be both enabling and constraining to the exercise of this agency.

7. From Sen, I conceptualize empowerment as the expansion of agency, seen through the choices offered and the ability to exercise them. This expansion is necessarily related to aspects of power as it concerns the movement of a person from a more disadvantaged position to one of more advantage.

8. ICTs are conceptualized within an ensemble view, as an element of a larger socio-technical network, with different affordances for different people. ICTs can be seen as having conversion ability to translate capabilities to functionings. How well this ability is exercised is shaped by the capacity of the individual to use the technology for what they value. Technology it in it-self provides choices (and in some cases constrains them), and thus has implications for shaping empowerment.

9. Participation firstly, helps build capacities to use the technology to pursue choices, and secondly can create new choices for the individual by creating deeper understanding of the possibilities that the technology offers.

This framework is presented in the figure below.
Following my empirical analysis, I will further elaborate this model.

3. Research methods

I discuss the research methods under 4 broad sub-sections. First, I describe my role in the research, and some of the underlying ethical dilemmas that I needed to engage with. Second, I discuss my overall research design. Third, I discuss my overall approach to data collection, which is followed by the concluding data analysis component.
3.1 My role in the research

In this research, I played two roles of “PhD Researcher” and “Project Coordinator” in the cases I studied. As PhD researcher, I studied the implementation of various ICT initiatives in the Indian health sector to understand empowerment within a broader development framework. Secondly, I am employed as Project Coordinator in an Indian NGO (called INGO) which has for more than a decade supported Indian national and state governments in the design, development and implementation of health information systems (HIS). I present two of the INGO projects in this paper as my empirical cases to which I had research access. As project coordinator, I have made decisions (for example related to system design or implementation) which may reflect an exercise of power that could influence processes of empowerment of the health worker that I am seeking to understand as a PhD researcher. As a result, my relationship with projects and health staff by design was not neutral requiring me to simultaneously implement the project based on HISP India’s contractual obligations, and also study the same from the perspective of my research design. The “researcher-researched” relationship between me and the health staff I studied was very much tied up to my role as project coordinator and the implementation dynamics, raising issues which I needed to negotiate with myself shaping my role as a researcher. I provide some examples of the same.

The project on the design, development and implementation of a mobile phone based reporting system for frontline health workers in Punjab, was one which I coordinated for INGO and this was also a part of my PhD research. At start of the project, the application developed by INGO was installed on the mobile phones bought by the government and distributed to the health workers. After two years, the health department changed the reporting formats, which meant that the application also needed to be changed and reinstalled on the mobile phones. In the process of installing the new application on the phones, INGO trainers which included myself, discovered that in most cases the phones had no remaining memory space for installing/upgrading the application, as the phone memory was full with songs and pictures which the health workers had downloaded in their personal capacity. In this case, since the new application could not be installed, as project coordinator, I took the decision to
randomly delete pictures or songs to create adequate memory to install the application. This act of mine represented an ethical dilemma as I exercised power in capacity of project coordinator to delete personal files on the health worker phones, which potentially could significantly influence feelings of empowerment, which was an object of my research endeavour. I have no clear answers on how I have or could have negotiated these ethical dilemmas, other than reflecting on it as a part of my methods description.

3.2 Research design

There are 5 key elements of this research design: i) Philosophical underpinning of interpretivism; ii) Comparative case study analysis; iii) Longitudinal design of research over a 4 year period; iv) Multi-level engagement. Each of these elements are now briefly discussed.

Interpretivism: My research study focuses on understanding “empowerment” within an ICT4D context. Empowerment being a concept which would be understood differently by varying groups of people and which has strong underlying notions of power, I believed an interpretive approach which allows for multiple interpretations of the truth, rather than a “single truth”. Interpretivism implies that I see the world as socially constructed and my research is my subjective interpretation of the world. In my research, I have tried to derive meanings to my empirical work, based on others’ interpretations of the situation and happenings, and how processes of inter-subjectivity are developed (Orlikowski & Baroudi, 1991). During my empirical work, I interacted with multiple individuals, who shared divergent views on the same system and the process. This experience did make me believe strongly in the interpretive perspective, which helps to see ‘a’ truth rather than ‘the’ truth, as issues will always be interpreted differently by different people (Walsham 1993), based on their cultural, social, educational backgrounds and experiences.

One of the consequences of interpretive perspective is that, while different individuals share divergent views of the same system, I too create meaning of these views based on my own background and experiences, which influence how I see the world. Hence, I did not take this research from value-neutral position and the data I collected, but that it was always “value-laden” and influenced by my own world views. For instance, while working on understanding requirements for designing the hospital information system in India, I
interacted with staff from multiple departments in the hospital – clinical, laboratory, radiology, OPD, accounts and administration – to try and understand how they envisaged the hospital information system and their expectation of how this would support their work? The responses were very different. The registration clerks felt such a system would make their work efficient, allowing them to search and count patients, the clinicians felt that the system used for recording patient encounters will take away time from patient interaction, will increase their work and maybe make it also more ‘clerical’. This view too changed while talking to younger doctors, who thought introducing computers to support work will make their work much efficient and reduce the manual work of filling multiple forms. Understanding the “why” of these multiplicities of views was a key aspect of my research.

**Comparative case study design:** A case study allows the in-depth examination of a phenomenon within a situated context. In my study, I have followed a comparative case study strategy to help study the phenomenon of empowerment in two specific case contexts. This then enabled me to compare and contrast across the cases to help discern how processes of empowerment are shaped (or not). In both the cases, the unit of analysis has been the individual (health worker or medical doctor), and I have tried to understand how individual level empowerment is shaped by institutional structures, the agency of the individuals involved, and the particular technologies in question. In the table below, I briefly outline the characteristics of the two cases.

<table>
<thead>
<tr>
<th>Research facets</th>
<th>Case Study: Himachal Pradesh Hospital Information System</th>
<th>Case Study: Punjab MHealth/Mother and Child Tracking System (MCTS) for Health workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of technology</td>
<td>Open source hospital IS networked across 20 hospitals</td>
<td>Mobile based reporting /Software application (MCTS) to track individual mothers and child, linked with mobile</td>
</tr>
<tr>
<td>Unit of Analysis</td>
<td>Individuals including state administrators, district authorities, and hospital</td>
<td>Field level health workers (called ANMs)</td>
</tr>
</tbody>
</table>
facilities service provides.

| Contextual conditions | A progressive state with strong mandate on improving public health systems in decentralized settings | A state characterized by strong bureaucracy and processes of centralization |

**Longitudinal design:** I have been part of both the cases right from inception and continuing, starting from 2009 to date. During this period I have engaged in each project in terms of its conceptualisation, developing concept and proposal, understanding system requirements, system design, capacity strengthening, institutionalisation, feedback, trouble shooting, implementation support, and much more. I have of course done all these activities as a part of the HISP India team working in collaboration with the health staff. I have been continuously visiting the implementation sites over the years (at least one visit a month), and in the last year, the number of visits have reduced. These multiple visits over time, many times meeting the same actors helped me to understand the expectations and fears of the different actors, and how these have evolved and changed over time and space. This gave rich insights to different dynamics that may shape or constrain empowerment, and the role of technology.

**Multi-level engagement:** My research in both cases spanned multiple levels of the global, national, state, district, sub-district and facility. Across these levels, I have engaged with global developers, Ministries of Health, national level teams, state administrators, district administrators, hospital administrators, sub-districts staff (including medical officer, health supervisors, health workers), hospital staff (doctors, nurses, pharmacists, pathologists, laboratory technicians, radiologist, inventory managers, clerical data entry staff, and others), and staff external to health such as IT and Infrastructure. However, I must admit that my interactions have been limited with patients and citizens/users of health services, within the public health sector.

My primary unit of analysis is the individual from the perspective of the health department, spanning these different levels. Process of empowerment may be shaped by their interaction with the structures and processes of these inter-connected levels and components of the health system. It is impossible to adequately understand something like empowerment of a health
worker without looking at issues of whom she reports to, how, when and other enabling and restricting conditions. For example, in the mobile project in Punjab, I worked closely with state, district and facility teams. As the initial monthly reporting system was designed top-down, I collaborated with the state team during the design of the system, finalisation of datasets, reporting flows, defining infrastructure specifications, getting technical systems to work and state-wide capacity building of 5000 health workers in across 20 districts. During capacity building, I worked with district teams to define training content and approach, and during the one-on-one capacity strengthening, where I learnt a lot about empowerment. During the development of the hospital system for Himachal Pradesh, I also engaged in discussions with the global development community of OpenMRS on technical questions on the platform, and these had implications on the system made available to the users.

3.3 Data collection

Data collection has been intensive, on-going and involved various methods, both formal and informal. Across all the cases the modes of engagement that helped me to collect data included – requirement understanding sessions, meetings, training sessions, prototype demonstrations, trouble-shooting sessions, workshops, letters notifications, documents, conduct of capacity building, and building of user manuals, standard operating procedures, and presentations for these sessions. The capacity strengthening process was a rich source of ‘data,’ starting from understanding requirements from the department, including current and proposed workflows, and creating mock-ups and visualization of working screens. Users had difficulties to articulate their requirements, and this was an important source of understanding their mental models and also future aspirations around their work life.

My personal role of a researcher and a project coordinator would have had a bearing on the process of data collection. Many of the health staff with whom I interacted, I had a long period of association with. In many cases, this stretched over many years, and they would see me more as a friend and confidante, rather than a researcher. As a result, they would share with me there intimate concerns which normally they would not with external researchers. Further, many times the meetings with them took place in the field or in their offices, and I did not feel comfortable in making notes, as it would be seen as being a little alien to the interviewees. In such cases, I would just try to remember some of the important points made and note them later in my diary. In this process, I may have missed out direct quotes or issues
of importance. Also, many times my meetings took place in groups, so responses could not be attributed to particular individuals.

During requirements analysis, discussions were held with users providing the basis for the formal documentation of requirements. Meetings were another vital and extensive source of data collection, including during the requirements study phase, where we had various rounds of clarifications on issues, review of progress, discussions with hardware vendors and network designers, discussions with state authorities on the reporting needs and various others. Capacity building processes were another important source of data collection, including understanding users’ opinions about the system, request for additional functionalities and features, and various others. Log books and suggestion books were maintained by INGO to record requests and suggestions from users for support. During many meetings and presentations on the projects, I received different comments which served as very useful sources of data to guide the institutionalisation process. Various forms of written documentation was prepared, for instance in the case of hospital system design, reports were made for the requirements analysis for each module, flow of patients and information from one department to the other, progress reports, protocols for use of different modules, training material, technical notes on models of knowledge transfer, signage in hospitals to inform patients of revised process, wherever applicable and various others.

I have used interviews specifically in the case of the Punjab project to speak to about 30 ANMs to understand their personal views on the MCTS systems, how it has changed their work life, whether they thought it was for the better, and their future expectations. In the case of the Hospital project, I helped to design a questionnaire to gather information from staff on what has been their experience following the introduction of the hospital information system. Together, with other members of INGO, I carried out interviews using this questionnaire in one hospital, and then the team went on to meet about 68 staff from 7 hospitals in the state. This helped me to develop an understanding of the perceived outcome of the system in use.

The electronic medium has been a rich and continuing source of data and multiple types of electronic tools were used. For example, at INGO, we internally used the project management tool called Redmine, to archive all project documentation, including all reports, presentations, bug requests, bug fixes and the like. Skype calls have been a constant feature in my work, either for getting clarification on issues, or get more information to define a requirement and
to review progress on work. Besides all this, there have been literally thousands of emails sent by team members to each other and to the hospital, district and state authorities, which have served as important means of data collection and recording. There has thus been a rich, ongoing and intensive process of data collection – from both primary and secondary sources - involving various means and actors across all the cases.

3.4 Data analysis

My data analysis process can be broadly described as being inductive, where the empirical insights have helped to inform my theoretical concepts. However, this inductive analysis is not similar to a grounded theory kind of approach where I have started from a blank slate. I had certain starting concepts around development, empowerment, and participation, and these were further revised as I carried out my empirical analysis. In this sense, my analysis process can be described as a process of a conversation between my concepts and empirical works, where each informs and is shaped by the other.

Data analysis throughout the projects had the aims of both developing practical knowledge to effectively implement the project and to generate theoretical knowledge which goes into the formulation of my research insights. The data collection and analysis processes have been intertwined, rather than taking place in sequential steps. As these various project level interventions were carried out, the INGO team members discussed these internally, and with the state team members on how these interventions would contribute to potential improvements. Within the project framework, there have been periodic discussions on the progress of the project, challenges faced, and inferences on new insights and knowledge being generated. Through my analysis, themes of participation, capacity, power, and technology were found relevant, and these were included in my initial theoretical framework presented in the theory section.

1. Case study narratives

Two case studies are described in this section. The first relates to the hospital information system in the state of Himachal Pradesh (HP), while the second is about a Mother and Child Tracking System in Punjab.

4.1 Hospital Information System in Himachal Pradesh
**Case context:** Himachal Pradesh is a hilly state located in the north of India in the region of the Himalayas, with wide variations in altitude ranging from low hills to high mountains with lakes and flowing rivers. HP has 12 districts with a population of 6,856,509 (2011 census), with a population density of 123 persons per square km, with about ninety per-cent of the population living in rural areas. The state’s hilly terrain, low population density which is largely rural has resulted in a unique context of political and economic cohesion in other ways as well. The smallness creates incentives for collaboration, reinforces inter-dependence, helps transcend divisions, and strengthens networking across groups. The Himalayas is a strong part of the Himachali identity, binding citizens in a common social and religious attachment to the mountains, its flora, fauna and water sources. Underlying its strong economic and social development outcomes, the state has shown commitment to expand access to public services to the remotest areas. Health has been a priority focus with ongoing efforts to strengthen health governance, which includes the decentralization of public health information systems. The state has made investments to leverage the use of technology in overcoming the geographic challenges such as tele-medicine and GPS enabled ambulances equipped with trauma-care facilities and automated ECG machines to strengthen the referral system. The state has been pioneering in connecting all district and sub-district hospitals with a Hospital Information System (HospIS), which is the focus of my case study, which is next described.

**Case description:** At the outset, an overall timeline of how the empirical project was carried out is summarized below, and then elaborated.

<table>
<thead>
<tr>
<th>Time line</th>
<th>Milestones/Events</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>State floats a public tender for HospIS</td>
<td>53 firms apply; for techno-commercial reasons, no vendor selected</td>
</tr>
<tr>
<td>2009</td>
<td>State approaches INGO to propose HospIS project</td>
<td>After negotiations on scope, the project was informally initiated in May 2010, and a formal MOU signed August 2010 for 2 years</td>
</tr>
<tr>
<td>September, 2010</td>
<td>First two modules released and deployed in reference hospital</td>
<td>Extensive capacity building, and building ownership in hospital</td>
</tr>
<tr>
<td>September 2010 to March 11</td>
<td>Remaining modules 8 released incrementally in reference hospital</td>
<td>A period of stabilization of existing modules, and strengthening of infrastructure</td>
</tr>
</tbody>
</table>
I start the narrative in 2008 when the state approached INGO to initiate a project for the
design, development, implementation and support of HospIS across 20 district hospitals (DH)
of the state. A DH is typically a 100 to 300 bedded hospital with multiple specialties catering
to a daily load of about 800–1000 outpatients and 40–50 inpatients. The systems in a DH are
largely manual and with minimal computerization, thus making IT related capacity
strengthening a formidable challenge. Through negotiations between INGO and the state, an
incremental approach for the project was adopted, where patient registration and billing
modules were taken up first, given the fact that they were relatively less complex and more
publicly visible, and the Outpatient and Inpatient modules were taken up last given their
relatively high complexity of work processes and that it involved medical doctors. It was
decided that the entire product development process would take place in a reference hospital
(RefHosp), and after the system was developed and approved, the same would be taken to the
other 19 hospitals of the state. RefHosp was set in the capital city of the state, in a 182 year
old British Heritage building, with very high patient loads. The rationale for its selection was
that if the system could be made to work here, it would be able to work in any other hospital
in the state.

Right from project initiation, a participatory and incremental approach was adopted, including
for modules prioritization, conducting requirements, design and implementation. An

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>September 2011</td>
<td>Started process of deployment of integrated system in 19 other hospitals</td>
<td>Intervening period from March was towards building the infrastructure in respective hospitals by the State</td>
</tr>
<tr>
<td>August 2012</td>
<td>MOU extended by 12 months</td>
<td>By this time only 6 of the 20 hospitals were covered due to infrastructure deployment delays, necessitating this extension</td>
</tr>
<tr>
<td>August 2013</td>
<td>MOU came up again for extension for one year</td>
<td>With accelerated deployment of infrastructure, 18 of 20 hospitals covered.</td>
</tr>
<tr>
<td>May 2014</td>
<td>All hospitals covered, process of data use strengthening ongoing</td>
<td>State strengthening systems of ownership and sustainability of HospIS</td>
</tr>
<tr>
<td>August 2014</td>
<td>MOU extended by 12 months</td>
<td>Focus on additional capacity building to increase system usage in all hospital</td>
</tr>
</tbody>
</table>
important design guideline was not to `just” automate processes, but also to add value by `re-
engineering existing processes. This required the design process to be based on mutual 
collaboration and dialogue, where users were not assumed to be passive providers of 
requirements, but as actively engaged in co-constructing them. The process followed included 
the INGO team observing and understanding the work and information flows in a department, 
followed by discussions with the department team, returning with mock-up screens 
representing the understanding of the department requirements for discussions, making 
revisions as required, presenting final design for signoff and then initiating the development 
of the particular module. The proposed design was very context sensitive, involving hybrid 
approaches, where the aim was not to fully automate but to combine paper and computer to 
ease processes of introduction and acceptance of the system.

DHSs represent a complex system, involving various inter-dependencies between departments 
including of patient flows, information, people and resources. For example, a patient is 
expected to make payments prior to getting investigations done, so billing becomes a central 
ode which the system must support. After an OPD encounter, the patient takes the slip to the 
billing counter, makes payment against investigations advised, and takes receipt of the 
payment made. The system sends an `order’ to the respective laboratory (biochemistry, 
haematology, x-ray, ultrasound), and patient name appears on the patient queue for the 
respective laboratory. For the patient to be queued for any investigation, they must be 
channelized through billing. Supporting this work flow needed sensitive design and also 
process related changes in the hospital.

Developing standards was an important aim of the project and recognized as key to reducing 
work burden of the hospital staff. For example, in the case of the radiology module, patient 
observations were hand written, with no practice of use of specific formats. The radiologists 
argued that this was the case because of their high patient load which did not give time 

equal to type too much text. The hospital staff now wanted to standardise radiology 
observations by creating pre-defined formats for each investigation. The hospital radiologist 
while recognizing the value of such an approach acknowledged such a system did not exist 
anywhere in the state and this should be developed as a state and not just a hospital initiative. 
She proactively started discussions with other radiologists to identify all possible use cases, 
and their integration with billing. For each investigation, parameters for observation were 
defined and corresponding result options. For example, for an ultrasound for Neck Swelling
the result parameters defined were size of swelling, outline, echo texture, and pressing up to a vessel. And then each result option was detailed for computerization, i.e. size of swelling – actual or abnormal, outline – regular or irregular, echo texture – isoechoic/ hypoechoic/ hyperechoic; and pressing on vessel – yes/no. A negotiated process contributed to the design of forms for 36 investigations, and subsequent development of a generic module to be taken to all hospitals in the state.

As the system was made ready for implementation in RefHosp, INGO initiated processes of capacity building of the hospital user using training-manuals and SOPs for each module. Training was customized to the needs of three broad categories of users: i) those proficient in computers, including the contractual data entry operators for registration and billing; ii) those who had prior experience with computers (doctors and other health providers), but were not significantly proficient; and, iii) those who had never worked before on computers (including nurses, pharmacists, and store clerks. Most of the staff were in the last two categories. The training design included the first two-days of classroom exercises with aids like presentations and mocks-up, followed by five-days of hands-on exercises on the system. This was followed by a dry-run of the system in the entire department where users were expected to complete their everyday tasks using the system. After about 3 weeks of training, departments went ‘live’. Overall, there was a successful design and development of the system in RefHosp, and the state approved readiness to scale to other facilities.

About one-and-a-half years after project initiation, scaling to other hospitals was started. Information system and stabilise processes in the reference hospital, and then initiate scaling processes to other hospitals. These hospitals were located in other cities of the state, typically involving a day’s travel from where the reference hospital was located. As a result of these time and resource constraints, it was not possible to replicate in the other hospitals the intensive process of support and capacity building carried out in the reference hospital in the other hospitals. An approach was improvised which involved INGO enrolling staff from the reference hospital like data entry operators and pharmacists to support training of counterpart staff from the other hospitals. In this way, some networks of learning were enabled to allow for sharing of experiences and capacities to create stronger collectives. Staff felt a strong sense of pride as they helped mobilize broader processes of learning in the state.
In 2014, more than 3 years after inception, all hospitals were ‘officially’ live on the system, INGO initiated hospital level reviews to understand usage patterns, capacity building needs and user feedback across hospitals, starting with the reference hospital. It was seen the Registration and Billing modules were reasonably well used and stabilized, while the Outpatient and Inpatient modules were relatively unused or sub-optimally used. I saw specific cases of strongly motivated individuals striving to use the system. A junior doctor in Gynaecology department in the reference hospital said, “learning to work on HospIS is an advantage, as when I apply for job at a bigger hospital, I will have a plus given that all big hospitals have an HIS.” Motivation for a senior nurse in male medical ward in the reference hospital was that, she found computers very interesting as she saw her children use them. Though she wanted to learn but never really got a chance, but now she could tell her children that ‘even she knew working with computers’, which the children thought was something only for youngsters. Similarly the lab technician in another district hospital said that he had wanted to bring in many changes in this lab and standardise processes, and changing over to the new system gave him the opportunity to do so. A senior doctor at the reference hospital, who had also been very engaged in the process of finalising requirements, was one of the very few doctors using the system, motivated by the potential of being able to analyse disease patterns vis-a-vis age, gender, and area. The system enabled him to search data to analyse his local information better. The data entry operators had not only became proficient in all modules, but also had evolved into master trainers capable to training users in their hospital and also others.

In 2014, the State started to proactively take steps for the hospitals to use the system, start to look at their local data, take decisions based on this data, and increased training sessions at the hospitals by INGO for strengthening hospital ownership of the systems. Overall, the project is perceived as a success, and of being one of its kind in the country in that it is operational in all district hospitals. Also, it is acknowledged, that lot more needs to be done on strengthening capacity, and using data for hospital management. The current MOU is now in the process of further extension to meet these perceived needs.

Punjab is a state in north India, with a population of about 27 million (2011 census), making it the 15th most populated state in India. The state is spread over an area of about 50000 sq. km. making it the 19th largest state in the country in terms of area. The population density is 550 per sq. km, which is inevitable given the opportunities of growth and development in the
state. The population of the state is rising considerably due to rapid efforts towards development and progress. The literacy rate in the state is about 73% a figure that has improved tremendously in the last few years due to the consistent efforts

a. Mother and Child Tracking System (MCTS) in Punjab

Case context: Punjab is a state in north India, with a population of about 27 million (2011 census), making it the 15th most populated state in India. The state is spread over an area of about 50000 sq. km. making it the 19th largest state in the country in terms of area. The population density is 550 per sq. km, which is inevitable given the opportunities of growth and development in the state. The population of the state is rising considerably due to rapid efforts towards development and progress. The literacy rate in the state is about 73% a figure that has improved tremendously in the last few years due to consistent efforts of the state. Punjab enjoys the credit of ushering the green revolution in the country in the sixties. A progressive mix of irrigation, fertilizers and high-yielding variety seeds laid its foundation; a process, which was further strengthened by agricultural credit societies, rural link roads, village electrification, and a variety of extension services. A strong agro-based industrialization has been a prominent feature of the state economy. The state has made commendable progress in strengthening the infrastructure, particularly irrigation and power. Despite this high pace of economic growth, the state lags with respect to its social and health indicators, including literacy, sex ratio, infant mortality and nutrition. On an all India comparison, Punjab ranks 6th on the Human Development Index (HDI) but 16th on the Gender Development Index (GDI) indicating that gender equality cannot be linked to income level alone (Punjab Human Development Report 2014).

Case description: The primary case which I focus on is the Mother and Child Tracking System (MCTS). This system is also linked to the use of mobile technology for reporting on the performance of the ANMs with respect to tracking of care to mother and children. In 2009, the national Ministry of Health initiated a pilot to test the feasibility of mobile technology to support mobile based reporting of sub-centre data by the field nurses. INGO successfully implemented this project, and based on the results, Punjab adopted the application state wide for ANMs to report their facility data through the phone. This project later was to become linked to the MCTS project which I describe next.
All states in India have a monthly aggregate reporting system (called Health Management Information System – HMIS), which was place under reform in 2008. While this reform process was ongoing, the health minister announced in 2009 that aggregate numbers are not good enough for monitoring immunization, and hence name-based reporting must start with immediate effect. A Government of India notification announced:

> It has been decided to have a name-based tracking system whereby pregnant women and children can be tracked for their ANCs and immunisation along with a feedback system to ensure that all pregnant women receive their ante-natal care check-ups (ANCs) and post-natal care (PNCs); and further children receive their full immunisation. An online module for the name based tracking system is being developed and direction of use will be given soon. ....

Following from this, the MCTS was designed by a government agency, and States were mandated to start collecting and reporting data on the MCTS formats. Small teams from all states were called to the national level for training to enter names and codes of facilities by outreach centres. A cascade model of training was adopted, with those trained at the national level would train those in the level below and so on. From April 2010, data started to flow into the software, and system usage was monitored based on ‘number of women and children registered yesterday and expected’, which was communicated daily by SMS to the State Health Secretary first thing in the morning. These messages over time added state rankings, telling how the state ranked vis-a-vis others on registrations. Approval of state budgets slowly became conditional to the achievement of registration targets. Along with this, monthly letters to states from the centre for enhancing registration. For example:

> On close analysis of the data available in MCTS, it is noticed that only 77% of the mothers and 12.5% of the live births are registered in MCTS till date. More over the services given to mother and child are not seen updated regularly.

(Government of India DO Letters, dated 10.02.2012)

Two years into the implementation, the ministry was still struggling to get full coverage on registration, and the health minister announced:
Information is collected to track every mother and child by name, address and telephone for which a call centre has been set up in the ministry to verify the data and inform women of the check-ups and the immunization schedule, health minister said. The Minister also made sample verification calls to registered women under the MCTS database to verify the database entries today.

(Press Information Bureau, Government of India, October 2011)

The word ‘verify’ echoed the same ‘trust level’ which was at the foundation of the launching of the massive tracking system. Such press releases were sent by the ministry each month:

Over 99.5% districts, 96% health blocks, 88% health facilities (other than Sub Health Centres (SHCs) and 94% SHCs are reporting data in MCTS. Total 2.3 lakh ANMS are registered in MCTS, of which 2.2 lakh (ANM are registered with phone number). Total 8.4 lakh ASHAs are registered in MCTS, out of which 6.9 lakh (82.9%) ASHAs are registered with phone number. Everyday approximately 7-8 lakh SMSes are being sent to the beneficiaries.

(Press Information Bureau, Government of India, May-2013)

In November 2013, the ministry advertised a new request for proposal for setting a ‘Mother and Child Tracking Helpdesk (MCTH)’ to strengthen validation of data as well as a single platform for information exchange.

MCTH shall validate records of health worker, pregnant women and children registered under MCTS by making outbound calls to the health beneficiaries and health workers. Errors / deviations that are generated in the validation exercise must be reported back to MCTS so that corrections can be made. Minimum 70-calls (outbound) and minimum 6-hours of actual calling in a day by individual helpdesk agent. The average calling time per call is expected to be 5 minutes.

Four-years into the programme, the ministry was still at the stage of validating the data, and states unable to generate all required reports. The only figures/data the states received was what the ministry sent with them (via morning SMS, letters or press releases). From 2012, the state could generate reports on facilities not entering data, district-wise monthly data entry, verifications done and services tracked. In state review meetings, the issue of insufficient capacity building came-up as a reason for low registration, and the Population Research Centres (PRCs) were notified as the nodal agency for monitoring MCTS.

I discussed with some ANMs on their experience with MCTS application and implications on their work, especially with respect to workload and quality of care. ANMs expressed concerns about their increased workload with each case (pregnant woman or child) needing to be entered in detail. Data entry could not be completed even with a whole day of work, and ANMs needed to line-up at cybercafés close to their homes to update data entries in the evening after work hours, which they go to with family members for reasons of security. Some ANMs even contracted cybercafés to enter data into MCTS with personal usernames and passwords. An ANM said:

*I return from work by 5.30pm, rush into kitchen to get dinner ready and finish whatever I can to leave home by 6.45pm to reach cybercafé by 7pm. The shop closes at 8pm. Only if I put in one hour of data entry everyday can I complete my workload for registration. Am not fast at using computers and my son does not understand the data. So we both try to complete as much, as cannot afford salary cuts.*

ANM, Punjab

The letters from centre to state giving the state ranking snowballed into letters to districts from the state, with district-wise ranking, and further to each ANM with health-worker-wise ranking. No incentives were given if registration was below 90%, and poor performing workers were publicly shamed by names being displayed on notice boards. Letters called for explanations for low registration, and negative performance remarks were recorded in service books which are the basis for annual confidential appraisals and other benefits.

*I am always lagging in my registration targets and I am lowest performer in my district. This has been told to everyone in every meeting. But*
what’s not told is that I have seven big villages under my area with highest load of mother-child registration in my block. It is always a race to complete data entries – my son and daughter help me complete, but they have college in the day and internet shops is far from home, which does not leave much time for them. Now I have contracted internet shop operator to complete my entries. I pay him from my pocket, which of course does not get reimbursed. We are larger joint family to support and diverting the resources is not helping. But all this still does not help, as I have been now been labelled worse performer, which is extremely demotivating.

ANM, Punjab

While the centre made percentage of MCTS entries a condition for state budget approvals, the state made salaries of ANMs conditional to registration percentage:

State has also started with salary cuts for not meeting targets and I have had three continuous salary cuts due to not meeting the targets. I cannot afford this. PHC has only one data entry person and the load is too much so most of us have been asked to find our own ways to completing entries. I am 58 years and I don’t know computers. I don't have computer shops near my house. I am struggling with my data entry. I need to take my registers to computer shop which is far and leave the registers they for 3-4 days. But then I have back log of data entry in registers also. I had suggested using untied funds for completing data entry, which has been denied. So, all of us are using our own money to complete data entry. This is not sustainable.

ANM, Punjab

While discussing the issue of low registration, one AMN pointed that while government issued the MCTS formats for reporting, the recording registers were not revised. How do we report on data that we do not capture? One ANM pointed to something which was at heart of this MCTS-data relationship:
We have been dealing with pregnant women and children since I joined service (which was 30 years now). We always discussed cases at the PHC with the doctor about cases which we think to be high risk in our monthly meetings, and also discuss how to plan immunisation and nutrition days and other outreach programmes. But for three years now our monthly meetings are only about percentage of names registered in MCTS, show-cause letters issued to those not completing targets and timelines to complete entries. We do not discuss cases, data or workplan anymore.

ANM, Punjab

In summary, more than 5 years into the MCTS implementation, registrations of mother and child is taking place, but there is lack of evidence of it having improved the quality of care, or having an impact on the poor maternal and child health indicators in the state and country. The workload of the ANMs has significantly increased, and so also processes of control and monitoring. The mobile phone has been central in enhancing the visibility of the health workers performance, and provide a basis for increased central control, and to the detriment of the ANM empowerment.

10. Case analysis

I start this section, my schematically presenting a theoretical framework that I have inductively derived from the cases, and which takes as the point of departure the initial theoretical framework presented in section 2. Following this schematic presentation, I elaborate on the framework, and see how it contributes in answering the research questions posed in the introduction of the paper.
6.4 The theoretical framework of empowerment

**Opportunity Structure**
- Role of the State
- Prior experience with ICT projects
- Health system demands
- Rules of bureaucracy

**Participation**
- Defining participation agenda
- Capacity required to participate
- Role of institutional conditions

**Technology Characterised by Conversion ability and Affordance**
- ICTs as means of control & surveillance
- ICTs as enabler / inhibitor for participation
- ICTs as subject and object of capacity

**Empowerment**
- * Expansion of agency
- * Availability and leveraging of choices

**Capacity**
- Capacity to understand artefact
- Capacity to apply the technology in everyday work – “capacity for use”
- Capacity to apply the technology to other areas of value – “capacity for exchange” – capability

**Agency**
- * Of Health System Users
- Enablers – participation, capacity & capability, capacity to aspire
- Mediated by technology and its affordance
The framework is constituted of 6 interacting components: i) opportunity structure; agency; participation; capacity; technology; and empowerment.

**Opportunity structure** represents the existing conditions and institutional context in which choices are provided and exercised (Alsop and Heinsohn 2005), and also sometimes constrained. These include organizational hierarchies, policies, control mechanisms, laws, regulatory frameworks, and informal norms governing behaviour. Elements of opportunity structure identified through my empirical analysis included: role of the state; prior experience with ICT projects.

**Role of the state**: The state administrators of Punjab in MCTS saw the potential of the mobile phone as a tool to control the health workers, by enhancing visibility of their work. Kabeer (2009) argues that power is a key constituent of structure, raising both negative and positive meanings of agency. In a positive sense, ‘power to’, refers to the space people are given to define and exercise their choices, while in a negative sense of ‘power over’ represents how an individual or group (in my case the state) overrides agency of others (in this case, the health workers). In Punjab, the ICT infrastructure comprising of the MCTS, mobile phones, server infrastructure taken together, coupled with the intention of the administrators and their authoritarian actions on project control, systems of reprimand and salary deductions, helped to create “power over” the ANMs with negative implications on their empowerment. The Himachal Pradesh case showed a contrasting case in the role of the State, where the approach was towards enabling “power to” by enabling decentralization and making the hospital staff fully engaged in processes of design and capacity building on the system.

**Prior experience with ICT projects**: Prior experience with ICT projects provides project pre-conditions with implications on shaping agency. The lack of prior experience also means the required infrastructure is not in place and also raises demands and impedes the learning processes. Sometimes the lack of prior experience may be positive as there are no legacy systems to battle with in practice and in the mind.
Health system demands: A district hospital catering to a daily OPD load of 500-800 patients a day. For administrators, the hospital system was seen as a tool to manage better this high work load and get improved information to support their interventions. For the doctors however, who were directly dealing with the patient load, the system was seen to be an additional load to their work, and they resisted by non-use of the system. A system can be empowering only if it aids the staff to deal with the demands of the health system, and if it instead add more load, it would be seen as disempowering, as was in the case of MCTS where its reporting demands came in addition to existing work, rather than its reduction.

In summary, different elements of opportunity structure have been identified which are relevant for the particular cases studied. In other ICT4D projects, there may be other aspects which may be seen as relevant, such as conflicts between different political interests or the role of global agendas. A general implication is the need to identity aspects of opportunity structure, and how they may impact to the expansion or not of agency. I next discuss agency.

Agency: Agency is a foundational to the theoretical framework, and concerns how individual themselves are significant actors in processes of change involving not only choice but also resistance, bargaining and negotiation, and reflection, their sense of the power within. Agency represents not only the action that people take, but also their intentions to do so, which may be intrinsically driven or extrinsic. Agency, expressed through the creation and exercise of new choices which were not possible prior to computerization, has implications on empowerment. In Punjab, state control and authority constrained choices health workers had to provide improved care to mothers and children, which negatively influenced empowerment. While in Himachal, the hospital system by linking different departments through an integrated system, created better choices for providing for continuity of care and improving work processes in the hospital such as the structuring of patient queues and
printing of computerized receipts. The hospital users were intrinsically motivated to create new choices on how to do their everyday work (the radiology example) which helped to expand their agency with positive implications on empowerment. In Punjab, the agency of health staff to provide improved care was overridden by the technology and the intentions of the state to control, and on the contrary introduced resistance through union based strikes to protest against the demand of the state for daily reporting.

Participation: The framework conceptualises participation within the broader framework of opportunity structure and agency. Participation can be analysed through questions of who defines the agenda, what capacities are required to participate, and what are the influencing institutional conditions (Puri and Sahay 2003). With respect to who defines the agenda, it varies from whether it is externally driven (such as in the case of Punjab), or internally, or some combination of the two (like in the case of Himachal). The more the agenda is driven by the end users, the greater is the potential for empowerment. However, to engage in participation there must be the capacity to do so. While ICTs can potentially enhance the ability of people to participate, such as over distance by Skype, the requisite infrastructure and capacity to use Skype is needed. Technical and institutional structures need to be created to enable participation, like in Himachal the MOU made requirements development a part of the contract, rather than it being pre-specified. Institutional conditions represent opportunity structures that are important in shaping process of participation. My cases demonstrated different institutional structures for participation. In Himachal, the state gave full autonomy to hospitals to take design decisions to build a system which was to serve as a reference for the entire state. The state played an enabling and support role as and when required by making enabling decisions, providing resources, and giving confidence to the hospitals that they are supporting them. In turn the hospital, gave autonomy to each department to give
requirements, a space which was then provided to individual staff. This non-controlling, decentralised and facilitating structure enabled bottom-up participation and a stronger sense of ownership. In Punjab, the institutional structures were top-down and hierarchical, excluding participation.

Capacity and capability: The framework builds on Sen’s distinction between capacity and capability where the former refers to people’s ability to use ICTs, while “capability” refers to the ability of the user to use the technology to pursue choices they value. Both capacity and capability are seen in context with the conversion ability of the individual to apply the technology to pursue choices they value. Also, important is the capacity to participate and how this can contribute to the development of capabilities. While in MCTS, as in many ICT4D projects, the focus was primarily focussed on building capacity and the attention to strengthen capabilities remained limited. Building capabilities requires the users to be intrinsically motivated, while capacity is most often driven by extrinsic agendas. Intrinsically driven exercise of agency would help to create more choices and contribute to empowerment, while extrinsic agendas tend to curtail empowerment.

Technology: Drawing from the ensemble view, technology was conceptualized as an element in a larger socio-technical collective where the different elements need to be well aligned. The social comprises of human actors including administrators, facility users, donors, and system developers. The non-human actors include the technology being developed, other supporting infrastructure like mobile phones, servers, networks, printers, power supply equipment and others. Various institutional conditions and processes of exercising control, reporting mechanisms and donors also have an important bearing on how effectively or not the technology is used. Technologies provide different affordances and are used in varying ways
by users. The mobile phone provided the functionality of SMS based data transfers which health workers used for sending their routine reports. This same affordance was used by the administrators for control and surveillance purposes. The hospital information system provided a very different form of affordance, for example for linking the different departments within the hospital, which was used in different ways by the users in different departments. The MCTS technology was used to strengthen the institutional structures of central control, while the hospital system helped introduce new structures that valued information.

Technology, its material features and the ability of users to effectively use it, serves as a conversion factor to convert capabilities to functionings. In some cases, I saw this conversion ability to be effective, while not so in other cases. The mobile project provides an example of the latter influence, while the hospital system serves as an example of the former. The model thus emphasizes to not assume technology in a deterministic mode where it will automatically bring about positive outcomes, but it can have both kinds of effects. Further, these effects will take place over a period of time, and the nature of influences will vary.

*Empowerment:* The aim of the proposed framework is to understand the technology and empowerment relationship, where empowerment represents an expansion of agency. Some of these shaping processes include:

An enabling opportunity structure of decentralized governance has positive implications on expanding agency and empowerment. Prior experience in computerization can positively influence agency in that there is not the legacy to deal with, but creates additional demands on capacity strengthening.
Technology provides the potential of a conversion factor to expand agency by enabling the translation of capabilities to functionings. However, whether this potential is exercised or not depends on the affordance of the technology, the capacity to use it, and the intentions of users of how they want to use.

Participation is important in building capacity, but on the other hand also requires capacity to engage with. Technology can play an important role in enabling participation, but requires many other elements, such as infrastructure, to be in place.

Capacity and capability need to be seen in relation to conversion ability of individuals to use the technology to pursue choices they value. While capacity can help them acquire required skills to use the technology, capability allows individuals to visualize and pursue new choices that they individually value.

These different components of empowerment helps to answer the first research question of how do we theoretically understand empowerment. The second question concerns how can empowerment be made explicit in ICT4D projects. The model helps to answer this question in the following ways:

Improve conditions and processes of participation of users in design and development processes. This will require building also capacity of users to participate.

Enable capacity strengthening processes which not only have instrumental aims of building skills but also seek to enhance intrinsic value the technology may provide to the individuals.

Different approaches are required to nurture capabilities as compared to building capacities. While the latter can work with standard class room training techniques, the former requires more intimate and long term approaches of coaching and mentoring.
For ICTs to play an effective role as a conversion factor, capacities of users need to be strengthen, and conditions for their participation to be enhanced.

Discussions and conclusions: Making empowerment “visible” in ICT4D projects

Many ICT4D projects are post-hoc categorized as “failures”. For example, once in a discussion with a co-researcher on interpretations around the impact of a hospital information system in Himachal, my colleague created graphs to compare the number of patients registering in a day with the number of OPD encounters. The low percentage figures made him infer: i) Registration clerks were not using optimally the search function to identify revisit patients, and most patients were registered as new; ii) OPD doctors are not optimally using the system as the percentage of patients showing OPD encounters was small relative to the total patients. This made him see the system as largely a “failure.” However, further discussions made us see the inadequacies of this analysis. One, the hospital doctors themselves had taken the decision to electronically register only chronic patients (like those suffering from HIV, TB and Diabetes) who they felt required longitudinal care supported by an electronic medical record. This decision was made to help them manage the extremely high patient load a day (sometimes 70-100), giving them only 2-3 minutes per patient. Another reason for the low numbers was the fact that many “patients” even though needing to go through registration, had not come for OPD services, but for non-medical hospital services such as obtaining a certificate for medical fitness for a driver’s license.

This example emphasizes two points. One, the provision of health care through a district hospital facility in the context of a developing country is an extremely complex phenomenon
due to high patient loads, limited resources, manual work flows, and poor infrastructure. Introduction of ICTs, such as an electronic medical record system, in such a context becomes a very complex endeavour where various connected planned and unplanned events have to be catered for. This socio-cultural-institutional complexity represents a unique setting for ICT initiatives in which many elements are “invisible”. A second point of emphasis is that a sole focus on the visible impacts, such as looking at the graphs in the example above, would lead to the inference that the doctors are not optimally using the system. However, in practice the doctors have actually been “empowered” by the system, and were capable of directing the use of the system to where they felt they needed it most – i.e. to manage the care of chronic patients who needed longitudinal information support. Focusing only on the visible impacts of ICTs tends to trivialize the learnings taking place within the ensuing complexity, which I argue is making the empowering tendencies invisible.

The strong claims of failures of ICT4D projects (eg Heeks 2002) arguably only by observing visible impacts, and may thus be seeing a “glass half empty.”. Various forms of learning takes place amongst the people involved, which are not visible. For example, we found cases of nurses in Punjab tell us how they were now effectively using the phones to teach their kids how to surf the Internet. If the claim of failure of the Punjab project is of a failure, then we have missed out such examples of individual empowerment and learning. A reason to challenge such assertions of failures is that the authors focus on a very limited set of affordances provided by the ICTs, those which support a set of rational assumptions. Typically evaluations don’t examine activities that fall outside the frame of data collection, and are typically snap shot based which don’t look at learning which takes place over longer periods of time. Thus a richer analysis can be developed by detailed understanding of the
social-cultural-institutional complexity, and also of the affordances and constraints of ICT systems, especially those which may impact on invisible uses, users, and work flows.

This paper argues that these invisible impacts can be conceptualized as empowerment, theorized as the expansion of agency as the more and better informed choices. Further, the lens of empowerment helps to place the human as the primary focus, as contrasted with a lens that is framed largely by technology. A human-centred focus arguably provides for a richer understanding of the socio-cultural-institutional complexity of the phenomenon under study, including their relationship with the technology understood through notions of conversion factor and affordances. A human centred focus seeks to address the supply side bias in ICT4D projects, which marginalizes development concerns as espoused by Sen.

In this way, I believe my paper makes two contributions relevant to the theme of this special issues. Firstly, it explicitly provides for a novel approach to theorize development by articulating an integrative framework to theorize empowerment, in which ICTs are explicitly theorized within the context of opportunity structure and agency relationship. My framework builds and extends Dorothea Kleine’s (2013) “technologies of choice” perspective. While I adopt her view that choice itself can be an indicator of empowerment, I see technology more than just a resource, but as mediating in the relationship between opportunity structure and human agency, influencing participation processes, and also being an object and means of capacity strengthening. Secondly, I believe this framework to understand empowerment is also relevant to mainstream IS research. Notions of opportunity structure and agency, for example can apply also to other settings and technologies, only they would need to be understood in the specific contexts studied. Through empirical analysis of different technologies and contexts, the framework can be further refined and extended.
Reference


