INFORMING DEVELOPMENT: MOBILE TELEPHONY, GOVERNMENTS, AND LOCAL STAKEHOLDERS IN AFRICA

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INFORMING DEVELOPMENT: MOBILE TELEPHONY, GOVERNMENTS, AND LOCAL STAKEHOLDERS IN AFRICA

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ABSTRACT

It is believed that once groups acquire information and communication technologies (ICTs), they will prosper. When the most marginalized members of society have better access to information and knowledge, the likelihood of improving their livelihoods also increases. Past literature has dealt with the difficulties that such groups have had in accessing and acquiring technology because of institutional obstacles. This thesis examines the institutional obstacles and constraints faced by groups once they have acquired ICTs. I intend to examine why, despite the rapid diffusion of ICTs in developing countries over the past decade, there has not been a dramatic improvement in the alleviation of poverty. In particular, this thesis will explore the use of mobile phones in the context of development and poverty reduction in Sub-Saharan Africa and the relationship between institutions and local stakeholders to strengthen livelihoods.

This thesis hypothesizes that development initiatives using a collaborative, hybrid approach that integrates effective institutional involvement with inclusive grassroots participation will be more sustainable and scalable than those that attempt solely top-down or bottom-up approaches. In other words, initiatives devised by institutions that rely upon structures incorporaing local communities into projects will be found to be more successful in both the short-term and long-run. Case studies have been selected to

illustrate how this hybrid approach is ultimately more successful in improving the livelihoods of the rural poor than approaches that are either primarily driven by the top-down or bottom-up. The four cases considered in this thesis will describe the extent to which projects or initiatives using mobile phones have been successful in meeting the needs of local beneficiaries and improving their livelihoods.

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CHAPTER 1

INTRODUCTION

1.1 Research Problem

It is believed that once groups acquire information and communication technologies (ICTs), they will prosper. When the most marginalized members of society have better access to information and knowledge, the likelihood of improving their livelihoods also increases. Past literature has dealt with the difficulties that such groups have had in accessing and acquiring technology because of institutional obstacles. This thesis examines the institutional obstacles and constraints faced by groups once they have acquired ICTs. I intend to examine why, despite the rapid diffusion of ICTs in developing countries over the past decade, there has not been a dramatic improvement in the alleviation of poverty. In particular, this thesis will explore the use of mobile phones in the context of development and poverty reduction in Sub-Saharan Africa and the relationship between institutions and local stakeholders to strengthen livelihoods.

1.2 Hypothesis

This thesis hypothesizes that development initiatives that are more comprehensive and inclusive of local stakeholders and end-users, will be more successful, in terms of sustainability and scalability, than those conducted from the top-down and in a piecemeal manner with minimal stakeholder participation. Using the lens of technology appropriation, I posit that ICT4D projects using a collaborative, hybrid approach that integrates effective institutional involvement with inclusive grassroots participation will be more sustainable and scalable than those that attempt solely top-down or bottom-up approaches. In other words, initiatives devised by institutions that rely upon structures

incorporaing local communities into projects will be found to be more successful in both the short-term and long-run. When national institutions fail to implement and enforce policies and regulatory frameworks that are supportive of civil society needs, initiatives are not likely to succeed. On the other hand, when policies and regulatory frameworks are effectively developed to proactively address the demands of civil society, they are more likely to be sustainable and scalable. The private sector, including the corporate communications industry, nongovernmental organizations (NGOs), and multilateral donor agencies, plays a pivotal role in the implementation of ICT4D projects, as these actors can offer resources and support beyond what public institutions are often capable of providing.

The meaningful use of ICTs and telecommunication services can enhance human development. But the ability of members of civil society, and those living in rural areas in particular, to reach decent living standards is only possible with a regulatory environment that is responsive to the needs of the rural poor.

1.3 Methodology

To test my hypothesis, I will employ the structured focused comparison method. This method is defined by George and Bennett (2004) as one where "the researcher writes general questions that reflect the research objective and…these questions are asked of each case under study to guide and standardize data collection, thereby making systematic comparison and cumulation of the findings of the cases possible" (p. 67). The four cases considered in this thesis will describe the extent to which projects or initiatives have been successful in meeting the needs of local beneficiaries and improving their livelihoods. The selection of cases is "focused," in that they were chosen as

instances where various degrees of government intervention and civic participation have taken place. I will analyze the efforts of the sub-Saharan nations of Uganda, South Africa, and Ethiopia to increase access to ICTs. Small-scale innovations using mobile devices in various sub-Saharan African (SSA) nations will also be described. The intention behind this study of the experiences that various sub-Saharan African states have had is to draw out of each case an explanation for why certain approaches to ICT4D initiatives have been more successful than others. Table 1, below, provides a matrix for the case studies.

Table 1: Case Study Matrix

		Institutional decision-making	
		Strong	Weak
Participatory Processes	Strong	**Uganda: MTN Village Phone Program, Grameen Foundation AppLab, Community Knowledge Workers Initiative**	**Various sub-Saharan African states: Small-scale innovations from end users**
	Weak	**South Africa: On Cue Compliance System**	**Ethiopia: State-owned telecom sector**

Uganda has made strong efforts to listen to and meet the needs of the rural poor. This is best exemplified by looking at the case of the MTN Village Phone project and the Grameen Foundation's AppLab initiative. On the other end of the spectrum, Ethiopia has one of the lowest mobile penetration rates in Africa due to the absence of competition and ineffective policies and practices. In South Africa, the use of mobile telephones has become ubiquitous and mobile health projects, such as the On Cue Compliance System,

are being frequently tested. As mobile penetration rates increase across the continent, end users are experimenting with new ways to earn incomes and meet their needs through a variety of small-scale innovations.

The independent variables of institutional decision-making and participatory processes will be used. Each case study will examine the intentions of institutions, both public and private, behind the construction of policies, how such policies and frameworks are designed, implemented, monitored, and evaluated, how ICTs are understood in the context of the political and economic situations of the countries of concern, and the inclusion of various stakeholders, including private sector actors and local community participants. What is the interaction between the socioeconomic needs of the rural poor in these states and the regulatory bodies that make decisions and policies? How do these interactions impede or enhance access to telecommunication services and ICTs? I will elaborate on these independent variables and the selection of cases in Chapter 3.

To determine the level of success found in each case, I will assess how sustainable and scalable each initiative has been. I expect to find that in instances where there is a strong degree of institutional decision-making and a strong degree of civic participation, ICT4D initiatives will be more sustainable and scalable, and will contribute to improvements in human development. On the other hand, I expect that when either civic participation is weak, or institutional decision-making is weak, efforts to improve human development through the use of ICTs will be less successful. Finally, in instances where the involvement of institutions and civil society are both weak, it will be greatly challenging for development initiatives to be sustainable or scalable.

For the purposes of this thesis, the concept of sustainability can be best

understood as the ability of an ICT4D project or program to move beyond the initial pilot phase and be viable in the long-term. There are many components to the idea of project sustainability. Sustainability can be looked at from four different angles: the social, the technological, the financial, and the political. Social sustainability includes the ability to make positive impacts on human developments, the willingness of the community to participate and commit to the project, and the development of local capabilities to ensure the project is being fully embraced. These capabilities can include instruction on how to use a technology, follow-up with end users to answer questions and provide guidance, and getting feedback. A project's sustainability can also be greatly influenced by the extent to which the service or product is valued by its end users. If end users do not find the service or product useful or valuable, they are less likely to utilize it.

Technological sustainability entails ensuring that the type of technology deployed matches local realities. This includes considering the inputs needed for project maintenance and the presence of a solid infrastructure to support the project's use. Financial sustainability most simply involves achieving revenue that is equal to or above what money was put into the project and using an appropriate business model that serves the interests of end users. Obviously, if an initiative lacks financial backing and/or the ability to generate revenue, it greatly increases the likelihood that a project may not last. Of additional concern is if the project can continue once external support has been withdrawn (Puri & Sahay, 2007, p. 141). Political sustainability is regarded as appropriate policymaking, the presence of an enabling regulatory environment that is responsive to the demands of civil society, and an openness to the participation of the private sector. Additionally, the level of commitment by each partner or stakeholder

involved in the design and/or implementation of a project can influence its long-term sustainability. Are partners pleased with the objectives and outcomes of the project? Are they willing to extend their commitment beyond the pilot phase?

The concept of sustainability is closely related to a project's scalability. Scalability is best understood as the extent to which a project or program can be replicated across geographies, including in the same country, different countries, or regions. Obviously, mobile services and products that rely on an environment's existing technology and infrastructure have a higher potential of being scalable than those than necessitate introducing new technologies and/or constructing new networks. As the first case study on the Grameen Foundation's initiatives in Uganda will demonstrate, having stakeholders or partners involved in the program with incentives to make the service or product successful can heighten the likelihood of bringing a project to scale.

Verclas (2010) identifies barriers that can hinder scaling, including the fact that customers at the bottom of the pyramid (BOP) often have the lowest average return per user (ARPU) and are highly sensitive to price changes, making it harder for operators and service providers to find sustainable business models. Other constraints include "language, literacy barriers, scarcity of relevant and accurate content, inaccessibility to certain handsets, and competition amongst operators who do not have a strong history of negotiation or shared approaches" (p. 1).

Important questions to ask when considering if a project or service is scalable include: Is it cost-effective? Is it actually solving users' needs and providing a valuable service that will be useful in both the short term and long term? Is there a market for the services? Do stakeholders involved in project design and implementation have incentives

to see the project be successful? Addressing these questions will help practitioners and developers think about the factors that can contribute to the success of a program.

1.4 Context

In the past decade, the diffusion of information and communication technologies, and mobile phones in particular, around the world has been tremendous. In its 2009 report, *Information Society Statistical Profiles 2009: Africa*, the International Telecommunications Union (ITU) reveals the impact of ICT penetration in Africa, noting, "By the end of 2008, Africa had 246 million mobile subscriptions and mobile penetration has risen from just five percent in 2003 to well over 30 percent today. The high ratio of mobile cellular subscriptions to fixed telephone lines and the high mobile cellular growth rate suggest that Africa has taken the lead in the shift from fixed to mobile telephony, a trend that can be observed worldwide" (ITU, 2009, p. iii).

Academics, civil servants, and average citizens alike sing the praises of the mobile phone. Jeffrey Sachs has referred to the device as "the single most transformative tool for development" (The Economist, 2009, p. 4), while scholar Richard Heeks (2009) claims that mobile telephony has become "the delivery mode of choice to provide connectivity into poor communities in the global South" (p. 6). In his seminal study of fisherman in the Kerala region of India, Jensen (2007) concluded that their use of mobile phones resulted in less price variability and less waste. Aker (2008) determined that the introduction of mobile phones into Niger's grain markets has been associated with a twenty percent reduction in grain price differences across markets.

Despite the rapid uptake of mobile telephony in sub-Saharan Africa and the beliefs espoused over the past four decades that ICTs have the power to contribute to the

transformation of underdeveloped societies, extreme rates of poverty persist. More than half of the global population currently lives on less than two dollars per day. Moreover, in 2006, it was estimated that forty-four percent of sub-Saharan Africans live on less than one dollar a day (Wines, 2006). 32 of the 48 poorest countries in the world are located in sub-Saharan Africa as well.

Sub-Saharan Africa has succeeded in the leapfrogging of landline telephony, but it has not been able to solve its most pressing needs. This is in part due to the nature of many of the development initiatives that have been undertaken. Industrialized nations, development organizations, and aid agencies that are intent on using ICTs for development have been primarily technology-driven in their efforts, rather than encouraging the participation of local beneficiaries and responding to their needs. As a result, not enough focus has been given to building up the competencies and capabilities of local populations to appropriately use technologies deployed in their communities, and a high likelihood of project failure has resulted. To play the devil's advocate, this may be attributed to the evolution of understanding the concept of ICT4D, as well as development partners learning to accept that what works best for the West may not be as successful in least developed countries (LDCs).

Current and past telecommunications policies in sub-Saharan Africa and literature regarding the impact of regulatory regime restructuring provide insight into the abilities of users in LDCs to acquire technologies. There is a wealth of literature addressing how markets have benefited and grown as most telecom regimes shifted from centralized, state-run monopolies to decentralized, market-oriented regimes independent of the state. Both theories as well as the practical aspects of reform inform the current wave of

telecom literature and best practices of liberalization (Singh, 2010). Examining policy priorities and levels of government support to promote investment and competition provides insight into how ripe a country's environment is for economic growth.

Singh (1999) posits that development in many LDCs depends upon the type of telecommunications restructurings that occurs, as well as the formation of groups who can cohesively act to pressure the state and drive change. Many studies (Stone, 1991; Hosman, Fife & Armey, 2008; Dasgupta, Lall, & Wheeler, 2005) use empirical investigations to support the hypothesis that the growth of telecommunications infrastructure and the liberalization of the communications regime have contributed to increased economic activity and the alleviation of poverty in many countries. Yet for growth to continue, programs developed by regulatory bodies should be adaptive and facilitate increases in access, coverage, and service to the rural poor and underserved.

Various theoretical models of what societies need for development exist. An examination of models since the mid-twentieth century can guide and inform the current direction of development. Perspectives have changed over time, becoming less supply-driven and more focused on identifying and meeting the demands of the poor. In terms of ICT4D, the concept has evolved from viewing mass media as a panacea for socioeconomic problems to focusing more narrowing on reaching rural and underserved areas through the inclusion of private capital, and emphasizing the power of information networks and participatory approaches (Singh, 2001). With regards to investment in telecommunications, economists have argued whether an outward-focused strategy or one that is more inward-focused is best suited for development (Singh, 1999). The use of ICTs for development is most effective when well integrated into a country's overall

development strategy and not approached in a piecemeal manner (Steinberg, 2003; Mansell & When, 1998). More often than not, this can best be achieved through the inclusion of participatory processes that deeply involve the local population.

As Byrne and Sahay (2006) note, the primary aim of participatory processes in development programs is to increase the involvement of the marginalized in the process. Hosman and Fife (2008) argue that it is essential for local stakeholders to be included throughout the duration of an ICT4D project to create "a culture of use" for the technology and to improve program sustainability and relevance (p. 67). While many Africans now have access to or own mobile phones, many initiatives involve using new services or applications on the devices that may be unfamiliar. Identifying demand and intended users, building capacity at the local level, and encouraging collaboration are necessary elements for successful project implementation. A culture of use can be cultivated by ensuring that "services are visible, frequently used, context specific, have a human face, and meet tangible needs" (Hosman & Fife, 2008, p. 67).

Mansell and When (1998) identify two prerequisites central to the ability of any country or organization to exploit the potential of ICTs for development. First, a network infrastructure must be available, and, secondly, the capacity to create and administer an enabling environment must exist. While many African states have made tremendous progress in building out telecommunications infrastructure and setting up independent regulatory regimes, they have failed to see widespread success due to a historically inappropriate use of technology for development by institutions.

1.5 Organization

The thesis will proceed as follows: Chapter Two provides the theoretical

framework for my hypothesis. The literature review is broken into four sections. Section 1 reviews the conceptualization of poverty, and what an improvement in the quality of livelihoods actually means for the poor living in LDCs. Section 2 provides an examination of the impact of liberalization in telecommunications in Africa and why the opening of the telecommunications sector to competition and investment is a necessary condition for access to services. Section 3 provides an analysis of the types of participatory, bottom-up approaches used to integrate local community members into development projects. Finally, Section 4 explores how a hybrid approach to development initiatives, using both top-down and bottom-up approaches, will be more successful in the context of ICT4D. This approach integrates responsive policies and regulatory frameworks from national institutions with the cultivation of strong partnerships amongst stakeholders to support initiatives that meet the needs of the people into the process of achieving universal access and service.

Chapter Three begins by describing the mobile telephony boom across sub-Saharan Africa and how, as a result of this expansion, more projects using mobile devices for development (M4D) have come into practice. Then, the first case presents programs initiated by the Grameen Foundation in Uganda that strategically utilize mobile phones to improve the livelihoods of the rural poor. This case demonstrates how the development of a strong partnership amongst stakeholders, combined with the design of initiatives directly addressing the needs of local beneficiaries, can result in a successful model worthy of replication. In Chapter Four, case studies of Ethiopia, South Africa, and small-scale initiatives in SSA will be described to demonstrate how the instability of many development efforts can be attributed to the weakness of participatory processes and/or

institutional decision-making. In all four cases, how the needs of the rural poor in these states are met, or not met, will be examined. This will entail examining both institutional regulatory frameworks to support access to services and efforts to increase the participation of local end users in the process. A combination of data analysis, qualitative information, and anecdotal evidence will be used to gain knowledge regarding the participation of local constituents (or lack thereof).

The conclusion, Chapter Five, will address the research question and to what extent the hypothesis is validated by the case studies. Is a hybrid approach more successful than top-down or bottom-up approaches? What is the interaction between the socioeconomic needs of the rural poor and the regulatory bodies that make decisions and policies in each country? How do these interactions impede or enhance access to telecommunication services and ICTs?

This thesis hopes to fill a gap amongst the existing research on ICT4D that lacks studies examining the impact, in terms of sustainability and scalability, of projects using mobiles in LDCs. Donner (2007b) notes that while the number of studies focused on telephony in the developing world is growing, the majority appear in isolation from one another. Sey (2008) and Mpogole, Usandra, & Tedre (2008) argue that further research in the field is needed to distinguish between potential and actual impacts. Current scholarship on ICT4D lacks detailed analysis of projects that have failed to meet their intended objectives. Thus, the thesis makes a critical contribution to the existing scholarship by describing instances where of project failure and the barriers that prevented more successful outcomes.

While there are many analyses that examine development projects exclusively

from the angles of development practitioners, NGOs, or governments, there has been minimal work that looks at projects from the perspective of how they benefit local constituents. My thesis will contribute to this body of knowledge by examining the interactions between institutions and civil society using top-down and participatory levels of analysis.

CHAPTER 2

REVIEW OF LITERATURE

In this thesis, I argue that a strong degree of institutional structures creating proper enabling environments and a strong degree of local stakeholders contributing and participating in the development process are needed for development projects using ICTs to be sustainable and scalable. I will examine how, despite widespread diffusion of mobile telephony in the developing world, institutional obstacles and ineffective approaches to development have prevented impoverished groups from making improvements in their livelihoods. This literature review focuses on the conceptual framework of ICTs for development and poverty alleviation, as well as the socio-economic impact that the introduction of telephony has had on the lives of people living in LDCs.

In Section 1, I examine what an improved quality of life looks like for someone living at the bottom of the pyramid. The notion that ICTs can facilitate the improvement of livelihoods is also addressed. Section 2 provides a review of development theories that are related to the provision of ICTs. I address the theory of modernization, and how the first wave of literature regarding telecommunications spoke to the need for telecommunication restructurings in order for economic growth to occur. To relate to the independent variable of governments' institutional capacity to make decisions that foster human development, a discussion of how the liberalization of the telecommunications sectors in many LDCs has subsequently led to economic growth is also presented. This discussion intends to support my expectation that in instances where states have more aggressively pursued liberalization, a stronger enabling environment to support ICT-

driven initiatives will materialize.

The discussion presented in Section 3 relates to my other independent variable, the involvement of local stakeholders in development processes and how the strength of their involvement influences project sustainability and scalability. Literature that addresses the need for participatory approaches and how these approaches differ from previous methods is reviewed. Finally, Section 4 examines how the top-down, institution-driven approach to development can come together with the bottom-up, grassroots approach to best meet the needs of the poor. It describes under what conditions these approaches can work together. I expect that this approach will be more supportive of development initiatives and contribute to increased project success than alternative approaches.

2.1 Improving the Livelihoods of the Impoverished

If ICTs, and mobile phones in particular, can contribute to the transformation of lives, what do these improved livelihoods look like? In order to understand movements towards a more "developed" state, it is critical to first understand who the rural poor are and the constraints they encounter that hinder their development. This section describes my dependent variable, the livelihoods of the rural poor, and how those livelihoods can move from a deprived to an improved state.

Poverty can be simplistically defined as a deprivation of basic needs and assets. These needs include access to food and water, healthcare, shelter, and education. The United Nations Development Program (UNDP) (2001) describes poverty as "a state of economic, social, and psychological deprivation occurring among people or countries lacking sufficient ownership, control, or access to resources to maintain minimal

acceptable standards of living. It represents an exclusionary relationship where individuals or states are denied access to an adequate package of resources" (p. 10). As Chacko (2003) points out, moving beyond the conceptualization of poverty as simply one-dimensional and based on income levels alone provides for a deeper understanding of the concept. By taking a multi-dimensional conceptualization of poverty, one is more capable of seeing the various economic, as well as social, factors beyond income that can impact a person (Gerster & Zimmerman, 2003).

The majority of the world's poor lives in rural areas and depends upon agricultural production as the primary source of income. In fact, nearly 90% of Africa's poor live in rural areas (McNamara, 2003). Living in rural areas creates barriers to accessing information, government services, and viable livelihoods. Without such access, the rural poor are at a disadvantage compared to those living in more urban areas.

Understanding the nature of poverty and what moving from various states of poverty looks like can be best understand in the context of the UNDP's Human Development Index (HDI) and Human Poverty Index (HPI-1). These indicators were developed by the UNDP to show that understanding human development goes beyond, and provides an alternative for, macro-level statistics that simply share the growth or fall of national income levels. The UNDP (2009) defines human development as a development paradigm centered around, "creating an environment in which people can develop their full potential and lead productive, creative lives in accord with their needs and interests."

Instead of measuring development by GDP per capita, a composite HDI is comprised of various indicators used to measure development and progress. Key

indicators of basic human capabilities include life expectancy, educational attainment (including adult literacy), income, and access to public and private resources. The HDI can be especially helpful when comparing experiences within and between various countries.

On the other end of the spectrum is a human poverty index (HPI). Whereas the HDI reveals information regarding the level of opportunities and choices available to people, the HPI indicates the "features of deprivation" (UNDP) that are present in a nation. The three primary indicators of the HPI are a short lifespan, lack of basic education, and lack of access to basic public and private resources. The use of these indicators helps determine the extent to which populations are living in poverty and provides a new dimension to looking at those who are depraved of opportunities to improve their standards of living.

Such indices can prove helpful in understanding the livelihoods of the rural poor in Uganda and Ethiopia, two of the countries that are discussed in detail in the case studies. Data collected in 2007 to develop indicators for 2009 reveal that both states fared poorly. Uganda's HDI of 0.514 gives it a rank of 157th out of 182 countries; its HPI-1 value is 28.8%, ranking it 91st among 135 countries. Meanwhile, indicators show that Ethiopia ranks at the very bottom. Ethiopia's HDI ranks it 171st out of 182 countries (0.414) and its HPI-1 ranks it 130th (50.9%). South Africa, the location of the third case, has an HDI of 0.683, ranking it 129th, while its HPI-1 value of 25.4% ranks it 85th out of the 135 countries assessed.

According to the UNDP (2009), development is about expanding people's choices, and that "fundamental to enlarging these choices is building human capabilities"

(para. 1). When people who have been living in impoverished states gain greater access to assets that will help pull them out of their current state, their quality of livelihoods improve. The HDI and HPI can provide a macro-level understanding of livelihoods in particular nations. On a micro-level, what would these gains look like? At the most basic level, standards of living are raised. This includes greater access to basic needs (food, water, shelter) and better access to public services, including healthcare and education. In addition, the ability to effectively acquire and use relevant information can greatly aid in the improvement of livelihoods. Information can range from learning about employment opportunities to retrieving the latest market prices. The quality of livelihoods is also improved when the rural poor feel empowered to make their own choices and are engaged in the process of how to best meet their own needs.

Table 2, below, highlights constraints commonly encountered by the rural poor and how ICTs can contribute to the improvement of livelihoods. Macro-level data has provided evidence that increases in mobile penetration rates can contribute to economic growth (Roller & Waverman, 2001; Djiofack-Zebaze & Keck, 2008; Stone, 1991; Hosman, et al., 2008). More micro-level studies have demonstrated how the introduction of ICTs into an environment can contribute to improved economic and educational opportunities for the poor (Jensen, 2007; Aker, 2008; Burrell, 2008; Donner, 2009a; *The Economist*, 2009).

Table 2: How the Provision of ICTs Can Improve Livelihoods of the Rural Poor

Constraints Faced by the Rural Poor	Improved Livelihoods Goals	How ICTs Contribute to the Improvement of Livelihoods	Example
Lack of income	New income-generating activities Increased growth and	Markets made more accessible by access to information and services	Rural farmers can get information about market prices

	productivity		and can sell their products at better prices, rather than relying on a middleman to set the price
Deprived of access to basic resources and services (healthcare, food, education)	Improved and cost-effective access to basic resources and services	Information can be accessed more quickly and conveniently	AppLab Clinic Finder that helps people find the nearest health clinic
Vulnerability, powerlessness, social exclusion, lack of social capital	Empowerment, social inclusion (reduction in gender inequalities), social capital	The poor are less dependent on others in power (such as middlemen) to get information and are less isolated because they now have a means to be in closer contact for personal and professional matters	MTN Village Phone Program in Uganda enables the poor to start their own self-sufficient businesses that also enable community members to use phone services
Lack of access to relevant and timely information and content (for example: news, market prices, weather)	Access to relevant information and content, and opportunities to develop and share local content Reduction in information asymmetries	Markets are made more accessible through ICTs, including the sharing of prices and connecting buyers with sellers	Grameen AppLab in Uganda
Poor physical infrastructures	Improved infrastructures, through strategic public-private partnerships and private sector initiatives	More reliable infrastructures	MTN Village Phone reaches new rural markets
Weak access to capital and markets	Improved access to capital and markets, that, in turn, improves economic opportunities	Markets are made more accessible through ICTs Mobile banking solutions	M-banking services fill a financial void, enabling users to transfer money
Remoteness, isolation	ICTs can serve as substitution for transport Ability to be connected with members of your social network despite distance	Reduction in travel costs and transaction costs; time and space are no longer constraints; easier to maintain and strengthen social ties; more reliable and participatory access to institutions	Google Trader service (part of AppLab) enables farmers and entrepreneurs to connect with each other

ICTs have proven to be an enabling tool in the reduction of poverty and the improvement of livelihoods. However, in order for ICTs to be effectively used in this manner, it is important that a proper regulatory environment facilitates the use of these tools.

2.2 Telecommunication Policies and the Impact of Regulatory Regime Restructuring

Section 1's review of the conceptualization of poverty provides a base for understanding how telecommunications and other ICTs have the potential to aid in the development of livelihoods. ICTs can facilitate improved access to markets and information. They also provide the poor with an increased sense of empowerment and self-sufficiency that was not possible without access to communications services. Just as it is necessary to understand poverty, it is equally important to understand the historical development of telecom policies in LDCs to better inform our understanding of how the sector has been integrated into development initiatives.

Current and past telecommunications policies in Sub-Saharan African, in addition to literature regarding the impact of regulatory regime restructuring, provide insight into the abilities of users to acquire technologies and effectively use them. There is a wealth of literature addressing how markets have benefited and grown as many telecom regimes shifted from centralized, state-run monopolies to decentralized, market-oriented regimes independent of the state. The three most significant shifts in the African telecommunications industry over the past two decades have been the liberalization of the telecom sector, the privatization of public monopolies, and the creation of independent regulatory bodies. The remainder of this section will examine the first wave of telecommunication literature, and how it developed as a reaction to the modernization theory of development.

The modernization model of development is based on the notion that underdeveloped states needed to adopt Western ways in order to become developed. This model, first perpetuated after the Second World War and based on industrialization in the

West, advocates a top-down approach driven by the state. Theorists at the time attributed the underdevelopment of non-Western states to traditionalism, regime type, and lack of achievement motivation (Akpan, 2003, p. 263). Communication technologies, primarily mass media, were first introduced to developing states as part of centrally planned, state-led projects (Singh, 1999).

Modernization theorists tend to follow a top-down model of development, where economic growth is capable of being reached through a series of stages (Akpan, 2003). Resources, primarily in the form of capital and expertise from intergovernmental organizations and development banks, "flow downward to the developing countries from the developed nations' resource pool" (Calbreath, 2008, p. 9). Traditionally, an outside agent would deploy a technology in a community, the functionality of that technology would be tested, and the project's success or failure would be documented (Diga, 2007). The considerations of the local populations were often not accounted for during the design and implementation of the project.

This approach towards ICT innovation would be considered pro-poor, in that work is being done on behalf of impoverished communities, but is done so without their consultation. Heeks (2009) notes that this type of innovation is problematic in that it runs the risk of a "mismatch between the assumptions and requirements built into the design, and the on-the-ground realities of poor communities" (p. 13). Many have criticized this model as being too Western-centric and focused solely on economic growth, rather than also including non-material aspirations as factors that also contribute to human development (Bezanson & Sagasti, 1995).

While development efforts in prior decades focused on the centrality of mass

media, initiatives in the 1980s and early 1990s shifted to looking at the two-way, interactive potential of telecommunications for development processes. This shift occurred after the realization that mass media was not, in fact, the "magic multiplier" or cure-all for development needs and that the spread of such mass media systems was not resulting in the degree of economic and social growth that was previously anticipated (Singh, 1999; Sey, 2008). The literature that arose in the 1980s and 1990s addressed how the modernist approach was not feasible, and that the necessary condition for the improvement of livelihoods in LDCs entailed the provision of telecommunication services. More specifically, it was recommended that telecom regimes in LDCs shift from centralized, state-run monopolies to decentralized, market-oriented regimes independent of the state.

Singh (1999) posits that development in many LDCs depends upon the type of telecommunications restructurings that occurs, as well as the formation of groups who can cohesively act to pressure the state and drive change (p. 3). He notes, "Micro-heterogeneous and macro-plural pressures usually result in piecemeal, slow, and capricious restructuring because most states are unable to react fast or comprehensively in the face of myriad demands. On the other hand, cohesive pressures on a few states that act as 'catalysts' among groups, can result in fast, comprehensive, and demand-driven change" (Singh, 1999, p. 4). As North (1990) has described, the shift in thinking was towards more historical and institutionalist approaches that focused on who got what from the state.

The benefits of telecommunications restructurings are often dependent upon which particular user groups demand the services. Historically, elite, urban-centric user

communities, including large businesses, metropolitans, and those with export interests, have driven liberalization. Singh (1999) asks us to move the pure supply-driven model of telecommunications policy-making and re-focus on *who* are the users demanding the services. Clubs, or special interest groups, will be more successful if they have easier access to the state, can work cohesively for collective action, and work within a state that is catalytic in nature (rather than dysfunctional or predatory) (p. 12). However, the non-elite members of civil society, primarily the rural and urban poor, are often left out of the process and thus must depend upon the state to meet their needs and provide the necessary services. The case study on Ethiopia in Chapter 3 will show how civil society, in its weakened state, has not been capable of organizing and pressuring the state for the provision of telecommunication services. This has coincided with a predatory state unable to meet the demands of its citizens.

Individual governments who held monopolies over the telecommunications services have historically run the communications systems in Africa. However, beginning in the early 1990s, initiatives undertaken to privatize and liberalize the market transformed much of the African telecom landscape. This followed advancements in telecommunications services in industrialized countries in the 1980s, where the sector was restructured after the breakup of AT&T in the United States, and the introduction of competition in other states, including the United Kingdom and Japan (Saunders, et al., 1994, p. 19). As previously mentioned, interrelated recommendations to reform the telecommunications industry typically included privatizing the state-owned monopoly provider, introducing competition and foreign direct investment, and creating a regulatory agency that was independent from the government.

In the 1980s and early 1990s, much literature regarding telecom liberalization argued for both competition and privatization as effective mechanisms for providing telecom services, and also asserted that certain political economies could sustain the state-led monopolies (Singh, 2010). Yet, as Wallsten (2001) notes, by the 1980s, it was also evident that the nationalized monopoly telecom firms in many African countries could not effectively and efficiently provide telecom services (p. 3). By the mid-1990s, the focus shifted to more "practical aspects of telecommunications restructurings" and how to cultivate the right atmosphere for increasing teledensities.

While critics were aware that liberalization of the telecommunications sector, driven by powerful user communities, on its own was not enough to provide sustainable transformations and 'modernize' communities, there was hope that government ministries would take responsibility by enacting universal access programs to reach the 'last mile.' Between 1995 and 2004, the share of African countries that maintained a state-run monopoly in the mobile phone market dropped from 70 percent to less than 10 percent (Djiofack-Zebaze & Keck, 2008, p. 920).[1] At the same time, nearly every African state opened up its mobile market to competition and foreign investment. These moves greatly benefited markets and facilitated economic growth. As Wu (2008) confirms, "A competitive paradigm for communications markets [is] more economically beneficial than a monopoly model" (p. 770) and this has held true across many Africa states. Similarly, Waverman, Meschi and Fuss (2005) assert that, "Investment in telecoms generates a growth dividend because the spread of telecommunications reduces costs of

[1] There was a dramatic increase in the number of independent telecommunications regulators worldwide in the past two decades. In 1990, there were only 14 communications regulatory agencies in the world. By 2007, there were nearly 150 agencies (Wu, 2008).

interaction, expands market boundaries, and enormously expands information flows" (p. 10).

Many studies (Stone, 1991; Hosman, Fife & Armey, 2008; Dasgupta, et al., 2005) use empirical investigations to support the hypothesis that the expansion of telecommunications infrastructure and the liberalization of the communications regime have contributed to increased economic activity. Select findings include the presence of strong correlations between the development of and investment in telecommunication systems in LDCs and increases in gross domestic product (GDP) per capital (Stone, 1991; Hosman, et al., 2008), greater access to telecom services in low-income countries that have high World Bank ratings for competition policy (Dasgupta et al., 2005), and the reduction of transaction costs when telecommunications infrastructures are present (Norton, 1992). Returns from investing in telecommunications include the availability of more information in the marketplace, increased productivity, and new abilities to coordinate activity (Saunders, et al., 1994).

Roller and Waverman (2001) note that positive growth effects might be subject to having achieved a *critical mass* in a given country's communications infrastructure (p. 911). Djiofack-Zebaze and Keck (2008) found that increasing access to mobile networks by just one percent translates into a 0.5% increase in real GDP per capita (p. 919). Through fixed-effects regressions, Wallsten (2001) determined that privatization, combined with the presence of an independent regulator, is positively correlated with improved telecom performance measures.

The consumer also greatly benefits from the liberal telecom environment. Diga (2007) observed that in Uganda, citizens enjoyed greater choice in service providers and

plans, lower costs, and increased business prospects as a result on strong competition (p. 21). Similar positive gains have also been seen in other sub-Saharan African states (Mbarika & Mbarika, 2006; Donner, 2007b).

For the growth of the telecommunications industry to continue, it is essential that governments continue to support a competitive environment. This entails promoting private sector investment in the telecommunications sector, which can only occur when the regulatory and policy environment favors competition between operators (Mansell, 2001; Singh, 2010; Bhavnani, et al., 2008). While economic growth and improvements in the telecom sector do not immediately mean that new choices and opportunities are always readily available to all persons living in LDCs, restructurings are the first step towards incremental changes. However, strategic regulation can result in more affordable access, market innovation, and competitive pricing (Gillwald, 2005).

2.3 The Significance of Participatory Processes for Development

As the late twentieth and early twenty-first centuries have seen the advancement and proliferation of digital technologies, new approaches to development that are more closely connected to local needs have arisen. In LDCs, where markets are weaker, building the capacity of institutions and individuals is a much needed, but often overlooked, first step, that should precede the introduction of new technologies (Singh, 1999). This falls in line with a bottom-up, participatory development strategy that seeks to first listen to and examine the needs of the local community, then find and deploy technologies that fit those needs (Diga, 2007).

This new approach emerged in response to the shortcomings identified in the top-down, externally driven model (Puri & Sahay, 2007, p. 135). Cooke and Kothari argue

that many organizations and donor agencies began adopting this model after witnessing "the ineffectiveness of externally imposed and export-oriented forms of research and planning" that took place in the 1970s and 1980s (as cited in Byrne & Sahay, 2007, p. 73). Many projects of the mid-1990s to early 2000s were deemed failures. The primary reason for many of these failures has been attributed to the fact that projects were often driven by the technology itself, rather than being centered on the end users' needs. Such outside, top-down approaches have resulted in wasted resources and an inability to move beyond the start-up phase (Cecchini & Scott, 2003, p. 81). Oftentimes, these projects aimed to rapidly close the 'digital divide,'[2] without thinking further ahead as to how to make the project sustainable in the long term.

Frequently, the application of ICTs to development initiatives has been designed without fully considering the social and environmental realities of the LDCs (Anyimado in Ahmed, 2007, p. 343). In such events, the recipients of the technology are less likely to have fully bought into using the technology and feel that they share no responsibility in maintaining the project for the long-term. It is obviously challenging for projects to move beyond the pilot phase if they are not integrated into the institutional and political structures of local communities or if there is no clear idea regarding how exactly a technology will bring about a desired change (Sahay & Walsham as cited in Sahay & Puri, 1997, p. 142; Donner & Toyama, 2009, p. 6). If the goals of an intervention are not clearly defined, it becomes difficult to assess meaningful impacts. This is to the disadvantage of project designers, as "communities are usually considered to have important informational advantages. They know better the prevailing local conditions

[2] "Digital divide" is the term most commonly associated with those who have access to information and communication technologies and those who do not have access.

(such as who is poor and deserves to be helped, or the characteristics of the local micro-environment), and they are better able to monitor the activities related to interventions and to mitigate incentive problems" (Abraham & Platteau, 2002, p. 2).

The deployment of rural telecenters in developing countries is often cited as a specific example of how a project's design does not match up with the specific needs of a local community. A telecenter is a local community center equipped with personal computers where community members can go to access the Internet. The idea was driven by Western efforts to deploy new technologies to less developed countries. In many cases, however, it was done without the consultation of the local community. Qualitative studies have found that telecenters have been "short on footfall, and even lighter on real impact" (Donner & Toyama, 2009, p. 5). Moreover, telecenters were often found to be unsuccessful on many occasions because they were not built on sustainable or scalable models (Heeks, 2009). It proved to be hard to maintain telecenters, to find appropriate staff, and to develop the skills that locals needed to use PCs, especially if they were illiterate.

Emerging philosophy regarding ICT4D is driven by the desire to match technology appropriately with locals' needs. A shift has been made from a supply-driven model to a demand-driven model. Supply-driven models are often directed from the top-down, while demand-driven models work from the bottom-up to inform the project's design and implementation. Table 3, below, provides a framework for comparing these two processes. In order to determine what type of technology would best meet local beneficiaries' needs, it is vital to first get their feedback. The participatory model also posits that the building of human capital and people's capabilities is crucial to the

development process (Mansell & When, 1998, p. 9). As Bezanson and Sagasti (1995) argue, "The capacity to acquire and generate knowledge in all its forms, including the recovery and upgrading of traditional knowledge, is perhaps the most important factor in the improvement of the human condition" (p. 6). Beneficiaries are actively involved in the design and construction of the initiative and are empowered to make decisions. Development actions are characterized as enabling, focused, and inclusive of the poor (Heeks, 2009).

Table 3: A Framework for Comparing Supply-Driven and Demand-Driven ICT4D Processes

Supply-Driven ICT4D Processes "Top-down"	**Demand-Driven ICT4D Processes "Bottom-up"**
Led by the technology itself	Led by the needs of the local populations
Technology deployed may or may not be appropriate to the situation	Technological solutions are appropriate to the situation
Often insufficient and unsustainable	More like to be sufficient and sustainable
Technology-centered	People-centered
Based on modernization model	Based on empowerment model
Top-down, Western approach	Bottom-up, human development approach
Often views the poor as ignorant	Often views the poor as empowered participants and privileges indigenous knowledge, locally-generated content
Assumption of end beneficiaries' needs and the types of information they desire	Sensitivity to local needs, efforts made to build local capacities to ensure project sustainability
One way flow or transfer of information from expert to poor	Sharing of information, a two-way collaboration that supports both the consumption and production of information

The use of ICTs for development is most effective when well integrated into a

country's overall development strategy and not approached in a piecemeal manner (Steinberg, 2003; Mansell & When, 1998). As Byrne and Sahay (2007) note, the primary aim of participatory processes in development programs is to increase the involvement of the marginalized in order to improve the sustainability and relevance of programs. Identifying demand and intended users, building capacity at the local level, and encouraging collaboration are necessary elements for successful project implementation.

Participatory development processes are those that privilege the involvement of local populations in the creation, implementation, and management of a program created to improve their livelihoods. As Jennings (2000) notes, "Participation requires recognition and use of local capacities and avoids the imposition of priorities from the outside. It increases the odds that a program will be on target and its results will more likely be sustainable. Ultimately, participatory development is driven by a belief in the importance of entrusting citizens with the responsibility to shape their own future" (p. 1). Similarly, Green (2000) argues that the participation of the poor "facilitates transformations in consciousness which can empower [them] to embark on locally managed change" (p. 69).

It is logical to assume that initiatives based on expressed and understood needs will be more successful than projects that make assumptions about end users' wants and do not adapt a technology to local conditions. To focus on the long-term sustainability of projects, Hosman, et al., (2008) note that it is essential for local stakeholders to be included "throughout the duration of the project to create a culture of use for the technology" (p. 312). If the use of the technology becomes acceptable and pervasive, it is more likely to be sustainable, especially once external partners leave the program site.

Singh (1999) acknowledges that special interest groups will be more successful if they can work cohesively for collective action and have easier access to the state (p. 12). Similarly, Steinberg (2003) argues that the benefits of telecommunications can best be understood by examining the constituent groups who are demanding access to the service. The second case to be presented in this thesis on Ethiopia will demonstrate how the absence of strong civil society organizations to pressure the state for telecommunications services can result in a stagnate economy and a population that does not get to reap the benefits of improved ICT services.

The increased attention paid to participatory processes arose out of a need to resist the historic tendency to view the development process as the simple transfer of knowledge from the West to the South. As Wilson (2003) argues, "The result [of top-down initiatives] is that the wealth of local understandings, knowledges, and experience that could potentially aid development efforts are often devalued and their potential contribution to change processes thus wasted" (p. 3). Participatory processes champion the abilities of people to make decisions at the local level. Rather than affirming preconceived ideas brought in from the outside, the local participants are encouraged to identify and address their own needs (Jennings, 2000).

Engaging local populations is not always easy. It has been commonly found that the poor rely on trusted informal networks made up of friends, family, and local leaders for their informational needs. By contrast, outside institutions and other formal sources are less trusted and used (Pigato, 2001, p. i). Integrating ICTs into a participatory development strategy can provide the poor with new ways to share their own opinions and needs as they can more conveniently talk or connect with one another. The

advantage to privileging locally contextualized knowledge over the representational knowledge of professionals is that locals will likely feel more engaged in the process and not feel that their position is devalued (Thompson, 2004, p. 104). As Wilson (2003) notes, oftentimes, development initiatives fail to use and seize upon the knowledge that the poor already possess (p. 7).

To build local capacities necessitates both internal and external resources and the partnership of policymakers, organizations, and businesses working to work *with* local communities rather than *for* them. Puri and Sahay (2007) describe five elements critical to determining the capability of local constituents to effectively participate in a process. They are 1) acceptance and responsibility to participate; 2) the authority to carry out the consequences of an action; 3) the access to resources; 4) ability to effectively communicate; and 5) knowledge about a problem domain (p. 139).

Enhancing the skills base of the local population is another element crucial to the success of the participatory process. Byrne and Sahay (2006) note that with participatory development processes, "Capacity to participate is usually assumed, but there is often the need to develop this capacity. An initial position that can be taken entails opening up spaces for dialogue and the establishment of communication loops among the different levels" (p. 89). Mansell and When (1998) identify essential skills that must be developed in an effort to improve the likelihood of project success and sustainability. These skills include participatory skills (literacy, fluency of language), skills in the design, implementation and maintenance of networks, and management skills to ensure appropriate access to ICTs (p. 111). Building these skills will help bolster local ownership of initiatives, hopefully resulting in the resilience of projects (Cecchini &

Scott, 2003, p. 81).

Additionally, the participatory process is not absent of its own setbacks. Critics of this approach acknowledge that some female participants have felt alienated by the process (Lenny as cited in Sanderson & Kindon, 2004; Diga, 2007). This perception of differentiation by gender may be attributed to pre-existing power structures within local communities. Others have noted that while the participation of local community members is beneficial, it can be biased to the elite leadership of villages, rather than average members. Both of these critiques reveal the challenges inherent in bringing different stakeholders together into one process. Thus, any outside agent involved in the process must be skilled in negotiating cultural differences.

2.4 The Hybrid Approach

Literature regarding institutional decision-making, telecom liberalization, and participatory approaches to integrating ICTs into development efforts have shown is that neither a bottom-up or top-down approach can stand on its own. Thus, a hybrid approach combining both top-down and bottom-up practices is more capable of achieving the objectives of both institutions and local community members.

While much literature espouses the benefits of participatory processes, oftentimes a paradox that lies at the center of the participation rhetoric is overlooked: that the poor's capacity to improve their livelihoods cannot be done completely on their own terms and actually necessitates the involvement of outside agents (Green, 2000). While a grassroots initiative from the bottom up is ideal to many, it is rarely possible without the resources, tools, and support provided by governments, institutions, and aid organizations. The key is for outside agents to delegate responsibilities and build the capacities and

organizational skills of the local actors to the extent that initiatives can be sustained beyond the pilot phase (Abraham & Platteau, 2002, p. 2).

Thus, efforts to successfully use ICTs for development requires a multidisciplinary approach that not only acknowledges the influence of the poor in determining their own path and defining their own needs, but also creates space for institutions to build the capacities of the poor while also giving them the room to make their own decisions. This does not discount the role of effective regulatory bodies, as they are vital stakeholders in the process as well.

International institutions and aid organizations have attempted to embrace the role of participatory processes in their own ICT4D initiatives. The World Bank, and in particular its Global Information and Communication Technologies department, is engaged in many localized projects to development ICT infrastructures and usage in LDCs. Reviews of participatory development programs run by The World Bank, USAID, and the Canadian International Development Agency have concluded that such programs are often more cost effective in the long run, as well as more relevant and effective at successfully addressing the needs of local populations (Jennings, 2000, p. 3).

The greatest challenge most ICT4D initiatives have encountered is the inability to sustain projects beyond the pilot phase. As Sahay and Avgerou (2002) note, it is "hard to achieve the developmental benefits, due to the difficulty faced by many organizations in nurturing and cultivating complex projects over the long periods of time typically required" (p. 73). The challenge presented in the 21st century for development partners is to recognize that ICTs do not drive change, but how they are designed, implemented, and used can increase the potential for positive effects.

Essential to this challenge is the embracing the notion of 'appropriate technology,' defined as "anything that is suited to the environment in which it is used" (Banks, 2008, p. 1). The concept grew out of the argument that many Western attempts at deploying technology were unsuccessful because they failed to perceive what was actually needed and desired by local communities. Many critics have felt that technological change has been historically biased towards the rich (Cecchini & Scott, 2003, p. 77). Thus, the deployment any ICT must not only be technologically appropriate, but also culturally appropriate. Past evidence of failed initiatives has proven that one size does *not* fit all.

While the introduction of a new technology into a community will pose a disruption to the status quo, the aim must be to do so in a manner that will facilitate the appropriate deployment (Hosman, et al., 2008, p. 310). Having the proper mindset about the purpose of ICTs means making certain that the conditions are right for transformation. In addressing the social, economic, technological, and cultural challenges, it is essential for ICTs to be relevant and empowering to the particular community. A multitude of factors must be taken into consideration to develop realistic objectives about how a technology can be used by local constituents. These factors include the education level, age, and gender of end users, as well as preexisting cultural influences, and the perceived reliability, usefulness, and ease of use of a technology (Musa, et al., 2005, p. 123).

Institutional support, primarily in the form of regulatory frameworks that are conducive to increasing the access and availability of appropriate technologies to rural communities and groups, is an essential condition. However, past literature has noted

that many government universal access policies and mandates have not evolved at the same rate with the latest technological and market trends (Muente-Kunigami & Navas-Sabater, 2010). Thus, for ambitious programs to affect change, it is a necessary condition for regulators to be accountable, independent, and responsive to their citizens.

In the past, it has been inefficient to deploy technology that does not match users' capabilities. ICT4D projects oriented towards the users, rather than driven by the technology itself, are more likely to be successful, as the potential for ICTs to transform communities will be more closely connected to society members' skills and experiences. Equally important is the need for government understanding and intervention; this includes the government promoting an effective regulatory environment that is supported by relevant and responsive policies. As Mansell (2001) notes, the practices need to be embedded within the framework of appropriate institutions and development goals (p. 282).

As the case studies will demonstrate, states with supportive regulatory bodies that implement responsive and well-thought out policy instruments will be more capable of increasing access of telecommunications services to the rural poor than states where there is an absence of an effective institution that promotes best practices.

CHAPTER 3

THE GROWTH OF MOBILE TELEPHONY IN AFRICA AND CASE STUDY 1

3.1 Introduction

This chapter begins with a discussion of the growth of mobile telephony in sub-Saharan Africa, the factors that have facilitated this growth, and the impact it has had on society in general. It helps to provide context to the question, "Why mobile phones for development?" Then, the four cases studies will be briefly introduced, and the first case of initiatives in Uganda will be described in depth. These cases demonstrate how different degrees of institutional support and civic engagement influence the likelihood that a development project will be successful. Success is measured by the project's sustainability and scalability. It is the hope that the case studies presented in this thesis will contribute to the scholarly understanding of the contexts and conditions under which ICTs can be powerful contributors to the alleviation of poverty amongst the poor in LDCs.

Each case begins by providing a brief background of the country and its telecommunications environment. A historical overview of how national regulatory policymaking evolved, and the design and execution of relevant policies, mandates, and programs will be addressed. This also includes reviewing the state's responsiveness to and inclusiveness of locals in the human development process, as this thesis argues that the strength of civic participation will increase the effectiveness of development initiatives. Then, a program that has been implemented in each country will be examined to demonstrate the effectiveness (or ineffectiveness) of the approach taken, using sustainability and scalability as factors to determine how successful the outcomes are. It

must be noted that for each case, evidence of stakeholder participation is scattered and limited, and it is often reduced to research that was undertaken at the village level. Thus, such evidence cannot be taken as completely representative of the country or region on a larger scale. The first case, a study of the programs developed by the Grameen Foundation and its partners in Uganda, will be explored in Chapter 2. The three remaining cases will be presented in Chapter 3.

3.2 The Growth of Mobile Telephony in sub-Saharan Africa

"Realistically, for the foreseeable future, telephony is the ICT that will have the greatest penetration and impact when it comes to poor people" – Torero & von Braun, 2006

The success of many ICT4D projects is contingent upon deploying the technology that is most suitable for meeting the needs of local beneficiaries. Without such appropriate technologies, projects will likely be unsustainable and unable to be replicated on a larger scale beyond the pilot phase. With the growth of mobile telephony in SSA, mobile phones have quickly become the "go-to" device for development projects. This is due in part to the fact that the infrastructure for telecommunications service is often better than that for Internet services. Also, with the penetration for sub-Saharan Africa in general reaching 32 subscribers per 100 people, many local beneficiaries already own or have access to mobile devices; thus, it isn't necessary to introduce a new technology into society. In recent years, there has been a surge in the development of applications and services, both SMS- and web-based, for mobile phones. Subsequently, developers and practitioners are eager to test prototypes.

As I described in Chapter 1, the reformation of the telecommunication sector in most African nations over the past two decades has facilitated a tremendous demand for mobile phones. As mobile phones are becoming more accessible to those at the bottom of the pyramid, the phones will not miraculously lead to improvements in livelihoods unless the capacities of end users are built up so that they can effectively use these phones. For example, many M4D projects use SMS-based services, such as a simple query system where an end user can text a question about a health or agricultural problem and then receive a text response. To effectively use such services, the end users will likely need to be instructed why, how, and when to use the service. This may not come naturally or intuitively to them. The building of skills necessitates not only effective institutional involvement, but also the forethought of project partners to listen to the needs of end beneficiaries and learn what factors influence the user experience.

The case study of Uganda that comes later in this chapter will demonstrate how ICTs, and mobile phones in particular, have enabled improvements in livelihoods. First, however, it is necessary to understand the transformation that has taken place in Africa, and how this change has contributed to increased excitement both within and outside the continent for new initiatives to harness the potential of mobile phones for the amelioration of poverty.

As noted in Chapter 1, efforts to liberalize the telecommunication sector in many African states led to the creation of independent regulatory bodies. The opening of markets to multiple operators and the subsequent increase in competition has facilitated the tremendous growth in mobile telephony. In 2003, the ITU announced that mobile had overtaken fixed line service to become the basic telephony platform for the majority of

Africans. A higher coverage rate and attractive business models have made mobile the preferred communication service. Demand has been strengthened by pre-paid options that provide many people in low-income sectors with the ability to afford a mobile telephone, as they are able to pay for service up front, rather than waiting for a bill at the end of the billing cycle and facing the prospect of not being able to pay for service.

The adoption of mobile telephony has often been made possible by states employing a strategy of leapfrogging wired telephone lines. Leapfrogging is best understood as the process of progressing from a situation of limited or no technologies to the widespread adoption of more advanced or sophisticated technologies without having to go through the various stages of adoption, adaptation, and learning of intermediate technologies experienced by most industrialized countries (Pigato, 2001, p. 6). The process of technological leapfrogging enables those in developing countries to bypass "older, less appropriate, and less affordable forms of ICTs" (Sinha, 2005, p. 5). This strategy was primarily used due to the inability of many countries to build the infrastructure necessary for fixed lines. Telecommunications regulators in many states, including Uganda and Kenya, were able to induce the proliferation of mobile devices by undertaking this leapfrogging strategy. Sectors opened up to private investment and competition, which led to the building out of wireless infrastructure and increased rates of coverage and penetration. In a 2008 report, the GSM Association noted that mobile telephony has emerged as "the dominant and preferred route to universal access," as the barriers to entry are lower than those of fixed line service. Mobile, rather than fixed line service, has proven to be more capable of bringing communications services to all (GSM Association, 2008).

Across the African continent, many gains have been made in the past few decades that have resulted in increases in mobile penetration rates. A mobile penetration rate is best understood as the number of mobile cellular subscriptions per 100 inhabitants of a country (ITU, 2009). In 2003, mobile penetration in Africa was a mere five percent; by the end of 2008, penetration had reached over thirty percent (ITU, 2009). A 2009 report by Ovum Research notes that there are over 448.1 million mobile phone subscribers on the continent, a twenty percent increase from 2008 (Ovum, 2009). In order for the economic and social benefits of mobile to continue to be fully realized, Denton (2008) argues that it is "critical that governments provide an environment that supports investment [in the mobile industry]" (p. 3). Independent regulatory regimes facilitate industry growth by preventing inappropriate government tax policies and the build-up of monopolies, as well as by encouraging foreign investment. As the ITU (2009) confirms, "A key factor for increasing mobile penetration rates is the *degree of* competition adopted by countries. Most countries where mobile performance is poor relative to per capita income have limited competition" (p. 15). Competition results in the reduction of tariffs and increased network expansion. Tim Unwin (2009) confirms that an independent regulator plays a significant role in "ensuring a well-functioning competitive market that will maximize benefits from private-sector participation in a liberalized marketplace" (p. 164).

While it is established that the number of mobile phones and subscribers of cellular services in Africa is only growing, what benefits does the average African see? Previous literature provides both empirical evidence and anecdotal proof to substantiate claims that mobile phones are appropriate mechanisms for poverty alleviation. First,

mobile phones can help meet the demand for local information, while also reducing existing information asymmetries. This includes information regarding employment opportunities, job training, agricultural practices, markets, and crop prices (Pigato, 2001; Kenny, 2002; Bhavnani, et al., 2008). Jensen's 2007 study of fisherman in the Kerala state of India demonstrated how the fishermen effectively used mobile phones to discuss prices with potential buyers and coordinate sales. The access to and use of mobile phones directly contributed to increased product sales and a reduction in waste. Aker (2008) found that mobile phones have contributed to a reduction in grain price dispersion across markets in Niger. Using panel data of over 800 Ugandan households, Muto and Yamano (2009) found that the expansion of mobile phone coverage "seemed to induce the market participation of farmers in remote areas who produce perishable crops" since "the new flow of information made available by mobile phones can help traders to transport and market perishable products quickly to avoid spoilage" (p. 1887).

Mobile phones are also used as a substitution for transportation. For example, a rural retail trader in Uganda used to spend US$80 a month on transport for traveling into Kampala to purchase goods for his shop. Now, with his mobile phone, he can call his wholesaler in the city to arrange delivery of the goods he wishes to purchase (Butagira, 2009). Studies have also shown that the presence of mobile phones can enhance entrepreneurship and contribute to improvements in the livelihoods of women in Africa. There are many examples of how the purchase and use of mobile phones have enabled women to find new ways to generate income. As I will detail below, through the MTN Village Phone program in Uganda, women can purchase mobiles through micro-loans, sell phone service to local villagers, and make a small profit on each call.

Despite these gains, challenges persist, including low quality of service, high taxation, and issues regarding the regulation of interconnection rates. Many studies have argued that the benefits accrued from ICTs have been inequitably distributed in many African nations (Ahmed, 2007). Additionally, there "is a great variety between countries in mobile phone penetration and use" (Coyle as cited in Vodafone Policy paper Series No. 2, 2005, p. 5). For example, there are dramatic differences in the penetration rates for southeastern African nations that border one another. In 2008, per 100 inhabitants, there were 20 subscribers in Mozambique, 9 subscribers in Zimbabwe, 8 subscribers in Malawi, 29 subscribers in Zambia, and 25 subscribers in Tanzania (ITU, 2009).

These issues reinforce the significant role that African governments play in promoting an environment more conducive to the uptake of mobile phones. Oftentimes, mobile phone taxes have been high enough that the handsets themselves are prohibitively expensive to buy and use (Butagira, 2009). Additional barriers to the usage of mobile phones in particular, and ICTs in general, include high handset cost, lack of infrastructure, and technical constraints (Donner, Verclas, & Toyama, 2008). The absence or lack of human capabilities can also hamper the effective use of mobiles. These capabilities include possessing the language and literacy skills to effectively use technological devices (Pigato, 2001). Oftentimes, the intervention of institutional partners, such as NGOs or corporations, is needed to build the capacities of the end beneficiaries.

The fact that it is difficult to find concrete statistics on usage poses an additional challenge to understanding the uptake of mobile phones in sub-Saharan Africa. As Donner and Toyama (2009) point out, when quantifying the digital divide, the number of

users of a technology is counted, rather than what users actually do with or gain from the technology, thus privileging the use of the technology itself, rather than how useful its application is to users (p. 4). It has been challenging to assess the actual impact of mobile phones on livelihoods, and thereby learn what is or is not working, because there is a lack of data to draw concise conclusions from (Donner & Toyama, 2009; Hosman, et al., 2008; James & Versteeg, 2007). This knowledge gap has resulted in more failures because prior lessons have not been learned and shared amongst scholars and practitioners. The case studies presented in this thesis help to fill a gap in existing research by defining factors that contribute to or detract from the success of using mobile phones in development initiatives.

3.3 Introduction to the Case Studies

While the preceding section addressed the tremendous growth of mobile telephony across sub-Saharan Africa, the four case studies that follow will provide detailed analysis of ICT4D initiatives and related programs on the ground. As I posit in Chapter 1, this thesis hypothesizes that ICT4D initiatives using a hybrid approach to the development process – one that works to build sound partnerships at the institutional level, while also being inclusive of and sensitive to local stakeholders – will be more successful, in terms of sustainability and scalability, than those conducted from the top-down with minimal local participation, or from the bottom-up wihout much institutional support.

The following cases were chosen to illustrate how this hybrid approach is ultimately more successful in improving the livelihoods of the rural poor than approaches that are either primarily driven by the top-down or bottom-up. Countries from the eastern

and southern regions of Africa were selected as case studies for a number of reasons. First, as previously mentioned, the mobile telephony sector has been booming in sub-Saharan Africa. At the same time, there have been a limited number of studies examining the impact of increased mobile penetration and access on the livelihoods of the poor. Secondly, if transformations in livelihoods through the use of ICTs can occur in Africa, home to the poorest countries on the planet, then it is possible that these types of changes can happen anywhere.

Table 1: Case Study Matrix

		Institutional decision-making	
		Strong	Weak
Participatory Processes	Strong	**Uganda: MTN Village Phone Program, Grameen Foundation AppLab, Community Knowledge Workers Initiative**	**Various sub-Saharan African states: Small-scale innovations from end users**
	Weak	**South Africa: On Cue Compliance System**	**Ethiopia: State-owned telecom sector**

Table 1, above, provides a matrix for understanding the selection of cases for this thesis. Cases were chosen on the basis of the government's hand in policymaking, the strength of partnerships, and the use of participatory processes in development. In this chapter, the Grameen Foundation's programs in Uganda will be examined to demonstrate the successes that can be achieved with a strong degree of top-down, institutional decision-making, a supportive and enabling regulatory environment, and the presence of participatory processes that are inclusive of local beneficiaries. The remaining cases will

be addressed in Chapter 3.

This thesis utilizes two independent variables – variations in the degree of civil society participation and variations in the degree of institutional decision-making – to look at the likelihood that an ICT4D initiative will be sustainable and scalable. A weak approach to stakeholder participation could be described as minimal or superficial efforts made to include local populations in the design, implementation, and maintenance of a project. The end users typically have little choice regarding the type of intervention occurring and initiatives may privilege the elite or those in power and control. On the other end of the spectrum, a strong approach to stakeholder participation includes the active engagement of local beneficiaries in designing initiatives that meet their expressed needs. Partner may also engage in building end users' skills so they may appropriately and effectively use technologies and services/products. To encourage participation, needs assessments, ethnographic research, group discussions, interviews, and community meetings may be held (Byrne & Sahay, 2006). Also rapid prototyping of devices and applications may be employed to get feedback from the end users regarding what they thought about the prototypes. This was done during the development of the Grameen Foundation's AppLab. Building the trust of those who have historically been marginalized and voiceless in the development process can help strengthen efforts at effectively designing and implementing projects.

A weak approach to institutional involvement and decision-making is often found in states with closed markets and industries. When there is minimal involvement from the private sector and/or civil society organizations in development, the state may be less responsive to end users' needs, as there is less pressure to address demands. In such

cases, inappropriate policymaking often does not directly address local needs. On the other hand, a stronger approach includes policymaking that is appropriate and responsive to local needs or demands. This includes providing the opportunity for civil society to have their voices heard, and supporting "the growth and sustainability of local institutions and groups to analyze, adapt, and advocate for locally-appropriate policy and regulatory measures" (McNamara, 2008, p. 7). Institutions may also promote an enabling environment that is open and competitive, and welcome the role that the private sector and foreign partners can play in stimulating development.

3.4 Case 1: Grameen Foundation and MTN Village Phone, AppLab, and Community Knowledge Workers in Uganda

"The quickest way to get out of poverty right now is to have one mobile phone." – Muhammad Yunus, Founder of the Grameen Bank

This first case examining the work of the Grameen Foundation and other partners in Uganda sets out to validate my hypothesis – that ICT4D projects utilizing a collaborative, hybrid approach combining the effective involvement of institutions with the inclusive participation of local beneficiaries will be more sustainable and scalable than projects that rely solely on a top-down or bottom-up approach. This case details the design and implementation of a suite of inter-related mobile-for-development programs in Uganda led by the Grameen Foundation, a U.S.-based non-profit organization established out of the work of the Grameen Bank, one of the world's leading microfinance institutions, and its founder, Muhammad Yunus.[3]

[3] In 1976, Muhammad Yunus founded the Grameen Bank in Bangladesh on the premise that financial services should be extended to the poorest members of society. The bank makes small loans to the rural poor, primarily women, without requiring collateral. As of

I will also demonstrate how the Ugandan government has provided an environment that has enabled this program to exist and flourish, how a strong multi-stakeholder partnership has worked together to devise a novel suite of programs that is able to function well, and how local community members and their needs have been integrated into project conceptualization and implementation.

First, the political and social factors that have shaped Uganda and its telecommunications environment will be described. This background knowledge helps set the stage for understanding why programs like those of the Grameen Foundation and their partners are needed and what specific needs have been met. Then, each program – the MTN Village Phone program, the AppLab, and the Community Knowledge Workers initiative – will be detailed in depth.

3.5 Country in Context

This section provides contextual information to provide an understanding for the environment into which the Grameen Foundation's projects were implemented. It is important to recognize that the majority of Ugandans live in rural areas and is dependent upon income generated from agricultural activities to survive. Additionally, they confront a number of challenges – including high incidences of disease and poverty – that hinder their development. At the same time, the increased levels of mobile penetration make it a suitable environment for M4D initiatives to occur.

Uganda is a land-locked nation in the Great Lakes region of sub-Saharan Africa, bordered by Sudan, Kenya, Tanzania, Rwanda, and the Democratic Republic of Congo. It covers over 241,050 square kilometers and recent estimates put its population at over

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2007, there were more than 260,000 Village Phone operators in Bangladesh, operating in 50,000 villages.

32 million people. Over 85 percent of Ugandans live in rural areas, and an estimated 38 percent of the total population lives below the poverty line. The primary factors contributing to these high levels of poverty include high incidences of disease, especially HIV/AIDS, limited access to land and other assets, high fertility rates, and lack of control over productive resources by women (Second Uganda Participatory Poverty Assessment Program).

Uganda gained its independence from Great Britain in 1962 and, soon after, traditional kingdoms were abolished for a republican state. Following a 1971 military coup, the nation suffered from tremendous economic decline and gross human rights violations under the dictatorship of Idi Amin. After nationalist forces toppled Amin in 1979, years of civil war and tribal rivalry ensued. The leader of the National Resistance Army, Yoweri Museveni, seized power in 1986. In 1996, he was formally voted into office during Uganda's first presidential election, and is still the incumbent leader, having been elected to his third term in 2006. Despite the prior decades of tumult, Uganda's political environment has been relatively stable in recent years.

The basic indicators in Table 4 provide a 'snapshot' of Uganda; select statistics from the sub-Saharan region in general have been provided for comparison.

Table 4: Basic Indicators (Uganda)

Indicator	Uganda	Sub-Saharan Africa
Population	32 million	817.96 million
Human Development Index	0.514 (157 out of 182 countries)	
Human Poverty Index	28.8% (91 out of 135 countries)	
Median age	15 years	

Life expectancy	52.72 years	52 years
Total fertility rate	6.77 children born/woman	5.1 children born/woman
HIV/AIDS adult prevalence rate	5.4%	5.0%
Number of people living with HIV/AIDS	940,000	
Literacy (percentage of people over 15 years that can read and write)	66.8% Female: 65.6% Male: 81.8%	
School life expectancy (primary to tertiary education	10 years	
GDP (purchasing power parity)	$42.18 billion (2009 est.)	$987.12 billion
GDP per capita	$1,300 (2009 est.)	$1,082
Labor force by occupation	82% agricultural, 5% industry, 13% services (1999 est.)	
Population below poverty line	31% (2006 est.)	
Television broadcast stations	8	
Internet hosts	6,757 (2009)	
Internet users	2.5 million (2008)	
Telephones – main lines	168,500 (2008)	
Telephones – mobile cellular	11.89 million (2009)	
Fixed telephone lines per 100 inhabitants	0.53	
Mobile cellular subscriptions per 100 inhabitants	35	32
Internet users per 100	6.48	4.5

inhabitants		

Sources: ITU; The World Bank; CIA World Factbook

These basic indicators reveal the crippling effect that diseases such as HIV/AIDS have had on the Ugandan population. While many of these indicators are indicative of an impoverished state – such as a low life expectancy and high rates of fertility – the nation, for the most part, has seen growth and improvements in the past decade. Still, many of these indicators are lower than the general average in sub-Saharan Africa. With regards to ICT indicators, it is clear that most Ugandans do not have access to the Internet. It is also evident that mobile phones hold a unique position – there are twenty-five times more mobile subscriptions than fixed lines subscriptions in Uganda. Additionally, it should be noted that while evidence indicates that there are 13.58 mobile subscribers per 100 inhabitants, this does not tell us about Ugandans who share phones or have access to mobile phone services even though they do not own a handset device.

As will be described in greater detail below, the AppLab launched by the Grameen Foundation aims to provide information and services related to health and farming. By providing information related to maternal health, disease prevention, and farming tips and techniques, the program's partners are aiming to directly tackle many of the challenges that have hindered the development of Ugandans.

3.6 An Overview of the Telecommunications Sector

The overview of the telecommunications industry in Uganda that follows will describe strategies undertaken by the government to liberalize the telecommunications industry, to better reach Ugandans living in rural areas, and to support ICT4D programs. This will help to provide a better understanding of the enabling environment that is supportive of ICT4D initiatives.

Telecommunications and postal services in the East African region (Kenya, Uganda, and Tanzania) were historically run by the East African Post and Telecommunications Corporation (EAP&TC) until the community was broken up in the 1970s. The split led to the creation of the Uganda Posts and Telecommunications Corporation (UPTC), the de factor monopoly provider of telecommunications and postal services for the country. In 1994, UPTC was divided into separate telecommunication and postal services. The Uganda Communications Act of 1997 aimed to modernize communications systems in Uganda, encourage private sector participation and competition, reduce the government's direct role in the sector, and enhance coverage across the country. The Act also created a new regulator, the Uganda Communications Commission (UCC). The UCC is independently funded from licensing and spectrum fees. It has seven members, three of which are nominated by various professional groups. The Minister appoints the director and remaining members. The UCC issues licenses, regulates tariffs and interconnection agreements, promotes competition, and monitors overall service.

The UCC has maintained a reputation of impartiality and fairness since its inception. However, the UCC is not fully independent from the Ministry. The Minister officially approves any major licenses on the recommendation of the UCC and must approve the UCC's budget. The Minister is also allowed to provide the UCC with guidelines on sector policy. To date, however, the government had not interfered with the regulatory process unless specifically invited by the UCC. The UCC also has not had to rely on the government for any financial backing for its operations.

Uganda adopted a technologically neutral licensing framework. In addition, the

UCC distinguishes between licenses for service and for infrastructure. In shifting to unified licensing frameworks, the regulators are clearly looking ahead to a market that will be driven by technological convergence. Uganda has fully opened up its telecommunications sector to competition and presently there are five licensed mobile operators. As of late 2009, there was a mobile penetration rate of 35% in the country and operators shared a subscriber base of 11.89 million (ITU). Coverage of rural areas with a mobile signal is estimated to be over 90 percent. Table 5, below, provides details on the five operators.

Table 5: Mobile Operators in Uganda

	MTN	**Uganda Telecom**	**Zain**	**Warid**	**Orange Telecom**	**i-Telecom**	**Smile**
Year of license	1998	2001	1994	2006	2007	2007	2008
Year of launch	1998	2001	1995	2008	2009	2009	2009
Network	GSM	GSM	GSM	GSM	GSM	CDMA	VoIP
Ownership	MTN International	Ucom (69%), Government of Uganda (31%)	Bharti Airtel	Essar Group	France Telecom (53%), Hits (47%)		
Mobile banking service	Mobile Money	M-Sente	Zap				
Average Prepaid Tariffs	Ush320 (in and cross network)	Ush260 (in network) Ush360 (cross network)	Ush300 (in network) Ush340 (cross-network)	Ush299 (in network) Ush299 (cross-network)	Ush8 (in network) Ush310 (cross-network)	Ush150-250	
Number of Subscriptions	4.4 million	1.8 million	2.4 million	1.7 million	+1 million		
Investment	US$170 mil	US$10 mil to expand NGN	Not released	Not released	US$200 million over the next 3 years	US$100 over the next two years	US$130 million over the next three years

Sources: UCC; MTN Uganda; Uganda Telecom; Zain; Warid; Orange Telecom; i-Telecom; Smile

Table 6: Number of Mobile Subscribers in Uganda

Date	Number Mobile Subscribers	Mobile lines per 100 inhabitants, Penetration %	CAGR
1996	4,000	0.25	
1999	87,000	0.68	179.14%
2002	505,627	1.90	79.79%
2003	777,563	2.50	52.78%
2004	1,165,035	5.00	49.83%
2005	1,525,125	5.30	30.91%
2006	2,697,616	7.70	76.88%
2007	4,195,000	13.20	55.51%
2008	8,553,840	21.20	103.91%
2009	11,890,000	39.00	39.00%
2015		70.00 (estimated)	

Sources: Uganda Communications Commission; ITU

Table 6 shows the dramatic growth of mobile subscribers in Uganda since the telecommunications sector was first liberalized. There are now nearly 3,000 times more subscribers than there were in 1996. As Table 5 shows, MTN is the dominant mobile provider, but the other six operators are competitive in pricing and have amassed growing subscriber bases as well. The real jump in uptake occurred between 2007 and 2008, with the launch of Warid as the fourth operator. There has been steady growth between 20008 and 2008 as well, with the introduction of three additional operators.

The data provided in these tables indicate that through the UCC's proactive policymaking and an environment that has been open to competition and responsive to consumer demands, the provision of mobile telecommunications in Uganda as dramatically increased over the past few years. Since more Ugandans own or have access to mobile phones, it is easier to roll out ICT4D pilots, as the development partners know that the local beneficiaries are well versed in using mobile phones.

As access to ICTs is a prerequisite for any ICT4D project, it is important to

examine the ways in which Uganda's government and regulator have worked to increase access to and affordability of mobile phones for the rural poor. Due to the proliferation of mobile phones in many LDCs, many governments and operators realize that mobile telephony, rather than fixed line service, was the most viable route to achieving universal access.

Uganda has been able to accelerate the provision of mobile services through the implementation of strategic policies targeting rural communities. In 2001, the UCC formulated a rural ICT policy called the Rural Communications Development Policy (RCDP) and established a related universal service fund, the Rural Community Development Fund (RCDF), to help stimulate network development. The policy was renewed for five additional years in 2009 and makes no dramatic changes other than extending some of the targets of the original policy. This includes continuing to increase coverage, improving connectivity, and renewing efforts to develop local content (UCC, 2009).

As part of the Rural Community Development Fund, licensed service providers are levied a 1% tax on gross annual revenue. The tax supports the fund, while additional funding has been received from the Ugandan government and the World Bank. The fund began disbursements in 2003, with 100% allocated to mobile communications, with the government subsidizing investment in areas that have been considered unprofitable by the operators.

Many critics acknowledge that Uganda's strategy towards achieving UA is a model program that other countries should replicate; yet low mobile penetration rates persist (Intelecon, 2005). This is primarily due to the fact that the Ugandan telecom

sector has extremely high taxes on mobile handsets and services. Mobile subscribers are subject to a sector specific tax of 12% and taxes make up 27% of the total cost of mobile ownership (GSM Association, 2007). Despite criticism, the government has not shifted and reduced taxes. Until they do so, universal access will not be achieved. This is problematic for ICT4D initiatives because the benefits of such technologies cannot be realized to their fullest extent if there is a limited ability to use, and possibly own, a mobile device. The rural poor may be covered by a mobile signal, but without proper incentives for mobile devices to become more affordable and accessible, the poor will be unable to reap the benefits. Thus, programs like those of the Grameen Foundation help bridge the existing gap and meet the demand for telecommunications services. While the RCDP is one intervention to address the needs of the rural poor, other initiatives, such as multistakeholder partnerships led by the private sector, are needed to extend access and service.

3.7 National Development Policies and Strategies in the Context of ICT4D

While it is necessary to understand the telecommunications environment in Uganda, it is equally important to examine the various strategies undertaken by the national government to reduce poverty. Looking at how ICTs are linked to core development goals in Uganda demonstrates the extent of state support for meeting the communication needs of its poorest citizens.

It was estimated that as of 2006, 31% of Ugandans were living below the poverty line (WHO, 2008). While the nation has made significant gains reducing poverty levels in the past two decades (in 1992, 56% of Ugandans were below the poverty line), there is still tremendous room for improvement. Multiple factors have contributed to the high

poverty rate, including a slowdown in the agricultural sector, higher population growth, and an increase in the number of deaths related to HIV/AIDS (IMF, 2005).

The provision of ICTs are integrated into state strategies that aim to reach human development goals related to basic needs (health, education, income growth, water, and improved sanitation). The government acknowledged in its 2003 National ICT Policy document that timely and relevant information must be available and accessible in order to successfully implement its poverty reduction plans (Uganda Ministry of Works, Housing and Communications, 2003). The government has recognized the centrality of ICT to the development of society and that it should be a complementary input to any strategy. Thus, many initiatives directly or indirectly address the significance of ICTs to stimulate human development. A Ministry of ICT was established in 2006 to coordinate the role of ICT in various sectors and to provide guidance for situating ICT within the country's National Development Plan.

At this juncture, national government ICT strategies have focused primarily on building the infrastructure, which has led to somewhat more affordable access. As a 2009 International Institute for Environment and Development briefing notes, "This has successfully reduced access costs in many cases, but has not addressed who is using the technologies and for what, as well as what services can be developed to increase the impacts of this usage on livelihoods" (Garside, 2009, p. 2). This highlights how comprehensive partnerships involving partners from the private sector are needed to continue the work initiated by the government and develop information services that can meet the needs of the marginalized.

3.8 The Grameen Foundation's Initiatives

The sections above have helped to provide contextual background for the first case study of this thesis. The remainder of this chapter will explore the transformations made in many rural Ugandan villages due to the presence of the MTN Village Phone program, the Grameen Foundation's AppLab, and the Community Knowledge Workers initiative. For each program, problems identified at local levels, the development of program models in response to these problems, and the outcomes of program pilots will be discussed in detail. The enabling environment facilitated by the UCC, combined with strategic partnerships that speak to the needs of rural beneficiaries in Uganda, have proven to be effective at enhancing the abilities of the rural poor to access valuable information. Initial results indicate that the business model has proven to be sustainable and scalable business model, and that the various interests of the partners have been met.

Village Phone Program

The Problem

As previously mentioned, while there is mobile network coverage across many rural areas, actual penetration levels are much lower than desired. Few Ugandans in rural areas can afford to purchase a mobile phone handset and services. While prices have been falling, they are often still out of reach of the rural poor. Without access to vital information, poor rural Ugandans are placed at an economic and social disadvantage. For example, small farmers who depend upon selling their goods rely upon middlemen to purchase their products. These middlemen often charge exorbitant rates, and since the farmers are not aware of the going market price, they cannot contest it.

Developing the Program Model

In an effort to provide telecommunications services to the rural poor and improve

the livelihoods of both rural entrepreneurs and community members, the Grameen Foundation sought to replicate the Village Phone program that had been successfully implemented by Grameen Telecom in Bangladesh. The program is intended for villages that currently do not have cellular coverage. Under this model, local entrepreneurs, often women, receive a small loan from a microfinance institution to purchase a mobile phone kit that includes a handset, a cable to connect to an external antenna and a battery to keep the phone charged. In her village, the Village Phone Operator (VPO) sets up a business, purchasing pre-paid mobile airtime and then reselling that airtime to local community members. The VPO repays the loan over time, and then typically begins to make a profit. VPOs offer discounted airtimes to customers, at up to 25% less. They act as an alternative to public payphones, which have proven to be prohibitively expensive for operators to maintain.

In order to design a program that would be sustainable, the Grameen Foundation (GFUSA) recognized that strategic partnerships would need to be developed. The GRUSA also acknowledged that each partner would play a valuable role in the development of the program. The partners include MTN, the top mobile operator in Uganda, and nine independent and local microfinance institutions, including Foundation for International Community Assistance (FINCA), Foundation for Credit and Community Assistance (FOCCAS), Support Organization for Micro-Enterprise Development (SOMED), Uganda Microfinance Union (UMU) and Ugandan Women's Finance Trust (UWFT). Additional financial support and advice has come from Nokia and USAID's dot-ORG Information and Communications Technology Initiative.

Table 7: Timeline of Village Phone Program Design, Development and

Implementation

Date	Event
March 2002	Grameen Foundation approached MTN to partner; discussions take place Discussions with MFIs
March 2003	MTN Uganda Board of Directors ratified the Business Model and an agreement outlining the terms of the partnership; first 10 phone deployed in the Masindi district of western Uganda for field testing
	Additional MFI partners engaged
May 2003	Pilot phase begins
September 2003	By this date, 100 phones had been deployed
October 2003	Pilot phase completed; after a review of weekly reports, it was determined that the VPP was viable and should be launched
November 2003	MTN Village Phone formally created and launched as an independent company

Source: Keough & Wood, 2005

MTN was already established as the dominant telecommunications provided in Uganda when the GFUSA began its work in Uganda. The operator saw its participation in the VPP as a way of creating a new channel to the telecommunications market. Keough and Wood (2005), in the Village Phone Replication Manual, note, "Perhaps one reason why the partnership came together between Grameen Foundation and MTN Uganda was that Grameen Foundation made it very clear that ownership and control in the long term were not key objectives – [GFUSA was] offering services, expertise and corresponding resources and a risk-sharing partnership to create a new market and a new distribution channel for MTN Uganda – [GFUSA] could also point to the success of Village Phone in Bangladesh as established by Grameen Telecom." GFUSA was able to convince MTN Uganda that their "motives were social and not threatening to MTN Uganda, but MTN recognized that Grameen Foundation approached this social objective with a clear sense of the business approach required to make it sustainable, successful, and profitable" (Keough & Wood, 2005, p. 33). Thus, MTN did not feel that the

Foundation was a threat to their operations, and that the partnership could beneficially serve both organizations' needs: for MTN, to reach new markets and generate revenue, and for GFUSA, to meet the social and informational needs of those at the BOP. Since the VPP would extend to villages that previous were not covered by a mobile signal, MTN was also filling its UCC-issued mandate to achieve its universal and public access obligations, as well as its corporate social responsibility goals.

The MFIs that joined the initiative already had a presence on the ground and a pre-existing client base that could be approached to participate in the VPP. Also, since the various MFIs served different geographic locations, their involvement helped spread the model into different regions of Uganda (Knight-John, et al., 2005, p. 41). MFIs had multiple incentives in partnering with GFUSA and MTN. First, they would be able to offer new products to their clients, and would subsequently generate income from the loan repayment. Also, the MFIs were allowed to receive a percentage of the phone airtime sales (Keough & Wood, 2005, p. 10).

GFUSA set four primary goals for the initiative: "1) provide the rural communities of Uganda with valuable communications services to enable them to break the cycle of poverty; 2) to establish a general replication model for the Village Phone program; 3) to validate, measure, and document the model in a single country; 4) to disseminate this learning to the commercial telecommunications sector and the worldwide development communities so as to establish a global Village Phone movement" (Keough & Wood, 2005, p. 9). It is evident from these goals that the foundation acknowledged the empowering potential of communication services to improve livelihoods. Additionally, they recognized up front the importance of designing

a program that is scalable and sustainable, and that strong monitoring and evaluation tools were needed to exploit the benefits of the program. Uganda was selected as the first country for replication of the VPP model because of the widespread presence of microfinance organizations and its strong mobile telephone infrastructure (Keough & Wood, 2005).

The Ugandan program differs slightly from the original pilot program in Bangladesh. First, a microentrepreneur can either borrow money from an MFI to purchase a village phone kit or he or she can just purchase the kit outright. Additionally, there are multiple MFIs that are stakeholders in the program, rather than one. Also, the VPP in Uganda is not exclusive to female entrepreneurs; men can act as VPOs as well.[4] Under the original model in Bangladesh, women already comprised over 95% of the Grameen Bank's clients. Thus, operators in Bangladesh have typically been female. In Uganda, many MFIs are not gender biased, and offer services to both male and female clients (Siebel & Almeyda, 2002), so the opportunity to be a VPO was not limited to women. This demonstrates how when replicating a model from another country, it may be necessary to modify certain elements of the original model to adapt to local conditions.

Results and Outcomes

The program in Uganda was formally launched in November 2003. Since then, as Table 8 describes, targets have been quickly met and the project has proven to be widely successful across Uganda. The original goal was to introduce 5,000 new Village Phone businesses between 2003 and 2008. By May 2005, there were over 1,500 VPOs serving

[4] In Bangladesh, women microentrepreneurs were only given the option to borrow money to purchase the kit. Additionally, Grameen Bank was the sole lender.

their community members in 49 out of 56 districts in Uganda (Stanley, 2005). Within three years, 6,700 businesses were established and by of May 2007, there were 7,000 VPOs in the country. USAID estimates that the Village Phone program has grown at a rate of 150 new businesses per month. This data provides clear evidence that the VPP is a sustainable model that has been able to be replicated in villages across Uganda and that the services offered by VPOs are in high demand by villagers.

Table 8: MTN Village Phone – Units Planned Compared to Units Installed

Year	Planned Number of Village Phone Units	Actual Number of Village Phone Units
2003	120	142
2004	1,040	1,337
2005	1,940	3,079
2006	4,279	6,270
2007	6,100	9,000

Source: Grameen Foundation

The VPP has been regarded as a "win-win" situation for all partners involved. Table 9 details the needs of the various stakeholders prior to the implementation of the program, the contributions of each stakeholder to the VPP, and how they benefited.

Table 9: Unpacking Stakeholders' Roles (Village Phone Program)

Stakeholder/Partner	Needs/Wants	Services provided	How Needs/Wants were met, benefits accrued
Local Village Phone Operator	Income generation in order to improve livelihood and attain basic services	Provides affordable communication to local villagers	- Steady income - Increased status in society
Community Members	Access to telecommunications services	Provides business to the VPO	- Reduction in transaction and travel costs (can receive information more quickly and cheaply than printed material)

			- Strengthen existing social networks - Reduces feelings of isolation
MTN (Operator)	Increase subscriber base, fulfill Universal Access targets	Coverage of mobile cellular network; provision of infrastructure	- New revenue generation - Meeting UA goals - Reaching a previously untapped markets
Grameen Foundation	To reach the rural poor and improve their livelihoods	Expertise, assistance, training, management, evaluation	- Profitable business model that helps the rural poor
Microfinance Organizations	New products to provide clients	Loans, Village Phone kit, training VPOs	- Meeting the needs of clients - Loans repaid

MTN has been able to meet government requirements for Universal Access, and has experienced more traffic on their network from new clientele (Stanley, 2005, p. 3). The MFIs have been able to offer a new product to clients and earn more revenue. Similar to the model in Bangladesh, MTN offers discounted (wholesale) airtime rates to the VPOs. They are capable of offering these discounts because of the high volume generated from the Village Phones. In fact, the phones are used up to eight times more than the phones of average subscribers (Keough & Wood, 2005, p. 10). Due to such high use, VPOs have been able to repay their loans to MFIs in a timely fashion.

Among local community members, the VPOs obviously reap the most benefits. Not only have they increased their incomes, but VPOs also hold an elevated in status in the community. As *Seattle Times* writer Kristi Heim noted in 2007, "In Uganda, Village Phone Operators take in about $2.70 a day, which gives them about $1 a day of profit. While that may not sound like much, on average Ugandans earn about 77 cents per day.

The phone can also serve as an adjunct business for small shopkeepers. The operators make enough money to pay off their loans in about six months." With increased income, VPOs have been able to better educate their children, access healthcare, and create side businesses, such as phone charging. Female VPOs have also described how they are no longer as dependent on their husbands for economic support (Stanley, 2005).

While VPOs appear to reap the most tangible benefits, local community members have also seen their lives transformed by the introduction of a Village Phone to their villages. First, simply having access to basic information has been able to provide farmers and local entrepreneurs with information about prices and markets that they previously lacked. By learning about fair market prices, farmers are not only able to earn more income by receiving better prices, but also feel empowered, as they are better equipped to negotiate on prices and can possibly avoid going through middlemen. Entrepreneurs and others involved in micro- and small-enterprises can "consolidate their buying power for raw materials and services" with one another (Stockholm Challenge, 2004). They are also able to save time and money, as having access to mobile phones reduces the need to travel and serves as a substitute for transportation. More importantly, villagers are able to maintain contact with friends and family.

The Ugandan government has indirectly benefited from the VPP. More rural communities are being served and one of the nation's leading mobile operators is reaching its mandated Universal Access targets. Additionally, the program in Uganda has begun to see replication in Rwanda, where it is known as "Tel'imbere." The attention that the VPP has garnered has provided good press for the Ugandan government as well.

Application Lab (AppLab)

"AppLab is a great example of innovation from and for the bottom of the pyramid, bringing relevant, actionable information to communities where access to the Internet is unavailable. Through an approach including sector research, field-based rapid prototyping, extensive interaction with target users, and carefully structured field pilots, we have been able to gain deep insight from the people who benefit directly from using these applications." – Alex Counts, President of Grameen Foundation

Following the successful rollout of the Village Phone Program across Uganda, the Grameen Foundation's Technology Center began preparations in late 2006 for a new concept called the Application Laboratory (Grameen Foundation, 2009b) that aimed to provide rural villagers with a suite of mobile applications to meet their informational needs.

The Problem

The Village Phone initiative highlighted the need for poor and rural populations to have access to important information and knowledge that would enable them to improve their lives and livelihoods. While the existing Village Phone program permitted rural populations to make phone calls, the AppLab has been designed to connect the poor to critical information services.

Designing AppLab

The design and implementation of the AppLab has differed from, and improved upon, the rollout of the VPP. While the VPP had already identified that the rural poor needed access to telecommunication services, the AppLab worked closely with end users and partners to "identify, develop, test, deploy, and scale technologies" that could go beyond just voice and use applications to meet the informational needs of the poor (Grameen Foundation, 2009b). GFUSA could have taken a technocentric approach by

first designing applications to be used on VPO's mobile phones and then testing how the rural community members appreciated these applications. However, they decided to complete a thorough needs assessment as well as conduct ethnographic research on the ground to determine what types of information the poor most needed access to and how those needs could best be met. The various stages of the process included developing strategic partnerships with other stakeholders, conducting a needs assessment and ethnographic research, and deploying high-end device trials and prototyping.

The Grameen Foundation asked Gamos, Ltd., an international development research firm, to carry out a needs assessment in rural Ugandan villages to determine the information needs of the poor. The researchers conducted background research and on-the-ground interviews, surveying over four hundred mobile phone users in an effort to determine how phones were being used, what users' needs were, and the perceived value of different types of applications.

The findings of the assessment revealed that rural Ugandans carried a strong demand for agricultural and health related information. The highest priority was finding information related to HIV/AIDS, a disease that has crippled much of Ugandan society (Gamos, 2008). This is not surprising, given the high rates of disease and mortality, as well as the fact that the majority of Ugandans are engaged in farming to earn an income and support their families. The researchers also noted potential barriers that could hinder the utility of mobile applications. These included a lack of menus in local languages, a lack of confidence in using SMS services, and concerns about being able to consistently charge a mobile phone (p. 6).

To complement the needs assessment, GFUSA also conducted ethnographic

research focusing on rural livelihoods and income generating strategies. Like the needs assessment, it also addressed how locals were using mobile phones and what types of applications would best meet community members' needs. This process looked at "the motivations and existing activities of rural Ugandans as something that could be enhanced and improved through mobile phone-based services" (Burrell, 2008, p. 4).

Interviews were conducted in three different types of communities: a remote fishing village, a larger town where trade or non-agricultural work were the primary modes of generating income, and a farming village. While attempting to gain insight into what types of information services the rural poor would benefit from, the researchers found that the villagers had a difficult time conceptualizing 'information.' They understood information in terms of getting advice from a person. While most were comfortable with using a mobile phone and understood the device's utility, it was more challenging for them to articulate what *types* of information would be considered useful and needed since the concept of 'information' itself did not really exist in their culture. However, the researchers concluded that the villagers would benefit from information that is "dependable, accurate that is 'actionable'" (Burrell, 2008, p.3). The challenge would be teaching the villagers that the information/advice need not always come from a human source, per say, and that a mobile application could share knowledge as well. As a consequence of this finding, it helped to confirm for the Grameen Foundation that having the existing VPOs, already trusted community members, work as intermediaries would be useful.

In addition to conducting thorough background research, GFUSA also formed strategic partnerships with a variety of stakeholders to ensure the success of the AppLab.

Each partner brought different skills to the program. GFUSA served as the primary conduit for teaching locals how to use the technology, working on the ground to test pilots, and bringing projects to launch. Google provided the search technology and user support, while its non-profit arm, Google.org, also contributed in an effort to learn more about what types of applications were most relevant to meet the needs of rural entrepreneurs and villagers. MTN Uganda, the operator of the Village Phone program, again provided the communication infrastructure for the AppLab. Other NGOs involved provided sector knowledge, and help with reaching out to their rural networks.

During the initial stages of developing AppLab, GFUS equipped some VPOs with GPRS-enabled mobile devices that allowed them to access the web. The intention behind this trial was to learn how high-end devices could potentially enhance the existing business practices of the VPOs, if clients were interested in using these devices, and what types of information they were trying to access online. VPOs were also able to experiment with camera phones, netbooks, and PDAs as well. Local university students documented the types of information people were accessing, how they felt about the devices, and how the way they used these high-end devices compared with usage of basic mobile phones (Grameen Foundation, 2009b).

At the conclusion of the trials, the Grameen Foundation determined that there indeed was substantial demand for the types of services that could be provided by high-end devices. They were also able to develop a better sense of end users preferences, such as the need for local languages. Due to these thorough background preparations, the Foundation was able to potentially avoid putting out the wrong products and wasting time developing and scaling products that didn't actually match end user needs.

Groundwork in Uganda initiated in October 2008 and the AppLab formally launched June 2009. It offers a suite of five applications that directly meet the needs of rural Ugandans. It is evident that the background research was carefully taken into consideration when developing these applications. Each of the five applications is described in detail below.

Weather Application

The need: Rural farmers were found to lack access to weather forecasts. Without this critical information, it was hard for them to plan ahead. Thus, the need materialized to provide farmers with timely updates on upcoming weather activity.

What it is: This application provides farmers with access to highly localized, up-to-date weather forecasts.

Strategic Partner: AppLab partnered with the Ugandan Department of Meteorology to provide the forecasts.

How it works: The user sends an SMS to a short code with the keyword 'weather' and the user's location (either a city or district). A text reply will provide the user with the forecast and temperatures.

Benefit: Access to weather forecasts enables farmers to make better, informed decisions regarding planting, harvesting, transportation, and other preparations. By knowing weather patterns in advance, farmers can better prepare for storms, droughts, or floods. Many Ugandans using radio to get information about the weather; however, those reports only come on at certain times and could be easily missed. With the AppLab's weather application, Ugandans can learn weather information on demand and instantaneously.

Health Tips

The need: As previously mentioned, diseases, such as HIV/AIDS, have had a profoundly negative impact on the lives of Ugandans. Due to their remote location, the rural poor are often unable to get the best health information available. This includes preventative medicine and practices. In a country where the median age is 15 years old, it is extremely important to educate adolescents and young adults about healthy sexual practices and tips for preventing sexually transmitted diseases and pregnancy.

What it is: In response to this need, AppLab developed the Health Tips application. It educates users by providing useful information and tips regarding sexual and reproductive health. Health Tips end-users with accurate information and helps to dispel common myths about sexual topics.

Strategic Partners: AppLab partnered with Marie Stopes Uganda, an international service provider for sexual and reproductive healthcare, and Straight Talk Foundation, a Ugandan NGO that specializes in health communications, to provide information.

How it works: The end user texts a question to a short code[5]. He or she then receives a text response that provides tips and other pertinent health information relevant to the issue.

Benefit: In a country with high incidences of disease and health problems, villagers can now easily learn about a particular ailment. The ability to access reproductive and sexual health information better equips them with factual information that can enable them to make better choices.

Clinic Finder:

The need: If a Ugandan living in a rural village falls ill, it can often be challenge to find a

[5] A short code is a set of numbers, usually shorter than a telephone number, which can receive text messages.

nearby clinic that can best serve his or her needs.

What it is: The Clinic Finder application is a searchable directory of health facilities that users can access to find the most appropriate medical assistance.

How it works: The user can search by city or district to locate the nearest clinic and find out what types of services are provided at various clinics.

Benefit: It is now *much* easier for a villager to locate a clinic that can properly treat them. This will help Ugandans save time and money.

Google Trader

The need: The livelihoods of the rural poor are often heavily dependent on agriculture and small business enterprises. When buyers or sellers have products to exchange, it can be difficult to locate one another in the marketplace without effective means of communication and transportation. Farmers and traders alike often depend upon middlemen to get their goods to market, and, subsequently, lose a percentage of their income to these intermediaries. Middlemen can take advantage of the farmers' ignorance and charge higher prices that what the going rate is at the market.

What it is: Google Trader is a based on a classic bulletin board system or classified advertisements normally found in newspapers. It enables buyers and sellers to find one another directly, allowing them to avoid going through a middleman.

How it works: A user sends an SMS to list products he or she is either buying or selling, or to find space on a vehicle to transport their goods to market. The SMS is posted on a virtual bulletin board and producers and consumers can contact one another to make arrangements or purchases.

Benefit: Farmers and small entrepreneurs are empowered with an ability to directly find

buyers or sellers and are less dependent on middlemen.

Farmer's Friend

The Need: Farmers in rural areas of Uganda often lack basic information about how to take care of their crops and livestock, how to prevent crop diseases, and what to do if there is a farming problem, such as bugs or ineffective pesticides. Thus, there is a need for accurate and timely information to combat problems.

What it is: Farmers can search for agricultural information through an SMS-based database. The database includes information about crop and livestock, pest and disease control, planting, storage and harvesting tips, and weather forecasts.

How it works: A farmer sends an SMS to a short code with a query regarding agricultural practices or problems. Keywords in the SMS are matched against a Google-run database. The farmer then receives a reply with a tip related to the query terms. For example, if a farmer had a question about how to prevent banana wilt, he could send an SMS query asking, "How do I treat banana wilt?" A sample reply would look like: "To control, destroy infected plants and nematodes which spread disease. Seek advice of extension worker" (Google Mobile Uganda, 2010).

Strategic Partner: Grameen Foundation partnered with Busoga Rural Open Source Development Initiative (BROSDI), a local NGO, to gather technical farming information and techniques.

Benefit: Farmers can easily learn about better farming techniques and how to prevent or treat problems that could impact their productivity.

Table 10, below, identifies partners' needs, how the provision of services met those needs, and the benefits accrued.

Table 10: Unpacking Stakeholders' Roles (AppLab)

Stakeholder/Partner	Needs/Wants	Services provided	How Needs/Wants were met, benefits accrued
Local Village Phone Operator	Income generation in order to improve livelihood and attain basic services	Access to mobile applications that enhance existing communication services	Steady income; increased status in society
Local population, especially farmers	Access to information services	5 mobile applications	New and improved access to health, news, and agricultural information
Strategic partners: Grameen Foundation, Google, Google.org, MTN Uganda	Provide information services to the rural poor	Expertise, management, financial support	Successful partnerships, sustainable and replicable programs, recognition
Local and international NGOs	Provide services and information to the rural poor	Participation in providing information and content for applications	Expanding clientele base and reaching/educating more people in impoverished communities

Some controversy arose around the use of Google Trader when the application was launched. Users are charged a premium SMS rate of 220 Ugandan Shillings per use to use the application, rather than the basic 110 Ugandan Shillings. Should the partners involved make a profit off the use of Google Trader, when they claim to be helping the poor? Erik Hersman (2009a) argues that all parties can benefit, even if a premium rate is charged for the service. He states on his blog, "By doing so you help both parties; first, by providing a service that consumers value and are willing to pay for, and second by making the business of running an operation self-sustaining." He points to the fact that a 220 shilling SMS can likely save a person a much more expensive visit to a doctor or

veterinarian, and, thus, is worth the expense. Furthermore, as part of the extensive background work conducted prior to the launch, Google and the other partners held discussions with end users about prices. For the most part, end users felt that the direct value gained from using the service was worth the additional cost (Verclas, 2009a).

Community Knowledge Workers Program

The Grameen Foundation has piloted a third ambitious program in Uganda, the Community Knowledge Workers (CKW) Program. This program appears to be a hybrid of the VPP and AppLab, identifying, recruiting, and training rural farmers to take on the role of "Community Knowledge Workers" who act as trusted intermediaries and use mobile phones to provide information services to fellow farmers (Grameen Foundation, 2009a).

As noted above, the rural poor are often dependent upon agricultural work to sustain their livelihoods. These farmers have been found to lack access to vital information and knowledge about best farming practices and market opportunities. CKWs have a variety of responsibilities to their community and to the Grameen Foundation. First, farmers can go to a CKW and ask questions about suppliers, buyers, or farming practices. Using his or her mobile phone, the CKW can retrieve advice, get recommendations, or find suppliers. The CKW calls an operator that works for the AppLab Question Box and relaying the farmer's question. The operator uses pre-approved websites and databases to find information, and then she calls the CKW back to share the answer to the query. If the operator cannot find an answer to a question, she can contact an expert from Uganda's National Agricultural Research Organization (CTA ICT Update, 2009, p. 4). CKWs also collect data from the villages they serve to

document issues such as potential crop diseases and pest outbreaks. This information is then shared with researchers and other farmers to learn about the spread of diseases and how to fight them.

Pilot Phase: Deployment and Initial Outcomes

During the nine-month trial phase, which began in January 2009, a variety of information services and mobile applications were deployed and tested by CKWs. 38 CKWs conducted over 6,000 surveys. In July 2009 and September 2009, CKWs mapped the spread of banana bacterial wilt, using a mobile form based survey to help farmers identify and control the spread of these diseases (CTA ICT Update, 2009). Since the mobile phones they used were equipped with GPS and cameras, CKWs could add a farmer's GPS coordinates to each survey and take photos of the diseased crops, and send the information and photos to a central database, where it could be studied by scientists. Then, the CKWs could train farmers how to detect, prevent, and control banana wilt. After the pilot period, CKWs had trained over 3,000 farmers (CTA ICT Update, 2009, p. 5).

Through the pilot, GFUSA learned that many farmers in rural Uganda are women; thus, the program organizers understood that it is important to recruit females to be CKWs (Gantt, 2009). Only a third of the CKWs in the pilot phase were women. The Grameen Foundation has acknowledged that the recruitment criteria for CKWs – fluency in English, literacy, the location of training sessions – may make it more difficult for women to take part. However, it is important that the Grameen Foundation has been active in getting input from female CKWs and non-CKWs and identifying the need for flexibility and understanding of cultural practices and barriers.

The pilot was deemed successful and the Grameen Foundation received a $4.7 million grant from the Bill and Melinda Gates Foundation to expand the initiative. The goal of the project is to build a network of over 4,000 CKWs throughout the rural regions of Uganda. One story demonstrates the immediate effect of this initiative: a farmer shared a story with Foundation staff that he has been able to generate more than double his income in the previous harvest since he has been able to get better market information through his CKW. Multiple stakeholders benefit from the work of CKWs. Farmers have a trusted local intermediary to go to with agricultural issues and problems. They can rely upon these trained workers to teach them the best ways to solve their problems. Scientists have also benefited from improved information about the exact locations of agricultural diseases, enabling them to better monitor outbreaks (CTA ICT Update, 2009, p. 5).

3.9 Conclusion

Table 11, below, provides a comprehensive look at the Grameen Foundation's suite of programs and how rural information needs and priorities were met.

Table 11: Meeting the Informational Needs of the Rural Poor in Uganda with ICT

Rural information needs/priorities	How needs were met by Grameen Foundation and its partners	What program/application does
Contacting people in emergencies; Social wellbeing, maintaining relationships with family and friends	Village Phone Program	Villagers no longer need to walk long distances to reach a telephone; can quickly contact people nearby or far away
Agricultural information	Google Trader, Farmer's Friend, Community Knowledge Workers	Villagers can get market information more quickly and cheaply than either via printed material or by traveling; can learn better practices, which results in increased

		productivity and income generation; stronger linkages developed between buyers and sellers; substitution for transport; reduction in price discrepancies; improved market information flows
News, weather	Weather Application, Community Knowledge Workers	Farmers can plan ahead, and know weather patterns in advance; better preparation for storms, droughts, or floods
Health information	Health Tips, Clinic Finder	Villagers can easily locate a clinic or learn about a particular ailment; access to reproductive and sexual health information; increased volume and flow of vital health information

One factor directly contributing to the VPP's success has been the Grameen Foundation's ability to effectively broker relationships amongst and between its partners. David Keogh, Director of New Initiatives at the Grameen Technology Center, believes that the greatest challenge in replicating the program has been building relationships across potential partners, which necessitates the cultivation of a shared vision, commitment, persistence, hard work, trust and honesty (Islam, 2005, p. 22). Chapman, et al. (2003) note that building multidisciplinary partnerships is complex, and that "success will ultimately depend upon the establishment of effective systems of information and communication which facilitate multi-level knowledge partnerships between different stakeholders" (p. xi). From all assessments conducted on the suite of programs in Uganda so far, the partnerships developed have been strong and each partner has been able to meet its objectives (see Tables 9, 10, and 11).

A strong degree of institutional involvement, combined with a strong degree of

participation by local beneficiaries, resulted in the design and implementation of various programs that have met partner needs. The needs assessment and ethnographic research conducted prior to the development of the AppLab helped partners realize that people really wanted information about health and agriculture related issues, and then tailored the applications to meet those expressed needs. This also aligns with approaches that seek to understand how existing technologies – in this case, mobile phones operated by VPOs – could be used in new ways with added functionality (Heeks, 2009). The Grameen Foundation's initiatives built upon the strength of the VPP program that was already in place and enabled the VPOs, already trusted local intermediaries in villages, to offer new services. Finally, national policies, strategies, and programs were already in place, and the initiatives' objectives aligned with these goals. Thus, there was no conflict between the public institutions and the private sector.

Initiatives such as those driven by the leadership of the Grameen Foundation would not be possible without the rapid uptake of mobile telephony in SSA. A variety of projects (see Appendix A for details on projects) have been piloted due to the fact that competitive telecommunications environments have made it much easier for even those at the BOP to gain access to mobile telephones.

CHAPTER 4

CASE STUDIES 2, 3, AND 4

4.1 Introduction

Chapter 3 described how the Grameen Foundation's initiatives in Uganda were successful due to a hybrid approach that focused on building strong partnerships amongst stakeholders, responding to the informational needs of local Ugandans, and creating models with long-term sustainability and scalability in mind. In this chapter, I will describe three distinct cases: the impact that the troubled telecommunications sector has had upon society in Ethiopia, a pilot project in South Africa that uses text messages to remind Tuberculosis patients to take their medication, and the novel innovations being devised by mobile users across SSA to meet their needs. In each case, I attempt to validate my hypothesis that when there is a strong degree of institutional involvement and a strong degree of civil society involvement, ICT4D projects will be more successful in terms of their sustainability and scalability. In the three cases below, it will be shown that the weakness of either institutions or civil society, or both, hinders ICT-driven development initiatives from being fully sustainable and scalable. The case study matrix is reproduced below.

Table 1: Case Study Matrix

Institutional decision-making			
Participatory Processes		Strong	Weak
	Strong	**Uganda: MTN Village Phone Program, Grameen Foundation AppLab, Community Knowledge Workers Initiative**	**Various sub-Saharan African states: Small-scale innovations from end users**

	Weak	**South Africa: On Cue Compliance System**	**Ethiopia: State-owned telecom sector**

In Ethiopia, due to the lack of strong approaches by both the state and civil society in developing the telecom sector, there has not been significant economic growth in the telecom sector. Among other impacts, this has resulted in the absence of substantial ICT4D initiatives and many Ethiopians are incapable of realizing the benefits possible from mobile phone use. On the other end of the spectrum, mobile communications has become ubiquitous in South Africa. Subsequently, mobile health (m-health) solutions, such as the On Cue Compliance System that will be detailed below, are becoming more widespread. At the same time, however, this pilot project demonstrates that while mobile technologies may be appropriate and accessible for participants in a development initiative, the buy-in of all stakeholders is necessary to ensure proper and strong project implementation. The absence of adequate project management in Cape Town resulted in a project that did not exceed its targets and necessitated modifications to ensure future success.

In the fourth and final case, I describe how end users in various SSA countries, lacking the strong support of the government or other institutions, have devised small-scale, innovative solutions using mobile technologies. While a project initiated from the bottom up can be successful, it ultimately necessitates support, primarily in the form of partnerships with institutions and organizations, to become sustainable and scalable beyond its initial environment. Unlike the three previous cases, this case does not focus

on a particular sub-Saharan African country; rather, it provides examples from multiple countries to demonstrate the wide variety of innovations occurring on the ground.

4.2 Introduction to Case Study 2: Ethiopia

The initiatives undertaken in Uganda by the Grameen Foundation and their partners demonstrate how ICT4D projects that build strong and inclusive multistakeholder are more likely to be sustainable and scalable in both the short-term and long-term than those that are absent of solid partnerships. The first case in this chapter will look at another situation: what happens in the presence of both weak institutional frameworks and weak civil society participation?

In Ethiopia, the presence of a closed telecommunications sector, a weak regulator dependent on the state, and an environment that is not conducive to the participation of civil society have contributed to minimal economic growth and an absence of foreign investment. Due to these conditions, Ethiopia has yet to realize the gains that could potentially result from opening up the telecommunications sector to competition. These possible gains include increased access to affordable telecommunications services, easier ways of getting information and finding help during an emergency, and new employment opportunities. Since many Ethiopians are dependent upon farming for income generation, increased access to ICTs could give farmers access to market information and prices much more quickly and cheaply than via printed materials (Pigato, 2001, p. 3).

After providing relevant information regarding Ethiopia's social and political environment, details concerning its telecommunications sector will be presented. Then, it will be described how the absence of strong policy initiatives, the limited efforts to liberalize the telecommunications industry, and the weakness of civil society has

hindered human development and economic growth.

4.3 Country in Context

The context provided below about Ethiopia indicates that high incidences of poverty and disease, combined with a large proportion of civil society not receiving an adequate education and thus relying on subsistence agriculture, have hindered many Ethiopians from improving their livelihoods. Additionally, the government's policies and strategic plans for development typically lack specific, realistic, and achievable goals. The combination of under-developed civil society organizations and inadequate government intervention has resulted in Ethiopia ranking among the lowest countries in the world in terms of growth and human development.

While this case focuses primarily on Ethiopia's telecommunications industry, it is important to place an examination of this specific sector within the broader context of impoverished state that Ethiopia has become. Located in the Horn of Africa, Ethiopia is a large landlocked country covering over 1 million square kilometers and bordering Sudan, Eritrea, Somalia, and Djibouti. The population of Ethiopia stands at 85 million people, with at least eighty percent of the population living in the rural highlands. The government is a federal parliamentary republic with a prime minister and is comprised of four tiers: the federal government, nine regional states, 66 zones, and 550 districts known as *woredas*.

A brief look at the history of Ethiopia highlights the challenges that have hindered the country's growth and negatively impacted the lives of many Ethiopians. A feudal monarchy reigned over Ethiopia from the 10th century BC until 1974. In 1973, there was a severe drought, followed by widespread famine, resulting in the deaths of nearly

200,000 Ethiopians (Keller, 1992, p. 611). At this time, a coup staged by the Derg, a military junta, took over the government and established a Marxist regime led by Mengistu Haile Mariam. Under the repressive Mengistu, civil society organizations and associations that were created during the imperial regime were either co-opted by the new regime or shut down (Clark, 2000). Ethiopia experienced another catastrophic famine crisis between 1983 and 1986, resulting in the deaths of one million Ethiopians. As Hyden and Hailemariam (2003) describe, during the Derg era, "recurring food emergencies, involuntary displacement of large numbers of people, civil war, a totally dysfunctional economy, and massive starvation" (p. 5) became the norm.

In 1991, the Ethiopian Peoples' Revolutionary Democratic Front (EPRDF) took control of the state, and a federal democratic republic was established. Ethiopia's first democratic elections were held in May 1995, and a prime minister and president were elected. Ethiopia has not been without recent troubles. A border dispute between Ethiopia and newly independent Eritrea led to a two-year war that ended in 2000. A coalition of opposition parties has organized in an effort to oust Prime Minister Meles Zenawi and his party in the May 2010 general elections. Many have accused Zenawi's government of corruption and election fraud.

Ethiopia has an extremely high poverty rate, with only five out of 135 other countries having lower human poverty indexes. In 2000, it was estimated that 44% of the Ethiopian population lived below the national poverty line (UNDP). This is attributed in part to an over-dependence on a volatile agricultural economy that has been severely impacted by droughts and civil strife over the past few decades. As a result of these decades of crisis, Ethiopia has become increasingly dependent on foreign food aid. The

World Bank (2000) registered eight incidences between 1984 and 1998 when food aid has been granted to Ethiopia in response to acute food shortages. Furthermore, the percentage of the population affected by draughts increased from over 8% in 1975 to 16% in 2003 (Adenew, 2004, p. 141).

Unlike many other African countries, there are no major minerals or natural resources to exploit for financial gain. Thus, farming is the main source of employment and the export sector is based on a few commodities – primarily coffee and cut flowers. However, as mentioned above, Ethiopia is prone to droughts, which can have profoundly negative impacts on the agricultural industry. Thus, the assumption can be made that the presence of technologies could be one way for Ethiopians to enter the global information society and reap more benefits that they are presently able to from agriculture or other industries. Table 12, below, provides some basic indicators about the standards of living in Ethiopia and shows the deprived state that many Ethiopians are living in.

Table 12: Basic Indicators (Ethiopia)

Population	85.2 million (2009)
Human Development Index	0.414 (171 out of 182 countries)
Human Poverty Index	50.9% (130 out of 135 countries)
Median age	16.9 years
Life expectancy	55.41 years
Total fertility rate	6.12 children born/woman
HIV/AIDS adult prevalence rate	2.1%
Number of people living with HIV/AIDS	980,000
Literacy (age 15 and over that can read and write)	42.7%
School life expectancy (primary to tertiary education)	8 years

GDP (purchasing power parity)	$75.91 billion (2009 est.)
GDP per capita	$900 (2009 est.)
Labor force by occupation	85% agricultural, 5% industry, 10% services (1999 est.)
Population below poverty line	38.7% (2005-06 est.)
Television broadcast stations	1
Internet hosts	136 (2009)
Internet users	360,000 (2008)
Telephones – fixed lines	908,900 (2008)
Telephones – mobile cellular	3.168 million (2008)
Fixed telephone lines (per 100 people)	1.1
Mobile cellular subscriptions (per 100 people)	2.3
Population covered by mobile cellular network	10%

Sources: ITU; The World Bank; CIA World Factbook

These indictors clearly show how the majority of Ethiopians live in impoverished state. A few statistics in particular stand out: first, compared to most African nations, where the literacy rate is typically at or above 80 percent, the rate is almost half that in Ethiopia, with only 42.7% of the population literate. This reveals not only the lack of educational resources for most Ethiopians, but also the absence of educated individuals at large in Ethiopian civil society. With such high rates of illiteracy, it can be assumed that many lack the skills needed to effectively use many ICT devices that necessitate basic literacy skills for operation. In addition, without access to higher levels of education, members of civil society are handicapped in their ability to access the resources and have the knowledge needed to influence public institutions. This includes activities crucial to strengthening civil society, such as training in research and advocacy, report writing,

political analysis, and organizing.

Due to the fact that there is only one state-owned telecom operator, penetration of both fixed and wireless telephone lines is extremely low. The combined fixed and mobile-cellular teledensity is only about 5 users per 100 persons. By comparison, the penetration of mobile phones in Uganda is 13.58 phones per 100 Ugandans, and it is 32 mobile phones per sub-Saharan Africans in general. Another striking statistic is the fact that almost ninety percent of Ethiopians live in rural areas. As I will discuss below, with the majority of society living in rural areas, they would benefit from being connected to one another through communications networks for both personal and business reasons. Yet most areas are not covered by a mobile signal and there is a burgeoning divide between urban and rural areas in terms of access to and use of ICTs.

4.4 An Overview of the Telecommunications Sector

The overview of the telecommunications sector in Ethiopia below provides context for understanding how an environment driven by the state's interests is neither conducive to growth nor supportive of ICT4D initiatives. Ethiopia has had a telecommunications industry for over one hundred years. Under Emperor Menelik II, the first major telephone line was constructed in 1894. By 1930, over 7,000 kilometers of line were built and at least 170 towns were served (Tsigie & Feyissa as cited in Noam, 1999). Ironically, despite having one of the oldest telecom operations in Africa, Ethiopia currently has the lowest telephone penetration rate on the continent.

The Imperial Board of Telecommunications in Ethiopia (IBTE) was organized and began operations in 1953. In 1996, the government legally established a regulator, the Ethiopian Telecommunication Authority (ETA), which began operations in 1997.

This was followed by the establishment of the state-owned Ethiopia Telecommunications Company (ETC). The ETC is supervised by the ETA and is the only operator in the nation; both the ETC and the ETA are accountable to the Ministry of Transportation and Communications and neither has an independent board of directors. While the ETC sets basic service requirements and targets for infrastructure expansion, the Board of Directors and the ETA must approve these targets. The ETC is bound to the national government, "through funding, hiring and firing procedures, and procedural methods" (Hartley & Murphree, 2006, p. 13).

Ethiopia Telecommunications Corporation (ETC) launched its cellular services in 1999. The data provided in Table 13, below, details the number of mobile subscribers and compound annual growth rate. It reveals just how low the mobile penetration rate is in Ethiopia. Out of a population of over 85 million, only a little over 2 million have mobile subscriptions, or 2.3% of the population. This does not account for Ethiopians who share mobile phones or access telephone services through telecenters or kiosks. Most mobile phone service is limited to urban areas, including the capital, Addis Ababa, and larger cities near the capital. The ETA strictly prohibits telecommunications technology that bypasses the local network, such as VoIP and independent VSAT connections, thus hindering people from circumventing the state-owned operator in attempts to use telecommunications services.

Table 13: Number of Mobile Subscribers in Ethiopia

Year	Number of Mobile Subscribers	Estimated Mobile Penetration
1999	36,000	
2004/05	155,534	0.2%
2005/2006	410,630	0.54%

2006/07	866,700	1.1%
2007/08	1,208,498	1.5%
2008/2009	1,954,327	2.3%

Source: ETA

The compound annual growth rate (CAGR) between 2005 and 2009 was 88.28%. While this is high, this rate must be examined alongside the estimated rate of mobile penetration for each year. Given Ethiopia's large and growing population (the population has been over 70 million since 2005), the actual penetration rate has been quite low. For example, while there was a CAGR of 60% between 2008 and 2009, the actual increase in mobile penetration was less than one percent.

Table 14: Mobile Phone Ownership by Sector

Sector	Percentage of Overall Use
Private sector – individuals	71 %
Private sector – businesses	21%
Government	4%
International organizations	5%

Source: Demeke & Biru, 2002

As shown above in Table 14, the majority of mobile phone owners in Ethiopia are private individuals. However, high costs prevent most individuals who would like to own a mobile phone from doing so. For example, the cost of a pre-paid SIM card is relatively high; in Ethiopia, the price of a SIM card averaged between US$36 and US$42 in 2006, whereas in most other African nations they were free or offered at low-cost (Adam, 2007, p. 44). Furthermore, unlike most mobile operators in SSA, the ETC does not use a nationwide mobile tariff plan; instead, they have four designated tariff zones. If

a mobile phone call is placed to someone in a different zone, the user is charged double the tariff. As Adam (2007) concludes, "Such tariff structure is not cost-based or supportive of the underlying motive of mobile ownership, mobility, and impacts negatively on usage" (p. 46). Thus, even though 71% of the total mobile users are private individuals, these are primarily people living in the capital who have the financial means to own a mobile device.

4.5 Policy Initiatives to Increase Access: Few Benefits Realized So Far

While the state and the ETA are aware that initiatives need to be more aggressively undertaken to increase penetration and access to services, the policies and programs thus far have been underwhelming and very broad in scope. The absence of targeted strategies to achieve growth has resulted in intended goals not being achieved and few significant gains for improving human development. The assistance of multilateral institutions has been primarily focused on aid and food security, but some help has been provided in the realm of telecommunications. The World Bank approved an ICT Assisted Development (ICTAD) Project in 2004 to identify factors that have constrained growth and to strengthen the effectiveness of institutions. However, the ICTAD was restructured in 2008 due to a food crisis and money originally intended for a rural connectivity program was diverted to food aid, thus limiting the project's ability to focus on building out rural infrastructure (World Bank, 2009).

Ethiopia submitted an application to the WTO in 2003, and its application is still under review. The United States has advised Ethiopia to liberalize its banking and telecommunications sectors if it wishes to join the WTO. As recently as March 2009, Peter Allgeier, former U.S. trade representative to the WTO, urged Prime Minister

Zenawi to liberalize these sectors (McClure, 2009b). However, Girma Birru, Ethiopia's Trade Minister, insists that there are no plans to privatize the ETC, stating, "I don't see any plan [to break up the ETC]. If there are some problems it has nothing to do with ownership. It has only to do with management. Management and ownership don't necessarily go together" (McClure, 2009a).

The ETA developed a strategic plan for the years 2007 through 2010 with ambitious targets, including increasing mobile subscriptions to 10 million subscribers, rolling out 10,000 kilometers of fiber optic cables, installing 50,000 public pay phones, and building a next generation network (NGN) core network with 2.4 million capacity. Also, the ETA aimed to provide universal access to communications to 40% of the Ethiopian population within a walking distance of 5km, thereby serving over 15,000 rural villages. These rural *kebele* centers, often found in the most remote parts of Ethiopia, provide telecom services.

These programs have not been successful for numerous reasons. First, the second iteration of the program (2007-10) seemed overly ambitious in light of the fact that the previous strategic plan (2004-06) did not meet all of *its* original targets. The 2004 plan included targets to increased fixed line penetration to 1.7% by 2006 and to expand mobile penetration by 3% in 2006 (Adam, 2007, p. 18). Neither of these targets was achieved. In 2006, mobile penetration was a mere 1.3% and fixed line penetration only reached 1.2% by 2008 (Adam, 2007). The target aiming to increase public telephone access to 5,000 locations and make phone services available to 10% of the population within a walking distance of 5km was achieved, with public phone access rolled out to 4,764 villages by 2006.

Secondly, the ETC's focus on infrastructure rollout has had a negative impact on the quality of the existing telecommunications service (Adam, 2007, p. 10). The regulator has proven to be too weak to enforce quality of service targets, to set effective tariff rates, and to carry out its primary functions. The absence of private sector participation in building out infrastructure and providing services has negatively impacted the entire telecommunications environment. Building out infrastructure is necessary, but if quality service cannot also be provided, it defeats the purpose.

An ICT policy document was adopted by the Ethiopian Council of Ministers in 2002 and has undergone subsequent revisions and updates. However, since the government wrote this document without the input of civil society, it lacks any clear perspective on how members of civil society and private sectors can engage in the implementation of the plan. Additionally, while outlining the need for ICTs in society, the document does not clearly address any specific strategies for achieving said outcomes (Adam, 2007). For example, strategies listed in order to achieve the goals and objectives of the government's ICT policy include, "Promote and facilitate the participation of civil societies and communities in ICT development, "strengthen institutional capacity in government, education institutions, and in the private sector to develop ICT services," and "promote bilateral and multilateral cooperation with organizations involved in the development and promotion of ICT" (Ethiopia ICT Development Agency, 2002, p. 10). While these 'strategies' sound good on paper, the government does not actually provide any actionable and specific follow-up steps to meet these goals.

The Ethiopian government's ICT initiatives have primarily focused on building a national broadband network and interconnecting the nation's high schools (known as

SchoolNet), district level government offices (known as WoredaNet), and village government centers. These initiatives are supported by the World Bank and the African Development Bank (WoredaNet) and the UNDP (SchoolNet). While laudable, these initiatives run the risk of furthering the urban-rural digital divide. As stated in a World Bank report, "Of the schools that do have computers, most of them are in Addis Ababa, thereby creating a major rural-urban divide should the strategy be implemented within the current context" (Hare, 2007, p. 5). Additionally, the government has narrowly focused on minimal Internet-based solutions, seemingly ignoring the potential use of mobile phones for improving the educational sector and government.

The absence of a well-defined and detailed strategy, a rural connectivity program that has fallen short of many of its original goals, and an under-educated civil society incapable of accessing mobile services has led to Ethiopia lagging behind nearly every African state in being able to participate in the global information society. Factors hindering the development of Ethiopia's ICT sector include the absence of both a private and competitive ICT market and a strong, independent regulator, as well as the absence of sustained institutional and political support and capacity-building initiatives to develop the skills of both employees and users.

Ethiopia qualifies as a predatory state, where demands cannot be met and the environment is riddled with inefficiencies (Singh, 1999). Currently, the benefits of ICTs only accrue to a select minority – primarily those in the capital with the financial means to own a mobile phone. There is a growing gap between the demand for mobile phone service and the capacity of the state to meet those demands. Also problematic is the state's unwillingness to involve civil society in devising policies and delivering

services to rural areas. In section 4.7, below, the weakness of Ethiopia's civil society will be detailed in depth.

4.6 The Needed Next Steps: Liberalization and Opening Markets to Private Sector Competition

Despite witnessing the transformative power that privatization and liberalization has had on the telecom sectors in other African nations, Ethiopia has not made any significant moves to do the same. This primarily stems from failed attempts in the past to open up the sector, as well as a fear that the state will cede much of its control in delivering services to private interests. In 2002/03, the government attempted to partially privatize the ETC by offering a 30 percent share to the highest bidder. However, the government did not receive any bids that it was willing to accept, and, thus, this attempt at opening up the ETC failed. Additionally, the absence of strong civil society organizations intent on pressuring the government to open markets has enabled the government to take its time and feel less accountable to its constituents.

Wu (2008) describes the challenge that materializes in countries like Ethiopia when the state still operates communications services, arguing, "If communication operators…are still owned by the government, then the regulator is likely to be hostage to their concerns" (p.769). This has proven to be true in Ethiopia, where the ETC remains beholden to the state. By not opening the ICT sector to competition, the state is preventing the ICT market from growing and experiencing the benefits of competition, which includes faster growing markets, lower costs, and a better responsiveness to consumers' needs (Wellenius, 2006). Dobek Prater, a telecom analyst at Africa Analysis, confirms that the absence of competition is stifling investment and growth in Ethiopia,

stating, “As long as the government remains the sole owner of telecoms operators in the country, we are unlikely to see high levels of investment, particularly given the fact that the Ethiopian government is not one of the wealthier in Africa” (Wanjiku, 2010).

Table 15, below, summarizes many of the factors inhibiting growth in Ethiopia and the subsequent impact on society.

Table 15: Factors Inhibiting Growth in Ethiopia and the Impact on Society

Factors Inhibiting Growth	Impact on Society
- No independent regulator	- ETA is too weak to enforce quality of service targets - Inefficiency - ETA is beholden to the state’s interests
- Telecommunications sector is closed to competition; only operator (ETC) is state-owned	- Less incentive to build out infrastructure, thereby hindering growth in coverage - Less incentive to improve quality of service because there are no alternative service providers for people to switch to - No private sector participation or foreign investment to stimulate growth - Limited coverage, perpetuating the urban/rural divide - Market growing more slowly - Less innovation
- Poorly implemented strategic plans that are too broadly described in policy documents and lack specific and achievable goals	- Not meeting all targets to increase mobile penetration - Minimal involvement of civil society to identify their needs
- Low technical and institutional capacity of civil society	- Exacerbates socioeconomic poverty - Lack of skills and training - Less innovation
- Weakened civil society is not involved in policymaking	- Excluded from participation in developing policies and providing feedback to politicians, which results in

	weaker policy documents - Policy does not adequately speak to diverse needs of citizens - Little support for rural enterprise and entrepreneurship

Despite these factors retarding the growth of the telecommunications sector, the Ethiopian government has recently demonstrated a willingness to partially liberalize peripheral service areas. The ETA issued Proclamation No. 281 in 2002, which allowed for the issuance of licenses to private companies for telecenter or resale services, telecom exchange installation or maintenance, and cabling installation and maintenance (Federal Negarit Gazeta, 2002, p. 1782). While this is a good first step towards reformation of the sector, it is not enough. Hartley and Murphree (2006) note, "Ethiopian leadership intends to liberalize downstream services without having to first divest itself of ownership" (p. 9). In other words, the state wants to gain revenue by introducing competition into the value-added market, but it doesn't want to extensively reform the sector. From the state's perspective, any attempts at greater reformations could compromise the ETC's control of the market and profitability.

Interestingly, the government appears to be slowly moving towards liberalizing more telecommunications services. In February 2010, a bid from France Telecom, the French state-owned telecommunications provided, was selected by the Ethiopian government to take over the management of ETC. Many experts and officials who have been critical of Ethiopia's failure to open its telecom sector welcomed this partnership (Giorgis, 2010). It is expected that France Telecom will undertake many reformations of ETC's current operations, including the creation of new services and markets and

improvements in the maintenance of infrastructure. The Ethiopian government has also welcomed the support of Chinese telecommunications equipment provider ZTE in expanding its fiber optic network. Fiber optic networks are able to transmit information much faster than electrical transmissions over copper wire. In 2006, ZTE pledged to lend ETC US$1.5 billion in vendor financing to provide network equipment and services in efforts to upgrade the nation's telecom infrastructure. ZTE has also undertaken steps to train Ethiopian engineers and other staff so they will be able to maintain the network once ZTE leaves Ethiopia (ZTE Technologies, 2009). Without the involvement of the Chinese, the government of Ethiopia would not have been capable of undertaking such massive infrastructure projects.

This new attempt to open up the telecom sector by having France Telecom manage the ETC is a first step in liberalizing the entire sector. Given the state's resistance to liberalization in the past, it will be interesting to see how willing they will be to relinquish control of certain parts of the sector. Most recently, the ETC signed a deal with SEACOM, a privately funded undersea fiber optic cable system that will provide broadband to countries in East Africa, for Ethiopia to connect its domestic network to the fiber optic network (SEACOM, 2010). It is expected that the price of voice and data services could lower with this new method of connectivity.

While these partnerships can help positively contribute to the growth of Ethiopia's telecom and ICT sectors, there are negative implications as well. Foreigners can potentially displace local firms, manufacturers, and laborers. Also, once ZTE completes its work upgrading Ethiopia's telecommunications equipment, the Chinese "will have the monopoly position to deliver spare parts and related after-sale services for

years to come, perhaps at a price much higher than the market supply price for similar quality product" since Chinese products are often not easily compatible with others (Geda, 2008, p. 7). Geda (2008) further notes that the ETA appears more concerned with short-term issues related to the expansion of the telecommunications infrastructure, and has not given long-term issues concerning cost, quality, and operations into consideration (p. 7).

In March 2010, Canadian firm Technology Strategies International, in partnership with BroadGroup TMT Ventures, published a study predicting that the ETC will have a privatization timetable in place by 2011. The study claims that over the next five years Ethiopia could see a growth in mobile subscribers by a rate of 43% annually (TSI, 2010). These conclusions appear to be optimistic at best given the country's prior history. However, the steps taken by the ETC to slowly open telecommunications services to foreign participants are encouraging.

4.7 The Weakness of Civil Society

At the same time, the organization of individuals to form active civil society associations is weak. Civil society suffers from "low technical and institutional capacity," as well as poor education and a distrust of the government stemming from years of civil unrest (Adams, 2005). As Hyden and Hailemariam (2003) argue, "Neither the social structures nor the institutional setting [in Ethiopia] is congenial to the growth and sustenance of a civic tradition" (p. 215). The absence of strong community-based organizations is detrimental to the development of Ethiopian civil society, as such organizations "provide the advantages of source proximity, trust, and locally contextualized knowledge" (Pigato, 2001, p. 27).

One can glean a better understanding of the current state of civil society in Ethiopia by tracing its development. Civil society groups and organizations were

commonly found under the imperial regime. In larger cities, such associations would typically be comprised of professionals, such as lawyers, or students. In rural areas, farm cooperatives also developed (Hyden & Hailemariam, 2003). However, during the Derg period (1974 to 1991), Ethiopians had little choice about how to participate in civil society since the Derg took over or banned most civil society entities (Clark, 2000). While smaller self-help organizations cropped up at this time, these types of associations did not have a broad-reaching impact on society. Once the EPRDF came into power, Ethiopians were allowed to voluntarily join associations; however, the state was cautious about what types of organizations could exist and concerned about the motivations of group members. Hyden and Hailemariam (2003) note that civil society associations are cautioned against challenging the status quo and the political establishment. Those that have risked going against the government and engaging in political agitation have been punished by imprisonment, forced exile, or even execution. Thus, the government has a heavy hand in determining what civil society can openly do and say; those engaged in promoting their group's interests must be aware of the risks being taken in doing so.

Stronger civil society organizations exist in Addis Ababa, but they have primarily been interested in preventing government corruption, promoting a transparent election environment, and civic education of the election process (Gilley, 2010). While these actions are laudable, there has not been similar movement from civil society in rural or urban areas to pressure the government for increased access to ICTs or for the promotion of alternatives livelihoods not dependent on subsistence agriculture. The government launched a Public Sector Capacity Building Program (PSCAP) in 2005 that includes a provision to accelerate "the deployment and exploitation of ICT within the civil and

public service for efficient and effective service delivery" (Ethiopian Ministry of Capacity Building, 2006, p.5). Yet this initiative is driven by the government, and thus will be more responsive to their needs and wants than the interests and needs of civil society. As mentioned above, while the government acknowledges the need to build a stronger civil society, they have not outlined any specific steps to achieve this goal. In a 2004 document produced by the Ministry of Capacity Building, it is noted that, "government institutions are major stumbling blocks to releasing civil society organizations (CSO) energies to achieve development objectives. The current institutional environment for CSOs can only be described as 'disabling' in the sense that the laws, directives, and institutional framework governing the regulation of CSO activities impose heavy bureaucratic demands, and constrain CSOs in their ability to mobilize and control the resources they require to undertake development activities" (Ethiopian Ministry of Capacity Building, 2004, p. 16).

One would assume that international NGOs could step in to foster the abilities of civil society organizations and to support the growth of local development initiatives. Partnerships that develop between international NGOs and members of civil society on the ground can make a huge difference in providing expertise and resources that the government cannot. However, Ethiopia adopted the Charities and Societies Proclamation in January 2009, a law that bars 'foreign organizations,' defined as groups that receive more than 10 percent of their funding from outside Ethiopia, from conducting any activities or initiatives related to human rights issues, including issues pertaining to women, children, and the promotion of good governance (Feingold, 2010). The government's move to repress many facets of civil society and the work of international

organizations further hinders the possibility of strengthening the abilities of Ethiopians to pressure their government for access to telecommunications service, not to mention other sectors. While the motivation of the government to pass this law appear to be an attempt to prevent outside organizations from encouraging political agitation and to increase the openness of NGO work in the country, in essence, it hinders many charities and organizations from promoting initiatives intended to assist in the economic and political progress of the country. Regarding this legislation, Mary Robinson, former UN High Commissioner for Human Rights, stated, "I am very concerned about this legislation. It is regrettable to have legislation which might close the enabling space for civil society because it is actually part of the development of a country" (IRIN Africa, 2009). In 2004, there were 675 registered NGOs in Ethiopia, with 20% of those organizations considered international (Clark, 2000). With so many NGOs actively working in Ethiopia, this legislation is major setback and only further hinders the development of civil society.

4.8 Conclusion

While efforts to build out network infrastructure are essential to improving service coverage, the state also needs to design policies that address building the capacities of civil society. The liberalization of the telecom sector must go hand in hand with the development of civil society, because Ethiopians need to develop the skills and abilities in order to effectively use and experiment with technologies. Additionally, the government needs to more aggressively address the urban/rural divide. The rural connectivity programs initiated by the state have primarily aimed at providing schools and community centers with Internet connections, overlooking the crucial role that mobile could play in providing the rural poor with access to information and

communication. Furthermore, it will take government intervention, in the form of sector liberalization and the privatization of ETC, to close the widening inequalities that exist between the urban ICT users and the rural non-ICT users. Priority also has to be given to improving the state's educational system and to training the current and next-generation of Ethiopians to participate in the global information society. The ETC is attempting to upgrade its training center into an engineering college and Addis Ababa University offers graduate level technical programs. Given that most Ethiopians currently attend school for an average of eight years (see Table 12), it will continue to be a struggle to educate the current and next generation of Ethiopians.

There is evidence of small-scale ICT4D projects that have taken place in Ethiopia, although these initiatives are piecemeal and have not been replicated on a larger scale in the country. UNICEF used a platform called RapidSMS on mobile devices to coordinate the distribution and maintenance of food supply in its feeding centers. The Ethiopia Commodity Exchange is a system that delivers voice- and SMS-based market information to farmers and traders (Duga & Getachew, 2009). These smaller initiatives are difficult to replicate, however, because so much of the country is not covered by a mobile signal. Compounding this problem is the government's resistance to allowing the private sector to enter the market and its new legislation restricting the work of NGOs and international organizations.

This case demonstrates how the state's unwillingness to fully open the telecommunications sector to competition, the provision of policies that lack specific strategies to achieve development goals, and the weakness of civil society to pressure the government for change have hindered growth in Ethiopia. While the telecommunications

sector is just one of many important sectors in the country, the growth of this industry could benefit other existing sectors, as well as pave the way towards new livelihoods for a society overly dependent on subsistence agriculture. Ultimately, civil society suffers from an inability to access information and knowledge critical to personal development and improved livelihoods. The pace of development in the telecommunications sector, like many other sectors in the country, will not accelerate until the government chooses to move beyond offering piecemeal restructurings and instead focus on more comprehensive approaches to development with specific and attainable goals.

The current state of the telecommunications sector in Ethiopia is representative of many other sectors, from agriculture and basic infrastructure to disease management, that are unable to grow due to the predatory nature of the government. As McNamara (2003) claims, "The presence or absence of ICTs is a symptom, not a cause [of poverty]. And the underlying causes of persistent poverty often have little to do, except indirectly, with the supply or absence of ICTs" (p.4). Since the majority of Ethiopians participate in the agricultural sector and dwell in rural areas, they stand to greatly benefit from increased access to mobile services. As Bhavnani, et al. (2008) have argued, the benefits associated with mobile phone services in rural areas is often found to be of higher value than the benefits accrued in urban areas. Imagine if the farmers in Ethiopia were able to reduce their time traveling to markets, increase their access to market information, and learn how to better manage their crops. These were benefits realized by the farmers in Uganda mentioned in Chapter 2 once they were given access to mobile services. However, the existing informational and infrastructure constraints will prevent the rural poor from realizing these possibilities.

4.9 Case 3: The On Cue Compliance Service in South Africa

The third case in this thesis will examine what happens when an ICT4D project using mobile phones is rolled out and institutional decision-making is streamlined from the top-down, but weak participation and little buy-in from stakeholders on the ground results in weak project implementation. Ironically, for the amount of literature that references the multitude of ICT4D project failures in passing, there are very few studies that actually detail why such projects were unsuccessful and to what degree they did not reach their intended outcomes. The lack of specific case studies on projects that were not sustainable or replicable has made it challenging for policymakers, practitioners, and scholars to make comparisons between what works and what does not work on the ground and to learn from past errors.

The following case study highlights the pivotal role that mobile technologies are now playing in the healthcare sector, commonly referred to as the m-health field. Innovations in the fields of disease tracking, data collection, telemedicine, and patient monitoring using mobile phones are transforming how medical care is being provided to the most marginalized members of society (see Appendix A for more examples). The On Cue Compliance Service demonstrates one such way that mobile technologies are being deployed to improve patient care.

This particular project demonstrates that even with an enabling environment conducive to the use of mobile phones in urban areas, a lack of initiative to cultivate strong multistakeholder partnerships during a project's rollout makes it challenging for projects to be sustainable and scalable. Since this was a pilot rollout of the On Cue Compliance Service, the outcomes of the trial highlight key areas, such as building

relationships and providing on-going training, that can be improved upon to bring the project to scale. The absence of dialogue between partners resulted in a poorly implemented project; drawing on lessons learned from the trial, however, leaders were able to revise aspects of the project and make it more inclusive of end users.

Information regarding the high incidences of disease and poverty in South Africa will be presented will first be presented, followed a discussion of the telecommunications environment. Then, the implementation and outcomes of the pilot project will be described in detail.

4.10 Setting for the Project: Cape Town, South Africa

High rates of disease combined with high rates of mobile penetration and ownership make South Africa an ideal setting for m-health projects. South Africa is classified as a middle-income country; yet despite strong economic sectors, unemployment and poverty is high across the state.

Cape Town, a large metropolitan city in the southwest, is the legislative capital of South Africa and the capital of the Western Cape province. The population during the pilot project was less than 3 million[6]. According to the 2001 National Census, 46.6% of the city's population is under the age of 24, nearly 20.0% of the population is unemployed, and 38.0% of residents have completed high school. Compared to the majority of African nations, South Africa ranks higher according to the human development and human poverty indices. The indicators below provide a snapshot of life in South Africa, a country with a highly developed ICT sector, but riddled with high incidences of disease and unemployment.

[6] The population of Cape Town in 2007 was estimated at 3,497,097.

Table 16: Basic Indicators (South Africa)

Population	48.69 million (2008)
Fixed telephone lines (2008)	4,532,000
Fixed telephone lines per 100 inhabitants	9.3
Mobile subscriptions (2008)	45,000,000
Mobile subscriptions per 100 inhabitants	92.2
Mobile subscriptions population coverage (2007)	99.8%
Internet users (2008)	4,187,000
Internet users per 100 inhabitants (2008)	8.6
Life expectancy in years	50 (2007)
Primary completion rate	84%
Prevalence of HIV, total (% of population ages 15-49)	18.1% (2007)
GDP (Billions US$)	276.76 billion
Human Development Index, 2007	0.683 (129 out of 182 countries)
Human Poverty Index, 2007	25.4 (85 out of 135 countries)
Adult literacy rate (aged 15 and above), 2007	88.0%
GDP per capita (US$), 2007	9,757
Unemployment, ages 15 – 65 years	23% (2007)
Population living below $2 a day (%), 2000-2007	42.9%

Sources: ITU, The World Bank

In contrast to Ethiopia and many other countries, South Africa has an advantage due to its high mobile penetration rate. This puts it in a strong position to be a place where mobile development pilots can be tested since most areas of the country are covered by a network signal and most people have access to and can afford mobile services.

4.11 An Overview of the Telecommunications Sector

In South Africa, one of the fastest growing mobile markets in the world, nearly 100 percent of the population has cell phone coverage. At the time of the pilot, in June 2004, there was a competitive market with three operators (Vodacom, MTN, and CellC) and mobile penetration was estimated to be almost 19%. Hüsler (2005), in her analysis for Bridges.org, estimated that 65% of people living in Cape Town owned a mobile phone. This growth in penetration and coverage was possible due to government initiatives that began in the mid-1990s.

Following the 1994 democratic elections in South Africa, the government undertook sweeping reforms of the telecommunications sector, which culminated with the passage of the Telecommunications Act of 1996. This act established an independent regulator, the South African Telecommunications Regulatory Authority (SATRA), in 1997. As per the ICASA Act of 2000, the regulation of the telecommunication sector and the broadcast sector (previously regulated by Independent Broadcasting Authority) merged under a single independent regulator and the Independent Communications Authority of South Africa (ICASA) was established. The presence of an independent sector regulator makes South Africa in compliance with its WTO GATS commitments (Esselaar, et al., 2006, p. 10).

The ICASA Act was replaced by the Electronic Communications Act (ECA) of 2006, which "seeks to create a regulatory framework and licensing regime better suited to the convergence of broadcasting and telecommunication infrastructures and to Next Generation Networks and services" (Esselaar, et al., 2006, p. 15). However, at present ICASA's decision-making abilities have been hindered by changes in the composition of

its council, making the implementation of new regulations difficult. Many have seen ICASA's incapacity as a stumbling block (p. 21).

Vodacom and MTN were licensed as mobile operators 1994, while Cell-C was introduced as the third competitor in 2001. The telecommunications network is 99.9% digital (unlike Ethiopia, which is still converting its networks). The liberalized market continues to see growth as operators offer more competitive mobile packages to customers. At the same time, Esselaar, et al. (2006) note that the mobile market has been based on brand competition rather than price competition, and the multitude of packages available to consumers across the mobile networks is so complex that it can be challenging for consumers to determine which package is the best deal. The high cost of mobile services has hindered some from being able to own a phone, but "the convenience and flexibility of pre-paid mobile services (lack of credit checks, and a pay-as-you-go system) have clearly spurred adoption on a massive scale" (Gillwald, 2005, p. 477), as evidenced by the fact that there are 45 millions mobile subscriptions in South Africa. Many South Africans who had previously used the formerly monopoly provider Telkom[7] for fixed line service were charged high post-paid bills that they could not afford, resulting in their disconnection from the service. Even though the cost per minute on a mobile phone may be higher than using a fixed line, South Africans prefer the pre-paid feature that enables them to effectively budget their airtime use.

While the Department of Communications has identified the need to reduce the cost of communications, little headway actually been made in doing so (Esselaar, et al.,

[7] Telkom is the semi-privatized telecommunications incumbent operator. The South African government sold a 30 percent stake in Telkom after the 1996 Act. Telkom is frequently criticized, as many see its monopoly of the market and the government's stake in the company as not in the best interest of the public.

2006, p. 12). The mobile operators have not aggressively pursued the adoption of any BOP business models, perhaps out of concern that such models would not generate as much revenue. High costs have detrimental effects on both private individuals and businesses in their abilities to own mobile phones. Gillwald (2005) notes that telecommunications reforms in South Africa have emphasized privatization "at the expense of other reform mechanisms – including competition and, in particular, regulatory measures" that have negatively impacted affordable access to service (p. 469). At the same time, the tremendous number of subscriptions reveals that the majority of South Africans are clearly willing to pay higher prices up front in order to have mobile service, revealing the high value placed on communications services by citizens.

Uptake in Internet usage has also been negatively impacted by high service charges and anti-competitive practices by Telkom (Gillwald, 2005, p. 471). There are only 4,187,000 Internet users out of a population of nearly 50 million. The government is spearheading efforts to increase penetration. In 2008, the Cabinet approved laws to facilitate the formation of Infraco, a state-owned company that will provide broadband capacity through fiber optic cables to other telecom providers in the country (SouthAfrica.info, 2008) and the Internet in South Africa continues to slowly grow.

4.12 Trial Test of the On Cue Compliance Service

The On-Cue Compliance Service was designed to test a system that enables healthcare providers at local clinics to send patients text messages reminding them to take prescription medications. Dr. David Green, a South African-based doctor, identified the need for an alternative, cost-effect model to increase patient adherence to tuberculosis (TB) drug courses, as patients often forget to take their medicine. The objectives of the

program included decreasing the burden on already overloaded clinic workers and improving compliance with the drug regimen, which could result in a reduction of TB mortality over time.

In South Africa, the rates of TB are staggering. There were 960 incidences of TB per 100,000 people in 2008 (WHO, 2009). By comparison, in 2008 the WHO estimated that the global incidence rate for TB was 139 cases per 100,000. Uganda had an incidence rate of 310 cases per 100,000, and Kenya had 330 cases per 100,000.[8] In Cape Town alone, the site of the pilot, the city has seen a 66% increase in the number of reported TB cases between 1997 and 2003 (Cape Town TB Control, 2004).

TB is a contagious but curable disease, and treatment requires that those affected adhere to a strict course of TB drugs taken once a day, five days a week, for six to eight months. The drugs are typically given out by a directly observed therapy system, known as DOTS, where a patient comes to the clinic in person and a healthcare worker watches the patient ingest the pills. The DOTS program is obviously burdensome – requiring that the patient travel to and from the clinic and miss time from work or school, while also taking the healthcare worker away from other duties to administer medicine to the patient. That said, following the drug regimen is essential if a patient wants to successfully treat the disease. If patients miss doses, they risk becoming drug-resistant to the treatment. In Cape Town, the city provides free medicine to TB patients (Baldwin & Thomas, 2005).

Under the trial, which began in 2002, all 138 patients participating in the On Cue pilot already owned mobile phones and had network coverage. They were skilled in

[8] As a comparison, in the United States, there were 4.6 TB cases per 100,000 people in 2006.

using their mobile phones for sending and receiving texts. The system works as follows: The names and mobile phone numbers of TB patients are entered into a database. Every half hour, the server sends personalized messages to those patients reminding them to take their medication. Patients can receives texts in one of the three official languages of the Western Cape province: English, Afrikaans, or Xhosa (a Bantu language widely spoken in South Africa). After receiving the text reminder, the patient should promptly take the TB medications. Over 800 different types of messages were used during the trial and patients were likely to receive different messages throughout the day, including basic reminders, tips for healthier lifestyles, and jokes (Hüsler, 2005). Table 16, below, identifies the various stakeholders involved in the pilot project. The City of Cape Town Health Directorate provides the drugs for TB treatment and is primarily interested in increasing the cure rate and finding a more cost effective way of treating TB. The Chapel Street Health Clinic, an inner-city health clinic, was selected as the site for the pilot project. Clinic staff members were interested in finding new ways to increase patient adherence to the TB drug regimen; they were also excited that this service could give them more free time to complete other tasks, since administering DOTS is very time intensive. Finally, the TB patients were also eager to try this new system, as it would reduce the time they have had to spend missing work or school to travel to and from the clinic for treatments.

Table 17: Identifying Stakeholder Needs

Stakeholder	Stakeholder Needs
City of Cape Town Health Directorate, TB experts and managers	- Want to see higher cure rates than the current rate under DOTS, which would indicate higher rates of

	patient adherence to the drug regimen - Lower costs of providing treatment (more cost-effective)
On Cue Compliance Service	- Find a cost-effective, alternative method to DOTS
Chapel Street Health Clinic staff members (including physicians, nurses, and healthcare professionals)	- Free up more time for other duties - Increase patient adherence
TB patients at Chapel Street Health Clinic	- Reduction in travel costs and time, do not have to leave work if holding a job

4.13 Outcomes of the Pilot

Unlike many M4D pilots in SSA, access to and the use of mobile services was not a problem during the pilot rollout. It was also affordable, as patients were not charged for receiving text messages. Patients were already adept at using their mobile phones for sending and receiving text messages, so they did not have to be burdened with learning how to use a new technology. Patients were also eager to participate in the trial, as this would free up time in their daily schedules that had previously been spent traveling to and from the clinic.

Cost was also not a factor preventing the system from working effectively. The city provides TB medications for free in Cape Town. The cost of administering the medicine via On Cue at US$16 per patient per year was cheaper per day than the cost of patients under DOTS.

Despite this enthusiasm, many factors hindered the success of the pilot.

International NGO Bridges.org's independent analysis of the On-Cue rollout, completed in 2005, highlights how the absence of regular feedback and dialogue between and amongst stakeholders resulted in a weakened project. First, no needs-assessment or ethnographic work was conducted prior to the rollout of the program. Thus, the technology and service were 'dropped' into the laps of both healthcare workers and patients, without much instruction or consultation beforehand. While skilled in using mobile phones, the patients could have benefited from consistent reminders about what to do when they received text messages from On Cue. These factors are not attributed to failure on the part of the government. Rather, it appears that the On Cue service providers, the clinic staff, and the patients could have benefited from the presence of a local intermediary to ensure that the technology was being properly used, to mitigate problems like inappropriate use, and to serve as a cultural interpreter for understanding community needs.

If the project's designers had completed more aggressive background work prior to implementing the program, the likelihood of gaining buy-in from workers would also have been stronger. It was found that clinic workers lacked a strong sense of ownership for the project, and could have benefited from having more information and knowledge about the purpose of the project and how their help was needed to make the project successful (Hüsler, 2005). The consultant determined that many of the staff members felt that if their needs had been included in the beginning, "there may have been a greater sense of ownership among staff, engendering a greater level of conscientiousness about running the Service in the clinic" (p. 30). There was no champion for the project at Chapel Street, and a lack of ownership for the project from the perspective of the

healthcare professionals materialized. No one at Chapel Street acted as a project manager for the pilot rollout. Thus, there was no clear procedure for what to do when problems arose or who was responsible for particular management duties.

There was a disconnect between the city of Cape Town, the staff of On-Cue, and the clinic, resulting in a lack of continuous interaction and dialogue between the various stakeholders (Hüsler, 2005). Without consistent communication, it was challenging to get feedback from the stakeholders about what was working and what facets of the program could be improved. This highlights the need for monitoring mechanisms to be built into the service that enables the clinic staff to provide the city's TB program with constant feedback.

Additionally, many TB patients at Chapel Street were not using the On-Cue system properly. Since patients are self-supervised under the system, it is more challenging for clinic staff to ensure that the patients are actually taking their medications at the right time. While patients were familiar with using mobile phones and receiving text messages, there were other factors that came to light regarding how the system wasn't being used properly. For example, patients forgot to tell the clinic if their mobile number changed. Patients were also found to not always take their medicine right after receiving a text (Hüsler, 2005). Without the frequent face-to-face interaction between staff and patients, it appears that many patients failed to keep clinic staff up to date with any changes to their condition and concerns they may have had with using On Cue. Table 18, below, summarizes the pilot's benefits and challenges.

Table 18: Benefits and Challenges of the On Cue Compliance System Pilot

Project Benefits	Project Challenges

- Time saving: patients do not have to travel to and from clinic and do not have to miss work; clinic staff have more time to attend to other duties - More convenient - Technologically feasible – reliable coverage, cost effective, technology is not new or foreign to patients - More cost effective than DOTS (US$16 per day)	- Lack of procedure (no formal written procedure) - Lack of patient monitoring - Inconsistent follow-up with patients - No champion at the clinic to oversee project management, little buy-in from clinic staff - Assumptions made about efficacy of program (rather than first identifying limitations)

It was found that the pilot produced treatment outcomes in line with the clinic's outcomes under DOTS. In other words, patients using On-Cue met outcomes that were no better than the patients using the old system. In the pilot, only one patient out of the 138 total patients was not compliant with taking the medicine at all. While this is not bad news, it did not prove that the On Cue system was more successful at getting patients to adhere to their drug regimen than under DOTS. Table 19 summarizes each stakeholder's needs prior to the pilot and identifies if those needs were met.

Table 19: Were Stakeholder Needs Met?

Stakeholder	Stakeholder Needs	Were Stakeholder Needs Met?
City of Cape Town Health Directorate, TB experts and managers	- Want to see higher cure rates than the current rate under DOTS, which would indicate higher rates of patient adherence to the drug regimen - Lower costs of providing treatment (more cost-effective)	– The cure rates using On Cue were **not** higher than those under DOTS – On Cue was more cost effective

On Cue Compliance Service	- Find a cost-effective, alternative method to DOTS	- On Cue was more cost-effective, but not more effective at patient compliance
Chapel Street Health Clinic staff members (including physicians, nurses, and healthcare professionals)	- Free up more time for other duties - Increase patient adherence	– Clinic staff did appreciate having more free time – Clinic staff did not fully buy-in to the program, as there was no on-site 'champion' to manage the project – Clinic staff were weak at ensuring patients were using the service/taking their medication consistently
TB patients at Chapel Street Health Clinic	- Reduction in travel costs and time, do not have to leave work if holding a job	– Patients expressed appreciation for the time and money saved by not having to travel to the clinic – But patients were not always using the system most effectively

4.14 Project Revisions

To some extent, this project suffered from an "invention-down" approach (Heeks, 2009, p. 5), where technologies are brought into a development context without proper implementation for successful and sustainable outcomes. This is not to say, however,

that the project was doomed for complete failure. By revising the way that the service is implemented, it would be possible for it to be more effective.

After the trial rollout and the independent analysis by Bridges.org, areas that needed to be improved upon to make the On Cue system more successful were clear. First, there is a need for an on-site project manager at the clinic to train staff, problem-shoot, and ensure things were running smoothly. This manager can act as the project's champion and make sure that the staff has bought in to using the service. Additionally, the absence of a clear written procedure provided for much confusion. It was found that by 2004 patients at the clinic were being put straight on the On Cue service without first enrolling in a one-month period of DOTS (Hüsler, 2005). Thus, it is imperative that a written guide with clear directives be created. Additionally, closer monitoring and more consistent follow-up with patients about if they are receiving their SMS reminders and using the service properly will make it easier to discern if adherence levels are higher with the service over DOTS. Finally, the creation of timely communications mechanisms between all stakeholders will help ensure that the project is on the path to meeting its intended outcomes.

Another innovation, SIMpill, has developed out of the On Cue pilot project, taking the lessons learned from the pilot rollout and re-designing and implementing a project that also focuses on medication adherence. According to the company's website, "SIMpill is a proven medication management system that, operating together with [an] appropriate SIMpill device, is programmed with the patient's medication schedule. It will monitor the intake of medication and remind patients and [caretaker] as necessary by sending a text message to the patient and/or [caretaker's] mobile phone if the patient does

not take their medication as prescribed" (SIMpill, 2006). One difference from the On Cue pilot is that SIMpill uses a web-based program to monitor and detect non-compliance. Rolling out the service may not be as feasible in more remote, rural areas that do not have good infrastructure for Internet. Even in South Africa, network coverage is spotty and penetration is low with only 4 million Internet users). So far, SIMpill has proven to be replicable in developed countries with strong network infrastructure, with operations in the United States, the United Kingdom, Belgium, and Australia.

While many ICT4D projects have failed because the technology used did not appropriately match the needs of the end users, this was not the case with the On Cue Compliance Service. In fact, the use of mobile phones was both appropriate and affordable for the TB patients. At the same time, however, this analysis of the pilot highlights how essential gaining the buy-in of all stakeholders can be to implement a project successfully. The designers of the service appeared to have been so eager to test the new system that they overlooked the crucial role of cultivating relationships with the clinic staff and locating a champion to manage the system.

4.15 Case 4: User-Led Innovations in Mobile Technologies across sub-Saharan Africa

While the three previous cases have been quite straightforward, locating a case where there is a strong degree of participatory processes and a weak degree of institutional involvement is nearly a theoretical impossibility. For civil society to have access to use mobile technologies in the first place, the government and institutions will have already had to provide such technologies. What *is* interesting is the novel ways that people are using various ICTs, including mobile telephony, when basic services (such as

telecommunications, electricity, and banking) may not be providing optimal coverage, access, or service. This fourth case will look at improvisations and innovations by, for, and within African communities. First, the use of mobile airtime credits as a form of currency will be described, followed by a detailed look at the practice of "beeping." Then, I will describe how mobile phones have spurred invention from the ground up and have contributed to the rise of citizen reporting, crisis mapping, and election monitoring across various SSA countries.

As Ken Banks (2008) has noted, the poor and marginalized members of LDCs are rarely passive recipients of technology. In efforts to save money and solve common dilemmas, such as a lack of reliable electricity service, members of civil society have devised many innovative solutions. This harkens back to the time in American history when MCI used satellites to get around AT&T and oilrigs in Louisiana put up microwave towers in the 1940s much to AT&T's chagrin (Singh). While Song (2009) asserts that the use of mobiles in Africa is too expensive to easily facilitate experimentation, there have actually been multiple incidences when the development of new services and products came not from operators, but from the end users themselves. In fact, mobile operators are often found to be taking note of end user experimentation and formally adopting their inventions and practices into their own operations.

Mobile Airtime Credits as Currency

In many LDCs, the absence of a formal banking sector has prevented many people from having a secure and efficient way to save, transfer, and remit money to each other. At the same time, more and more people at the BOP have gained access to mobile phones. Interestingly, many people began to use phone credits (credits of airtime on pre-

paid mobile phones) as a form of currency to give money to friends or family members in many SSA countries. In Uganda, the informal service, known as Sente, enabled users to exchange airtime credits as a substitute for remitting cash (Burrell, 2008, p. 24). In Kenya, Safaricom, the dominant provider, started a service that allowed its users to share pre-paid cell phone minutes. While the company thought that users would use the service to send minutes to their families living in rural areas, Kenyans actually used the service to pay for services like taxi rides. This spurred Safaricom to develop M-Pesa in 2007, now one of the most successful and profitable mobile banking platforms (Roettgers, 2009). Similarly, pan-African operator Zain added the "Me2U" service that allows a user to send a text message to charge another Zain user's airtime in a desired amount, which is then deducted from the sender's account (ITU, 2009, p. 17).

Informal banking services are less common now that operators have developed applications that enable mobile phone users to share airtime, as well as other mobile-banking initiatives. At the same time, it took this innovative use of the mobile phone for operators to discover new markets and value-added services for mobile phone users.

Beeping or Flashing

Another type of user-driven service also resulted in mobile operators formally adopting it. In Africa, the per-minute cost of mobile airtime can be very expensive. When users did not want to waste valuable airtime credits to reach another user, they would call another's phone and then hang up after the first ring to indicate that they wanted to talk and for the other user to call them back. This cost-reduction strategy has become commonly known as "beeping," "flashing," or "missed calling." As Donner, who wrote a paper on the subject, notes, "Its roots are as a strategy to save money"

(Heavens, 2007). In 2007, Donner estimated that twenty to thirty percent of all calls in Africa were "beeps." Operators soon caught on and in an effort to reduce the network congestion stemming from widespread beeping, they created official "Call Me Back" services. Customers are given a fixed number of free SMS messages per day when they are out of airtime credit that enable them to request a callback (Banks, 2009).

Invention as a Reaction to Constraints

When faced with common constraints such as limited network coverage or unreliable electricity, mobile phone users on the ground have turned to inventing their own devices to best meet their needs. There have been instances in Uganda and Ghana where villagers have created their own homemade mobile phone charging systems out of battery sets as well (Hersman, 2009a; Berg, 2009). In Kenya, mobile penetration is high, with 42 mobile subscriptions per 100 people, but rural electricity coverage is often uneven, unreliable, and expensive. In Kenya's more urban areas, the penetration rate (the percentage of households with a grid connection) is up to 30%. However, in most rural areas, where the majority of the Kenyan population lives, penetrate rates are below 10% (Parshall, et al., 2008, p. 3). Obviously, the benefits of using a mobile phone are difficult to realize if the phone cannot be powered. Two Kenyan university students invented a device that enables people to charge their phones while riding their bicycles, using a dynamo on the wheel plugged into the mobile phone (BBC News, 2009). Why did this innovation come from two university students, rather than being produced in a mobile phone company's research laboratory? Tim Kelly (2009) argues that it is not surprising, noting that, "the mobile phone company would not have perceived a need for such a device in their own local community which is probably well-supplied with both charging

devices and electricity" (p. 2).

Institutions have recognized the growing importance of tech-related micro, small, and medium sized enterprises in African society. To support the development of this sector, the government of Finland, Nokia, and the World Bank's *info*Dev program partnered to create a new program in 2009 called "Creating Sustainable Businesses in the Knowledge Economy." The program focuses on "enhancing the competitiveness of emerging market SMEs in the information and communication technologies (ICT) and agribusiness sectors in particular. The program will also employ the use of the mobile communications platform to grow content, services and applications for developing countries" (infoDev.org, 2010). This move demonstrates that the involvement and support of institutions is often critical to sustainable development. A series of focus group discussions that include mobile application developers, operators, and others have been held in Uganda and Nairobi to get input from stakeholders regarding the development of a mobile applications laboratory (infoDev, 2010).

Citizen Reporting, Crisis Documentation, and Election Monitoring

In efforts to strengthen civil society, Africans have developed novel applications for citizen reporting, crisis documentation, and election monitoring. These initiatives have arisen in response to media blackouts, the absence of government invention to protect and inform civilians, and citizen concern for transparency and government accountability.

One of the most well known cases was when an open-source platform, known as Ushahidi, was used to amass reports of violence following the 2008 Kenyan elections. In early 2008, violence erupted across Kenya, as many Kenyans believed recent presidential

elections were rigged. There was much confusion and insecurity due to a media blackout. Influential Kenyan bloggers quickly came together to create Ushahidi as a resource for all Kenyans. As co-creator Eric Hersman describes, the bloggers asked each other, "How about a platform that serves as a centralized repository for on the ground reports from any Kenyan via SMS? The ability for people to upload videos and images with some text to a web-based and mobile phone accessible site?" (as cited in Makinen & Kuira, 2008, p. 333). Ushahidi, which means "witness" in Swahili, enables NGOs and individuals to submit reports via SMS or the web detailing acts of violence. There was minimal institutional involvement, as the government had imposed a media ban in efforts to quell violence. Thus, the platform helped to fill a void and provide Kenyans with information vital to their safety and peace of mind. Since its use in Kenya, the Ushahidi platform has been modified and adapted for use in South Africa (anti-immigration violence), eastern Congo (violence), Mexico (election monitoring), India (election monitoring), Gaza War (crisis monitoring), Haiti (post-earthquake), Washington, D.C. (Winter 2010 snowstorms), and Chile (post-earthquake). What started as a project built from the ground up has become a scalable and sustainable nonprofit technology company due to a model platform that can be modified to suit end users' needs. Donations and grants from organizations such as NetSquared, Humanity United, and The MacArthur Foundation have provided over US$250,000 in support of Ushahidi's work (Hersman, 2009d). Omidyar Network has pledged $1.4 million to Ushahidi that will further enable the organization to bring its platform to scale (Hersman, 2009c). Without the financial support provided by these and other organizations, Ushahidi would likely not have the

resources to support its full-time developers and members, and to focus on new initiatives.

In sub-Saharan Africa, the use of mobile phones have been critical in combating voting fraud, monitoring elections, and countering rumors. Katrin Verclas, co-founder and editor of MobileActive, a global network of practitioners using mobile phones for social impact, notes that there are two different ways mobile phones are being used in elections: for a more informal, citizen-generated and crowd-sourced election monitoring and data collection, and for systematic, organized monitoring undertaken by trained volunteers who follow a strict methodology (Verclas, 2009b). Both groups have benefited from mobile technology, as it provides them with a quick way to record and report information and results. Formal and informal mobile election monitoring has taken place in a variety of countries, including Ghana (2008) and Sierra Leone (2007). The U.S.-based National Democratic Institute for International Affairs (NDI) created a simple SMS-based system that is frequently used in the monitoring of elections and the sharing of any voting irregularities. NDI has been a key player in training volunteers worldwide to participate in systematic, organized, data-based monitoring.

Former United Nations Secretary General Kofi Annan applauds the use of mobile phones in ensuring free and fair elections. He stated to CNN on August 25, 2008, "With communication and cell phones, this is where it is difficult to cheat in elections now. You are announced at the district level and cell phones go wild so by the time you go to the capital, if you have changed the Tables, they will know and you will be caught out" (Steere, 2008). Using SMS, participants can share information about vote counts and any irregularities. Democratic activists hope that through increased civilian and independent

media participation, the election process will be more transparent and accurate. Sharing stories, video, and photographs can provide evidence to support more formal observations.

4.16 Conclusions

These examples have demonstrated that even when mobile penetration is high in a particular region, the government may not be actively driving the innovation of civil society applications. The ingenuity of end users likely would not be as necessary if the government would have provided reliable infrastructure and other institutional support in the first place. Table 20, below, provides information about the telecommunications structures and environments of many countries highlighted in this case. Innovations have primarily come from countries with competitive environments and fairly independent regulators. In many instances, user-end innovation was driven by the weakness of other institutional structures – such as banking or electricity supply.

Table 20: Telecommunications Environments in Case Study Examples

Example of Innovation	Location	Telecom Structure and Environment
Mobile airtime credits as currency	Uganda	Competitive environment 5 licensed mobile operators Independent regulator
	Nigeria	4 licensed mobile operators Independent regulator
	Kenya	4 licensed mobile operators Relatively independent regulator
Beeping or Flashing	Multiple	
Invention from the Ground Up	Kenya	See above
Citizen reporting, crisis documentation, election monitoring	Kenya	Freedom of press not guaranteed under the constitution 8 broadcast TV stations 3.36 million Internet users Over 100 AM/FM radio stations
	Ghana	In 2007 – 33 mobile subscriptions per 100

		Independent regulator - Ghana National Communications Authority (GNCA) Full competition in cellular services
	Sierra Leone	Spotty network coverage; election monitors had to travel to areas with coverage to send in reports at the end of the day In 2007 – 14 mobile subscriptions per 100 Independent regulator NATCOM

Sources: ITU, World Bank

When it comes to users who are living in isolated rural areas that are often off the electrical grid, it may not matter that there are competitive mobile operators that are supported by an independent regulator in the country as service coverage and access are still spotty. The case presented in Chapter 2 about the Grameen Foundation's initiatives showed how the active participation of a mobile operator (MTN) to facilitate initiatives can benefit the end users. On the other hand, when it comes to end users who have not yet benefited from universal access initiatives or other interventions to build out basic infrastructure, they often depend upon their own resources to meet their needs.

In Kenya, the Ushahidi platform arose as a way to share information in light of a government-imposed media blackout. Many Africans began to share airtime credits since they lacked a formal way to transfer money to one another. Due to high costs of service, mobile airtime became a valued currency amongst users. The practice of beeping was often employed to save money, while charging kiosks were created in response to users' inability to charge their phones at home. If access had been more affordable, and infrastructure more reliable, it would have been easier for people in SSA to access services and power their phones. As the cost of mobile services continues to decline in many states, the possibility that more people will be incited to experiment and innovate

with their mobile phones and related applications increases.

Interestingly, the cases presented in this chapter include a country with one of the lowest mobile penetrations worldwide, Ethiopia, and a country that has seen the tremendous uptake of mobile telephony, South Africa. In Ethiopia, the weakness of civil society has resulted in minimal pressure on the government to reform the telecommunications sector. Without access to mobile telephony, most Ethiopians have not been able to reap the benefits that many other Africans have accrued from using mobile phones. The examples shared in this chapter's third case demonstrate how end users, in the face of constraints, can devise novel solutions to meet their own needs. The outcome of the trial rollout of the On Cue Compliance Service provided evidence that while innovative solutions can come from the top-down, in this case a mobile-based health application, the buy-in of stakeholders on the ground and the presence of individuals ensuring proper project implementation can influence an initiative's success.

CHAPTER 5

CONCLUSION

"Wireless communication is no panacea for development. But development projects, from all corners of the planet, are embracing the potential of new technology and are using it for their own purposes according to what they are able to achieve." – Manuel Castells, et al. *(2007)*

The idea for this thesis began with a simple question: "With so much hype surrounding the potentially transformative power of mobile telephony in least developed countries, is its presence really making a difference in the livelihoods of the poor?" The trend in launching m4D initiatives has drawn more attention to the work of the private sector and aid organizations in sub-Saharan Africa (for example, see *The Economist's* special September 2009 issue), and the media is frequently releasing updated statistics about the growing number of mobile phone subscribers in Africa. At the same time, it has been challenging to find firm evidence of the direct effect of mobile telephony on the improvement of livelihoods on the continent due to the absence of a strong body of research devoted to the subject area.

Macro-level data has provided evidence that increases in mobile penetration rates can contribute to economic growth (Roller & Waverman, 2001; Djiofack-Zebaze & Keck, 2008; Stone, 1991; Hosman, et al., 2008). But what does this data actually mean on a more micro-level, and how does it resonate with evidence on actual improvements in human development? What do these conclusions about economic growth mean for a rural farmer in Uganda? What approaches to development initiatives that incorporate the use of ICTs are most likely to be successful, in terms of sustainability and scalability?

5.1 Theoretical Contributions

The arguments made in this thesis attempt to show how the technical dimension

of using mobile telephony in development initiatives must carry equal weight to the often overlooked social dimension that looks at who receives the phones, how phones are being used, and what impact their use has on lives and livelihoods. Poverty is experienced differently when the poor have access to mobile phones, and these devices are tools that enable human development. These case studies demonstrated that while mobile phones can play a part in facilitating development, it is the end users, with the support of institutions, that actually drive change. This thesis has helped to more clearly identify factors and best practices that impact the design, implementation, and scaling of projects. In order to pursue project sustainability, it is critical to recognize local recipients as equally valued stakeholders in the process. Equal attention must be given to cultivating effective partnerships between stakeholders who will likely have diverse expectations and incentives.

Many critics have questioned the level of priority that should be given to rolling out ICTs in LDCS, asking why the focus should be on the provision of telecommunications and building out networks when more urgent and pressing issues such as education, healthcare, and security should be at the forefront.[9] Skeptics are known to argue that ICTs are a luxury that the poor cannot afford and may cause further divisions between the rich and the poor rather than promote inclusivity. Others cite frequent project failure or misguided design as a reason to abandon ICT4D initiatives altogether in favor of other approaches (Gunawardene, 2005). However, as argued in

[9] Perhaps the most well-known of these critics is Microsoft founder Bill Gates, who, at a 2000 conference on the digital divide, asked, "Do people have a clear view of what it means to live on $1 a day? About 99% of the benefits of having a PC come when you've provided reasonable health and literacy to the person who's going to sit down and use it" (Verhovek, 2000).

this thesis, the provision of ICTs can be interwoven into other systems of development, rather than simply being viewed as inputs that further divide the have from the have-nots. Mobile services and products can deliver new opportunities and spur development (Verclas, 2010), and are most effective when integrated into programs that target basic needs. As the case studies have demonstrated, a variety of services and products offered via mobile devices have led to growth in the financial, healthcare, job, and education sectors (see Appendix A for other examples of M4D initiatives). A more optimistic approach acknowledges that technology itself cannot directly eradicate poverty, but the use of ICTs in a productive manner that is sustainable and scalable can contribute to improvements in human development in both the short-term and long-term.

The deployment of ICTs and initiatives to increase the penetration of mobile phones in less-developed countries is a means to an end, but not an end in and of itself. The mobile phone is a multi-functional tool and, in the right context and appropriate environment, it can effectively contribute to the alleviation of poverty. While there are multiple dimensions to the role of new technologies in poverty reduction, this thesis argues that when ICTs (e.g. mobile phones) are effectively and appropriately integrated into a human development initiative, they can increase the reach of the project and thus that project's effectiveness. It is ultimately not about the technology itself, but how it is used.

This thesis does not attempt to present the mobile phone as a magic bullet, missing link or cure-all. Mobile phones, like any ICT, can enable development, but will not directly bring it about. What *has* been argued is the need for a paradigmatic shift away from the mainstream, western model that has been historically focused on and

driven by the transfer of technology from the top-down to the marginalized at the bottom, to a new model that attends to the end users' needs. This necessitates shifting away from the status quo and reconceptualizing attempts to improve livelihoods as being driven by strategically built multistakeholder partnerships that balance the intervention of institutions with the cultivation of participation from civil society. Kyems (2010) affirms this approach, noting, "A recurring feature of technological failures in Africa is the flaw in the method for transferring technology to the continent that fails to incorporate necessary changes in human behavior and structural conditions of society that can facilitate sustained adoption and uses of technology" (p. 5).

Without cultivating strong partnerships between all stakeholders involved in a project, failure becomes more likely. Verclas (2010) argues that "the importance of ecosystems of networks of companies, organizations, and individuals that need to be in place for the entire value chain for m-services to take root, grow, and go to scale" cannot be overlooked. Building strong multistakeholder partnerships and learning from and working with the local beneficiaries on the ground can effectively work at answering the question, "How do you best meet the demand for information and knowledge" (p. 1)?

This thesis argues that the issue of poverty reduction should move beyond a one-dimensional view that conceptualizes poverty as solely about a lack of income, and rather take into account the multiple dimensions that inform our understanding of how to improve the human condition. One such component is the ability to access information and gain new knowledge. As the case studies have demonstrated, Africans have benefited from both the horizontal exchange and vertical dissemination of information. These benefits include improved access to markets, new avenues for gathering

information on prices for products and services, an ability to gain knowledge about health issues, and an easier way to connect with family and friends. The effective integration of ICTs into development initiatives can reduce the high cost of being poor. As the World Resources Institute argues in a recent report on the bottom of the pyramid (BOP), there is an untapped potential to integrate the 4 million people living at the BOP into the formal market economy (Hammond, et al., 2007). ICTs are one such avenue to bring the BOP into markets.

Once initial benefits have been realized from the integration of the marginalized into the formal economy, additional benefits materialize. This 'trickle-down effect' has been seen with the MTN Village Phone Program in Uganda. After Village Phone Operators set up their businesses and began making money, they were able to repay their initial loans, and were then able to create sustainable livelihoods. VPOs were then able to afford to send their children to school, pay for better medical care, and access to medicines. This example demonstrates that while M4D initiatives can directly affect the local beneficiaries directly involved in the project, the gains realized can also indirectly affect those in their social networks.

5.2 Empirical and Methodological Contributions

Previous scholars and practitioners have written extensively about the provision of telecommunications services and the transformative growth made possible when such services are available and accessible to previously closed markets. Additionally, many have contributed to discussions on the significance of participatory processes in development. A third growing set of scholarship has contributed to our understanding of ICT-driven development (known as ICT4D amongst scholars and practitioners). This

thesis has aimed to bring synthesize these perspectives together and examine the interactions between institutions and civil society to affect change. To my knowledge, recent scholarship has not compared and contrasted these perspectives using both top-down and participatory levels of analysis.

The case studies presented in this thesis have highlighted factors that contribute to project success or failure. Past scholarship lacks much detailed analysis of the precise factors have contributed to an ICT4D project's failure. Hosman and Fife (2008) note, "Given the high failure rate for [ICT-driven] ventures and the absence of a business model proven to function in such uncharted territory, the demand for an enumeration of best practices is extremely high." The case studies presented in this thesis, summarized below, contribute to the scholarly understanding of the contexts and conditions under which ICTs can be powerful contributors to poverty reduction and instances where, due to the weakness of institutional involvement and/or the lack of participation from civil society, ICTs have not been effectively harnessed to improve livelihood.

Table 21: Summary of Findings from Case Studies

		Institutional decision-making	
		Strong	Weak
Participatory Processes	Strong	**Uganda: MTN Village Phone Program, Grameen Foundation AppLab, Community Knowledge Workers Initiative** - The various initiatives have proven to be sustainable and scalable due to the collaborative, hybrid approach taken. Rural Ugandans are benefiting from increased access to information and knowledge. - The government and UCC have provided an enabling environment; appropriate technology was used; a strong multistakeholder partnership was built; local beneficiaries' needs were into project conceptualization and implementation.	**Small-scale innovations from end users** - The poor and marginalized members of society in LDCs are not passive recipients of technology. Due to a weaker degree of institutional involvement and lack of reliable infrastructure and services, many innovations and improvisations using mobile technologies have come from end users themselves to meet their immediate needs. - For innovations to be sustainable and scalable in the long-term, institutional involvement, primarily in the form of financial resources, is needed.
	Weak	**South Africa: On Cue Compliance System** - While the use of mobile technologies was appropriate, affordable, and accessible for participants, inadequate management and the absence of a local champion weakened project implementation. - The buy-in of all stakeholders was not gained from the beginning, thus project implementation was weakened; weak dialogue between stakeholders resulted in poor communication of the project objectives. - The project would have benefited from the presence of a local intermediary to serve as a link between all stakeholders.	**Ethiopia: State-owned telecom sector** - The state-owned telecom regulator and operator have not met the needs and demands of civil society for telecommunications services. - The absence of a liberalized telecom sector combined with a weak regulator dependent on the state and an environment that is not conducive to civic participation has led to minimal economic growth; Other contributing factors include the absence of competition and foreign investment and the inability of Ethiopians to pressure their government to meet their communication needs.

By tracing the development of the MTN Village Phone Program and the Grameen AppLab in Uganda, I was able to discover factors that contributed to the initiatives' potential sustainability and scalability. Success can be attributed to the presence of an appropriate regulatory environment, effective institutional involvement, the inclusive participation of end users, and the cultivation of strong partnerships amongst stakeholders. What set this initiative apart from many other endeavors were the Grameen Foundation's leadership efforts on conducting a needs assessment and ethnographic research of the local beneficiaries to directly pinpoint their needs prior to rolling out its program. As the AppLab is replicated on a larger scale, it will be interesting to see to what extent they continue to conduct extensive research on the ground before launching in new areas.

The telecommunications environment in Ethiopia, and subsequent institutional obstacles and constraints that have hindered this sector from contributing to the alleviation of poverty, was detailed in the second case study. Since the sector has remained closed to competition and private investment, growth in penetration has been minimal. This is coupled with the fact that civil society lacks the cohesion and development to pressure the state for change. Incremental changes are underway in the telecommunications sector, but the absence of a vibrant civil society will likely mean that transformations and improvements will come very slowly.

The case describing the rollout of the On Cue Compliance System in South Africa poses an interesting juxtaposition to the case of Ethiopia, as South Africa has one of the highest mobile penetration rates in Africa. However, conclusions drawn from an analysis of this m-health pilot project highlight the fact that despite access to and affordability of

mobile devices, project success is not guaranteed. The fact that the pilot was not successful in exceeding its target goals underscores the need for effective mechanisms to ensure project implementation. These mechanisms include developing relationships amongst the partners, providing feedback and dialogue, and having a local champion to encourage buy-in of a new system.

Finally, small-scale innovations across sub-Saharan Africa, including experimentation with sharing airtime credits as currency, creating businesses for charging mobile phones, and citizen reporting, demonstrate the culture of innovation that exists in various communities. It is exciting to see the ingenuity of the local users to devise solutions either by their own initiative or due to the absence of strong institutions to meet their needs.

5.3 Policy Implications

For policymakers, this thesis reinforces the tremendous importance of liberalizing telecommunications sectors, investing the network construction, and actively working to eliminate barriers that hinder those at the BOP from being able to access and afford mobile services. Additionally, specific and actionable agendas need to be drawn up to further drive the development of strong partnerships between the state and civil society. The successful implementation of ICT-driven initiatives necessitates not only the building of physical infrastructure and networks, but also the development of human capital and the skills to have the capacity and knowledge to use such technologies. The former requires the active role of the state in developing sound institutional frameworks conducive to growth, while the latter demands the inclusion of civil society in learning how to use technology and participating in the design, implementation, and maintenance

of an initiative. When civil society is weak, as is the case in Ethiopia, it is much more challenging to pressure the state for actionable changes to the status quo. The potential benefits that can be realized from the deployment of ICTs in sub-Saharan Africa are boundless. However, these benefits will not be fully seen if time is not taken to strengthen the relationship between institutions and civil society.

To further increase mobile penetration, regulators must continue to license new operators. Additionally, more aggressive approaches to reducing telecommunications-related taxes will enable more Africans to find mobile handsets and services affordable. Appropriate economic and competition policies can led to reductions in the digital divide (Dasgupta, et al., 2005, p. 239). Regulators and government ministries must also take into consideration what types of incentives might induce operators, private actors, and end users to participate in ICT4D initiatives. Mobile operators and private organizations may be less inclined to be involved in projects if they believe it will be too costly and not generate a profit. Operators may be motivated to engage in ICT4D initiatives if governments entice them with incentives, such as tax-relief, for innovations or experiments. With regards to the end users, incentives to participate in projects could result in better pilot outcomes. With the AppLab in Uganda, farmers were able to experience increases in their productivity and income after using applications like Google Trader and Weather Tips, leading them to continue using the services. With the On Cue Compliance Service in South Africa, TB patients and clinic workers had little incentive to properly use the system. Perhaps if the service had partnered with a specific operator and offered an incentive of airtime credits for compliance, higher compliance rates would have been seen.

5.4 Limitations and Questions for Further Research

While this thesis has primarily focused on the use of mobile telephony for development, it is obviously worth noting additional ICTs that are also being used to improve livelihoods. Radio remains an important device for the transmission of information, especially in rural areas. Kenny (2002) argues that the radio has many advantages over other ICTs, since it is one of the cheapest forms of mass media, its signals can reach remote areas, and an individual can receive information regardless of their level of education or literacy (p. 8).

The deployment of the Internet deserves equal attention. While many initiatives have been driven by a desire to access to the Internet, results have been mixed. The widespread provision of access to the Internet remains limited in sub-Saharan Africa, and there are more barriers to its use compared to mobile telephony, including issues surrounding access, affordability, and absence of skills. Kenny (2002) strongly argues against deployment of PCs, "The nature of extreme poverty in developing countries…points to an unsustainably high cost and relatively low benefit of direct Internet service provision through telecenters to the very poor. This might suggest that the push for universal Internet access as a tool for poverty relief is misplaced" (p. 142).

This emerging area of scholarship unfortunately suffers from a lack of reliable statistics and relevant data. As more contributions are made in this field, it is hopeful that the body of both qualitative and quantitative evidence will increase. It appears that the absence of effective monitoring and evaluation of ICT4D projects has resulted in a patchy body of work. Hosman and Fife (2008) comment on this gap, noting, "Both successful and unsuccessful cases remain underreported in the scholarly literature.

Uneven reporting and the difficulty inherent in ascertaining and tracking results indicate the need for solid methodological approaches to the study of ICT as a tool for development" (p. 315). While there seems to be no lack of mobile-driven initiatives, the absence of solid evaluation from work in the field has also made it more challenging to better inform practitioners and policymakers (Iluyemi, et al., 2007). There is a need for more study of project failures to inform scholars and practitioners about how to implement best practices. Caution must also be given with regards to being overly optimistic about the extent to which the marginalized will be actively involved in the decision-making process. The fact of the matter is that many initiatives where civil society has been engaged in the process is piecemeal at best.

Although the case studies only examined a handful of countries in sub-Saharan Africa, many of the conclusions drawn, recommendations made, and lessons learned are applicable to work being done in other developing countries. It is impossible to make overarching generalizations since each country has its own set of internal factors that influence the telecom sector. There will be differentiations between states. Future research examining how applicable the findings from these four cases are to similar cases is worth pursuing. It would also be worthwhile to conduct similar case study investigations using countries in Asia, where innovations in the field of ICT4D have also been underway.

The exploration of initiatives that has been offered in this thesis has also called into question the influence of various cultural influences on project outcomes. To what extent does cultural diversity influence institutional framework and the development of civil society, and thus impact the use of telecommunications services for the

improvement of livelihoods? For example, in Ethiopia, Amharic is the commonly spoken language, yet many mobile phones are not programmed with this language. To what extent are language and literacy skills a hindrance to the adoption of mobile services? In addition, there is much research to be done on the influence of gender on ICT usage and project implementation. Despite facing numerous constraints, including limited education and employment opportunities, women in LDCs, such as Uganda, are often primarily responsible for managing their households. However, Nicholl (2006) notes that women, "while perfectly positioned to gain and exchange knowledge for self-betterment, are frequently unable to take full advantage of the valuable information that communications offer" (p. 2). What facets of project implementation promote the inclusion and empowerment of females?

5.5 Conclusion

The Telecom Regulatory Authority of India (TRAI) held a forum in April 2010 to strategize about how mobile phones can best be used to deliver appropriate content and public services to Indians. It is a tremendous advancement to see a national regulator proactively taking the initiative to ensure conditions are in place to facilitate the growth of mobile initiatives (Boyera, 2010). Similar actions by regulators in SSA could signal movement towards an environment more conducive to development initiatives using mobile telephony. There is tremendous potential for mobile-driven initiatives to reach more rural and urban areas across the continent. Efforts to balance the involvement of institutions with the participation of local beneficiaries will increase the likelihood that such initiatives will successfully contribute to economic growth and human development.

APPENDIX A. EXAMPLES OF MOBILE LIVELIHOOD SERVICES IN SUB-SAHARAN AFRICA

Name of Service	Location	Purpose
Collecting and Exchanging of Local Agricultural Content (CELAC)	Uganda	Database of farmers, distributes agricultural tips and information via SMS
National Farmers Information Service (NAFIS)	Kenya	Database of voice responses to common questions
Farmer's Friend	Uganda	Farming tips, weather updates via SMS
Kenyan Agricultural Commodities Exchange Program (KACE)	Kenya	Agricultural information
Livestock Information Network Knowledge System (LINKS)	Kenya, Ethiopia, Tanzania	Information on prices and sales volume for livestock, weather information
Mobile for Good's Kazi560	Kenya	Job-seekers can place and browse ads via SMS
Souktel	Somalia	SMS-based job services
Manobi	Senegal	SMS-based market information service
Esoko	Ghana	Market news service
Drumnet	Kenya	Links agricultural supply-chain partners
Frontline SMS	Multiple	Send and receive text messages with groups
M-PESA, offered by Safaricom	Kenya	Mobile banking
MTN Mobile Money	Multiple	Mobile banking
Zain Zap	Multiple	Mobile banking
Grameen Village Phone Program	Uganda, Rwanda, Cameroon	Mobile phone services
Text to Change	Uganda	Mobile SMS-based quizzes and information about HIV
Txteagle	Kenya	Mobile phone users can earn small amounts of money by completing small tasks
SIMpill	South Africa	Monitoring patient adherence to prescription medicine schedule
TRACnet	Rwanda	Enhances monitoring of

		antiretroviral treatment of HIV/AIDS
Ushahidi	Multiple	Crowdsourcing crisis, humanitarian events/reporting
Project Masiluleke	South Africa	HIV and TB awareness, prevention
EpiSurveyor	Zambia	Data collection by health practitioners
FrontlineSMS: Medic	Malawi	Data collection
AED Satellife	Uganda, Mozambique	Data collection, disease outbreak tracking
Cell-Life	South Africa	Disseminate info via SMS about HIV
RapidSMS	Ethiopia, Uganda	Data collection
Question Box	Uganda	Free telephone hotline
MxIT	South Africa	Mobile social networking and chat service
CommCare	Tanzania	Community health worker support
Learning about Living	Nigeria	Delivers sexual and reproductive health education
WIZZIT	South Africa	Mobile payments
MyMsta (LoveLife)	South Africa	Mobile social network, focusing on pro-social and pro-health
School Empowerment Programme Kenya	Kenya	Bulk SMS as in-service training to primary teachers
Health Child (teaming with Text to Change)	Uganda	SMS service providing information on family planning, HIV/AIDS, and maternal health; collects personal health data
Me2U (MTN)	Uganda	Money or airtime transfer

Sources: MobileActive.org, 2010; Kiwanja.net, 2010; UN; Donner, 2008

APPENDIX B. USEFUL TERMS AND ACRONYMS

TERMS

Access – A person's ability to use a mobile telephone if could, since he or she has network coverage

AppLab – Grameen Foundation's Application Lab

Average Return Per User (ARPU) – The total amount of money that a mobile operator receives from its subscriber base divided by the total number of its subscribers.

Bottom (or Base) of the Pyramid (BOP) – those living on an average of less than US$2 per day

Fixed telephone line – also known as a landline or wired line

Information and communication technologies (ICTs) – Technologies that enable the sharing of information between two or more people, between a person and an electronic system, or between electronic systems

Least developed countries (LDC) – Defined as low income countries suffering from low levels of human development and/or weakness in infrastructure. The UN using 3 criteria (gross national income per capita, a human assets index, and an economic vulnerability index) to assess if a country falls into this category.

Mobile banking (m-banking) – Financial services, including the transferring of money, that can be done on a mobile phone

Mobile coverage – Area covered by a mobile cellular signal

Mobile penetration – The number of mobile cellular phone subscriptions per 100 people

Nongovernmental Organization (NGO) – Groups of individuals privately organized around a purpose or cause; not established by the government

SIM card – A removable memory card used in many mobile phones to identify a mobile subscriber and to store personal data such as contact names and text messages

Teledensity – phones per 100 inhabitants in a population

Universal access – Efforts on the behalf of governments, regulators, operators, and other institutions to ensure that people have access to public telephones in their communities

Universal service – The provision of basic telephone services to every individual household

ACRONYMS

ARPU – Average return per user

BOP – Base or Bottom of the Pyramid

CAGR – Compound annual growth rate

CKW – Community Knowledge Workers in Uganda

CSO – Civil society organization

DOTS – Direct observed therapy system for TB

EPRDF – Ethiopian Peoples' Revolutionary Democratic Front

ETA – Ethiopian Telecommunication Authority

ETC – Ethiopia Telecommunications Corporation

GDP – Gross Domestic Product

GFUSA – Grameen Foundation

HDI – Human Development Index

HPI-1 – Human Poverty Index

ICASA – Independent Communications Authority of South Africa

ICT – Information and communication technologies

ICT4D – Information and communication technologies for development

ITU – International Telecommunications Union

LDC – Least developed country

M4D – Mobile phones used for development

MDGs – United Nations Millennium Development Goals

MFI – Micro-finance institution

MSE – Medium- or small-enterprise

MSP – Multi-stakeholder partnership

MTN – Mobile Telecommunications Network (mobile operator)

NGO – Nongovernmental organization

PSCAP – Ethiopian Public Sector Capacity Building Program

RCDF – Rural Communications Development Fund in Uganda

RCDP – Rural Communications Development Policy in Uganda

SME – Small- and Medium-sized enterprise

SMS – Short message service, also known as a text message

SSA – sub-Saharan Africa

TB – Tuberculosis

UA – Universal Access

UCC – Uganda Communications Commission

UN – United Nations

UNDP – United Nations Development Programme

UPTC – Uganda Post and Telecommunications Corporation

USAID – United States Agency for International Development

USF – Universal Service Fund

VPO – Village Phone Operator

VPP – Village Phone Program

WHO – World Health Organization

BIBLIOGRAPHY

Abraham, A. & Platteau, J.P. (2002). Participatory development in the presence of endogenous community imperfections. *Journal of Development Studies,* 39(2), 104-136.

Adam, L. (2007). 2007 Ethiopia telecommunications sector performance review: A supply side analysis of policy outcomes. Research ICT Africa! Country Profile Series. Johannesburg, South Africa: Witwatersrand University, LINK Centre.

Adenew, B. (2004). The food security role of agriculture in Ethiopia. *Journal of Agricultural and Development Economics,* 1(1), 138-153.

Ahmed, A. (2007). Open access towards bridging the digital divide: Policies and strategies for developing countries. *Information Technology for Development*, 13(4), 337-361.

Aker, J. (2008). Does digital divide or provide? The impact of cell phones on grain markets in Niger. BREAD Working Paper No. 177. Durham, NC: Bureau for Research and Economic Analysis of Development.

Akpan, P.I. (2003). Basic-needs to globalization: Are ICTs the missing link? *Information Technology for Development*, 10, 261-274.

Baldwin, P. & Thomas, L. (2005). Promoting private sector investment and innovation: To address the information and communication needs of the poor in sub-Saharan Africa. Washington, DC: The World Bank.

Banks, K. (2008, May 23). Appropriate technology and the humble mobile phone. *PC World*. Retrieved from http://www.pcworld.com/businesscenter/article/146248/appropriate_technology_and_the_humble_mobile_phone.html

Banks, K. (2009, September 15). Mobile offer lifelines in Africa. *BBC News*. Retrieved from http://news.bbc.co.uk/2/hi/8256818.stm

BBC News. (2009, July 24). Pedal power for Kenya's mobiles. *BBC News*. Retrieved from http://news.bbc.co.uk/2/hi/africa/8166196.stm

Berg, M. (2009, June 24). C-cell mobile phone charging in Ghana [Web log message]. Retrieved from http://www.buildafrica.org/2009/06/24/c-cell-phone-charging-in-ghana/

Bezanson, K. & Sagasti, F. (1995). The elusive search: Development and progress in the transition to a new century. Ottawa, ON, Canada: International Development Research Centre.

Bhavnani, A., Chiu, R.W., Janakiram, S., & Silarszsky, P. (2008). The role of mobile

phones in sustainable rural poverty reduction. Washington, DC: The World Bank: ICT Policy Division, Global Information and Communications Department.

Bollou, F., & Ngwenyama, O. (2008). Are ICT investments paying off in Africa? An analysis of total factor productivity in six West African countries from 1995 to 2002. *Information Technology for Development*, 14(4), 294-307.

Boyera, S. (2010, April 10). Mobile web for development in India [Web log message]. Retrieved from http://www.webfoundation.org/2010/04/m4d-in-india/

Burrell, J. (2008). Livelihoods and the mobile phone in rural Uganda. Washington, DC: The Grameen Foundation USA.

Butagira, T. (2009, November 26). Uganda grapples with the pros and cons of increased access to mobile phones. *Business Daily Africa*. Retrieved from http://www.businessdailyafrica.com/-/539552/805986/-/687oqn/-/index.html

Byrne, E. & Sahay, S. (2006). Participatory design for social development: A South African case study on community-based health information systems. *Information Technology for Development*, 13(1), 71-94.

Calbreath, K.A. (2008). Networked ICTs and international development: A case study of technology diffusion in Kenya (Master's thesis.) Georgetown University, Washington, DC. 1-92.

Cape Town TB Control. (2004). *TB control progress report 1997-2003*. Cape Town, South Africa.

Castells, M., Fernandez-Ardevol, M., Qiu, J.L., & Sey, A. (2007). *Mobile communication and society: A global perspective*. Cambridge, MA: Massachusetts Institute of Technology.

Cecchini, S. & Scott, C. (2003). Can information and communications technology applications contribute to poverty reduction?: Lessons from rural India. *Information Technology for Development*, 10, 73–84.

Central Intelligence Agency. (2010, April 1). The world factbook: Ethiopia. Retrieved fromhttps://www.cia.gov/library/publications/the-world-factbook/geos/et.html

Central Intelligence Agency. (2010, April 1). The world factbook: South Africa. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/sf.html

Central Intelligence Agency. (2010, April 8). The world factbook: Uganda. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/ug.html

Chacko, J.G. (2003). ICT policies for poverty reduction and human development: Reassessment. United Nations Development Programme-Asia-Pacific Development Information Programme. Bangkok, Thailand: UNDP.

Chapman, R., Slaymaker, T. and Young, J. (2003), Livelihoods approaches to information and communication in support of rural poverty elimination and food security. London, United Kingdom: Overseas Development Institute.

Clark, J. (2000). Civil society, NGOs, and development in Ethiopia: a snapshot view. Washington, DC: The World Bank.

Coyle, D. (2005). Vodaphone Policy Paper Series (Ed.), *Africa: The impact of mobile phones*. 3-9.

Dasgupta, S., Lall, S., & Wheeler, D. (2005). Policy reform, economic growth and the digital divide. *Oxford Development Studies,* 33(2), 229-243.

Demeke, M., & Biru, M. (2002). ICT penetration and usage in Ethiopia: Baseline study. *The Scan-ICT Project.* Addis Ababa, Ethiopia: The University of Addis Ababa.

Denton, A. (2008). Policy priorities to connect Africa. *Proceedings of the 1st international conference on m4d mobile communication technology for development* (pp. 3-4). Sweden: Karlstad University.

Diga, K. (2007). Mobile cell phones and poverty reduction: Technology spending patterns and poverty level change among households in Uganda (Master's thesis.) University of KwaZulu-Natal, Durban, South Africa.

Djiofack-Zebaze, C., & Keck, A. (2008). Telecommunications services in Africa: The impact of WTO commitments and unilateral reform on sector performance and economic growth. *World Development*, 37(5), 919-940.

Donner, J. (2005). User-led innovations in mobile use in sub-Saharan Africa. *Receiver,* 14, 1-6.

Donner, J. (2007a). The rules of beeping: Exchanging messages via intentional "missed calls" on mobile phones. *Journal of Computer-Mediated Communication*, *13*(1), 1-22.

Donner, J. (2007b). *Mobile telephones as institutional links in the developing world.* New Brunswick: Microsoft Research India.

Donner, J. (2008). Research approaches to mobile use in the developing world: A review of the literature. *The Information Society*, 24(3), 1-41.

Donner, J. (2009a). Mobile-based livelihood services for individuals, small farms and micro & small enterprises in Africa: Pilot and early deployments. *Proceedings of the*

Conference on the development and information technologies (pp. 1-18). Barcelona.

Donner, J. (2009b). Blurring livelihoods and lives: The social uses of mobile phones and socioeconomic development. *Innovations*. 4(1), 91-101.

Donner, J. & Tellez, C. (2008). Mobile banking and economic development: Linking adoption, impact, and use. *Asian Journal of Communication*, 18(4), 318-322.

Donner, J., & Toyama, K. (2009). Persistent themes in ICT4D research: Priorities for inter-methodological exchange. *Proceedings of the 57th session of the International Statistics Institute.* Durban, South Africa, 1-10.

Donner, J., Verclas, K. & Toyama, K. (2008). Reflections on MobileActive 2008 and the M4D landscape. *Proceedings of M4D 2008,* Karlstad University, Sweden, 73-83.

Duga, N., & Getachew, H. (2009). Mobile services and ICT4D to the network economy: Bridging the digital divide, Ethiopia's case. *3rd Scientific Conference on Electrical Engineering*. Addis Ababa University, Ethiopia, 1-7.

Duncombe, R. (2006). Using the livelihoods framework to analyze ICT applications for poverty reduction through microenterprise. *The Massachusetts Institute of Technology Information Technologies and International Development,* 3(3), 81-100.

Esselaarr, S., Gillwald, A., & Stork, C. (2007). South African telecommunications sector performance review 2006. LINK Centre Public Policy Research Paper, 8. Johannesburg, South Africa: Witwatersrand University.

Ethiopia ICT Development Agency (EICTDA). (2002). National ICT policy. Addis Ababa, Ethiopia.

Ethiopian Ministry of Capacity Building. (2004). *Civil society organizations' capacity building program: Program design: Zero draft for public consultation*. Addis Ababa, Ethiopia.

Ethiopian Ministry of Capacity Building. (2006). *The National ICT for development five year action plan for Ethiopia (2006-2010)* (Draft Version 4.02). Addis Ababa, Ethiopia.

Feingold, R. (2010, March 4). *Feingold statement on the fragile state of democracy in Africa*. Retrieved from http://feingold.senate.gov/record.cfm?id=322668

Federal Negarit Gazeta of the Federal Democratic Republic of Ethiopia (2002). Proclamation No. 282/2002: A proclamation to provide for the amendment of telecommunications proclamation, No. 28, p. 1780-1782. Addis Ababa, Ethiopia.

Gamos Ltd. (2008). Rural communities and communication needs (Uganda): Executive summary.

Gannt, W. (2009). A day in the life of a (female) Community Knowledge Worker [Web log message]. Retrieved from http://www.grameenfoundation.applab.org/applab-blog/2009/11/06/a-day-in-the-life-of-a-female-community-knowledge-worker/

Garside, B. (2009, April). Village voice: Towards inclusive information technologies. London, United Kingdom: International Institute for Environment and Development (iied).

Geda, A. (2008). Scoping study on the Chinese relations with sub-Saharan Africa: The case of Ethiopia. *African Economic Research Consortium*, p. 1-14.

George, A.L., & Bennett, A. (2004). Case studies and theory development in the social sciences. Cambridge, MA: The Belfer Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University.

Gerster, R. & Zimmerman, S. (2003). Information and communication technologies (ICTs) and poverty reduction in sub-Saharan Africa: A learning study (synthesis). Building Digital Opportunities (BDO) Programme. Retrieved from http://www.gersterconsulting.ch/docs/Synthesis_report.pdf

Gilley, B. (2010, January 25). *Civil society, democracy, and elections*. Retrieved from http://www.america.gov/st/democracyhr-english/2010/January/20100126152113mlenuhret0.7919886.html

Gillwald, A. (2005). Good intentions, poor outcomes: Telecommunications reform in South Africa. *Telecommunications Policy*, 29, p. 469-491.

Giorgis, T.G. (2010, March 30). ETC, France Telecom sign management contract. *All Africa*. Retrieved from http://allafrica.com/stories/201003300684.html

Google Mobile Uganda (2010). Google SMS tips for your phone. Retrieved from http://www.google.co.ug/mobile/sms/#6001

GSM Association. (2007). Taxation and the growth of mobile services in sub-Saharan Africa. London, United Kingdom.

GSM Association. (2008). Universal access: How mobile can bring communications to all. London, United Kingdom.

Grameen Foundation (2009). The AppLab partnership. Retrieved from http://www.grameenfoundation.applab.org/section/the-applab-partnership

Grameen Foundation. (2010a). *Grameen Foundation - Uganda*. Retrieved from http://www.grameenfoundation.org/sub-saharan-africa/uganda

Grameen Foundation. (2010b) *Grameen Foundation – AppLab*. Retrieved from http://www.grameenfoundation.applab.org/section/index

Green, M. (2000). Participatory development and the appropriation of agency in Southern Tanzania. *Critique of Anthropology*, 20(1), 67-89.

Gunawardene, N. (2005, November). Waiting for pilots to land in Tunis. *Islam Online.* Retrieved from http://www.islamonline.net/English/Science/2005/11/article10.shtml

Hamelink, C.J. (1997). New information and communication technologies, social development and cultural change. United Nations Research Institute for Social Development Discussion paper No. 86. New York, NY: United Nations.

Hammond, A., Kramer, W.J., Tran, J., Katz, R., & Walker, C. (2007). The next 4 billion: Market size and business strategy at the base of the pyramid. Washington, DC: World Resources Institute.

Hare, H. (2007). ICT in education in Ethiopia. *Survey of ICT and education in Africa: Ethiopia country report.* Washington, DC: The World Bank, infoDev.

Hartley, L., & Murphree, M. (2006). Influences on the partial liberalization of internet service provision in Ethiopia.. In M.L. Best (Ed.), *Last mile initiative innovations: Research findings from the Georgia Institute of Technology* (pp. 56-73).

Heavens, A. (2007, September 27). Phone credit low? Africans go for "beeping". *Reuters*. Retrieved from http://www.reuters.com/article/idUSHEA92325720070926

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

Heeks, R. (2009). The ICT4D 2.0: The next phase of applying ICT for international development, *IEEE Computer*, 41(6), 26-33.

Heim, K. (2007, November 1). A Calling plan to change the world. *The Seattle Times*. Retrieved from http://seattletimes.nwsource.com/html/businesstechnology/2003986889_grameen01.html

Hersman, E. (2009a, February 2). A Ugandan housewife's homemade mobile phone charger [Web log message]. Retrieved from http://www.afrigadget.com/2009/02/02/a-ugandan-housewifes-homemade-mobile-phone-charger/

Hersman, E. (2009b, May 7). Announcing funding and Ushahidi's open beta [Web log message]. Retrieved from http://blog.ushahidi.com/index.php/2009/05/07/announcing-funding-and-ushahidis-open-beta/

Hersman, E. (2009c, June 30). Africa's poor: Premium SMS in the crossfire [Web log

message]. Retrieved from http://whiteafrican.com/2009/06/30/africas-poor-premium-sms-in-the-crossfire/

Hersman, E. (2009d, December 3). Announcing funding from the Omidyar Network [Web log message]. Retrieved from http://blog.ushahidi.com/index.php/2009/12/03/announcing-funding-from-the-omidyar-network/

Hosman, L., & Fife, E. (2008). Improving the prospects for sustainable ICT projects in the developing world. *International Journal of Media and Cultural Politics*, 4(1), 51-69.

Hosman, L., Fife, E., & Armey, L. E. (2008). The case for a multi-methodological, cross-disciplinary approach to the analysis of ICT investment and projects in the developing world. *Information Technology for Development*, 14(4), 308-327.

Hüsler, J. (2005). Evaluation of the On Cue Compliance Service pilot: Testing the use of SMS reminders in the treatment of Tuberculosis in Cape Town, South Africa. Prepared by bridges.org for the City of Cape Town Health Directorate and the International Development Research Council (IDRC). Cape Town, South Africa.

Hyden, G., & Hailemariam, M. (2003). Voluntarism and civil society: Ethiopia in comparative perspective. *Africa Spectrum, 38*(2), 215-234.

Iluyemi, A., Fitch, C., Parry, D., & Briggs, J. (2007). Health information systems for community based health workers: A case for mobile and wireless technologies. *Proceedings of the ISTAfrica Conference 2007*, Maputo, Mozambique.

infoDev. (2010, April 13). *First steps towards a mobile applications lab for Africa*. Retrieved from http://infodev.org/en/Article.517.html

Intelecom Research & Consultancy, Ltd. (2005). Universal access and universal service funds: Insights and experience of international best practice.

International Monetary Fund (IMF). (2005). Uganda: Poverty reduction strategy paper (PRSP). IMF Country Report No. 05/307. Washington, DC.

International Telecommunications Union (ITU). (2009). *Information society statistical profiles 2009: Africa.* Geneva, Switzerland: ITU Publications.

International Telecommunications Union (ITU). (2009). Mobile cellular subscriptions. Retrieved from http://www.itu.int/ITU-D/icteye/Reporting/ShowReportFrame.aspx?ReportName=/WTI/CellularSubscribersPublic&ReportFormat=HTML4.0&RP_intYear=2008&RP_intLanguageID=1&RP_bitLiveData=False

International Telecommunications Union (ITU). (2003). Mobile overtakes fixed:

Implications for policy and regulation. Geneva, Switzerland: ITU Publications.

IRIN Africa. (2009, January 6). New law on charities passed despite objections. *IRIN Humanitarian News and Analysis*, Retrieved from http://www.irinnews.org/report.aspx?ReportID=82223

Islam, M.N. (2005). Multistakeholder partnership in ict4d: a case study of village phone program in Bangladesh. *MSP Case Study Report*, 1-30.

James, J. (2001). Information technology, cumulative causation and patterns of globalization in the third world. *Review of International Political Economy*, 8(1), 147-162.

James, J. & Versteeg, M. (2007). Mobile phones in Africa: How much do we really know? *Social Indicators Research*, 84(1), 117-126.

Jennings, R. (2000). Participatory development as new paradigm: The transition of development professionalism. *Community Based Reintegration and Rehabilitation in Post-Conflict Settings Conference*. Washington, DC, 1-10.

Jensen, R. (2007). The digital provide: Information (technology), market performance and welfare in the South Indian fisheries sector. *The Quarterly Journal of Economics.* 122(3), 879–924.

Keller, E.J. (1992). Drought, war, and the politics of famine in Ethiopia and Eritrea. *The Journal of Modern African Studies.* 30(4), 609-624.

Kelly, T. (2009). A research agenda for applying mobile 2.0 solutions for base-of-the-pyramid user communities. Teleuse@BOP, Working Papers. Colombo, Sri Lanka: LIRNEasia.

Kenny, C. (2002). Information and communication technologies for direct poverty alleviation: Costs and benefits. *Development Policy Review*, 20(2). 141-157.

Keough, D. & Wood, T. (2005). Village Phone replication manual: Creating sustainable access to affordable telecommunications for the rural poor. Seattle, WA: Grameen Technology Center.

Kimenyi, M.S., & Ndung'u, N.S. (2009). Expanding the financial services frontier: Lessons from mobile phone banking in Kenya. Washington, DC: The Brookings Institute.

Kiwanja.net. (2010). *Mobile applications database*. Retrieved from http://www.kiwanja.net/database/kiwanja_search.php

Knight-John, M. Zainudeen, A., & Khan, A.S. (2005). An investigation of the replicability of a microfinance approach to extending telecommunications access to

marginal customers. WDR Dialogue Theme 3rd Cycle Discussion Paper WDR0506. The World Dialogue on Regulation for Network Economies (WDR). Denmark.

Kuriyan, R. Toyama, K. & Ray, I. (2006). Integrating Social Development and Financial Sustainability: The Challenges of Rural Computer Kiosks in Kerala. *International Conference on Information & Communication Technologies for Development*, Berkeley, California.

Kyems, P. (2010). Is a Non-western path to modernity via the deployment of information communications technology possible in Africa?. *Proceedings of the IFIP 2010 at CIT,* Makerere University, Uganda.

Makinen, M. & Kuira, M.W. (2008). Social media and postelection crisis in Kenya. *The International Journal of Press/Politics*, 13(3), 328-335.

Mansell, R. (2001). Digital opportunities and the missing link for developing countries. *Oxford Review of Economic Policy,* 17(2), 282-295.

Mansell, R. & When, U. (1998). Knowledge societies: Information technology for sustainable development. Oxford: Oxford University Press.

Mbarika, V. & Mbarika, I. (2006). Africa calling: Burgeoning wireless networks connect Africans to the world and each other. *IEEE Spectrum*, *43*(5), 56-60.

McClure, J. (2009a, February 19). Ethiopia won't free telecoms, banking for WTO, sinister says. *Bloomberg News.* Retrieved from http://www.bloomberg.com/apps/news?pid=20601116&sid=adot_hJ.1pyc&refer=africa

McClure, J. (2009b, March 19). Ethiopia should ease bank, telecom rules to join WTO, U.S. says. *Bloomberg News*. Retrieved from http://www.bloomberg.com/apps/news?pid=20601116&sid=adrjqcD27t8Q&refer=africa

McNamara, K.S. (2003). Information and communication technologies, poverty and development: Learning from experience. A background paper for the infoDev Annual Symposium. Washington, DC: The World Bank.

McNamara, K.S. (2008). Summary report: Building local capacity for ICT policy and regulation: A needs assessment and gap analysis for Africa, the Caribbean, and the Pacific. infoDev Working Paper No. 16. Washington, DC: The World Bank.

Mobile marvels: A special report on telecoms in emerging markets. (2009, September 24). *The Economist*.

Mobileactive.org. (2010). *mDirectory*. Retrieved from http://mobileactive.org/directory

Mpogole, H., Usanga, H., & Tedre, M. (2008). Mobile phones and poverty alleviation: A

survey study in rural Tanzania. *Proceedings of M4D 2008,* Karlstad University, Sweden, 62-72.

Muente-Kunigami, A. & Navas-Sabater, J. (2010). Options to increase access to telecommunications services in rural and low-income areas. The World Bank Working Paper No. 178. Washington, DC: The World Bank.

Musa, P.F., Meso, P. & Mbarika, V.W. (2005). Toward sustainable adoption of technologies for human development in sub-Saharan Africa: Precursors, diagnostics, and prescriptions. *Communications of the Association for Information Systems (CAIS),* 15(33*),* 592-608.

Muto, M. & Yamano, T. (2009). The impact of mobile phone coverage expansion on market participation: Panel data evidence from Uganda. *World Development,* 37(12), 1887-1896.

Nicholl, H. (2006). The gender dimension of communication technologies in Uganda: Documenting ICTs in the daily lives of women. Ottowa, ON, Canada: International Development Research Center.

North, D.C. (1990). Institutions, institutional change and economic performance. Cambridge: Cambridge University Press.

Norton, S.W. (1992). Transaction costs, telecommunications, and the microeconomics of macroeconomic growth. *Economic Development and Cultural Change*, 41(1), 175-196.

Ovum Research & Consultancy (2009). Mobile market trends in Africa. London, United Kingdom.

Parshall, L., Pillai, D., Mohan, S., Sanoh, A., & Modi, V. (2008). National electricity planning in settings with low pre-existing grid coverage: Development of a spatial model and case study of Kenya. *Energy Policy,* 1-16.

Pigato, M. (2001) Information and communication technology, poverty and development in sub-Saharan Africa and South Asia. Africa Region Working Paper Series No. 20. Washington, DC: The World Bank.

Puri, S.K., & Sahay, S. (2007). Role of ICTs in participatory development: An Indian experience. *Information Technology for Development*, 13(2), 133-160.

Research ICT Africa! (2008). A survey of ICT access and usage in Ethiopia: Policy implications 2008.

Roettgers, J. (2009, March 11). Kenya's mobile banking revolution [Web log message]. Retrieved from http://gigaom.com/2009/03/11/kenyas-mobile-banking-revolution/

Roller, L.H., & Waverman, L. (2001). Telecommunications infrastructure and economic development: A simultaneous approach. *The American Economic Review*, 91(4), 909-923.

Sahay, S. & C. Avgerou (2002). Introducing the special issue on information and communication technologies in developing countries. *The Information Society, (*18)7, 73-76.

Sanderson, E. & Kindon, S. (2004). Progress in participatory development: Opening up the possibility of knowledge through progressive participation. *Progress in Development Studies,* 4(2), 114-126.

Saunders, R.J., Warford, J.J., & Wellenius, B. (1994). Telecommunications and economic development. Washington, DC: The Johns Hopkins University Press.

SEACOM. (2010, March 18). Ethiopia's national infrastructure initiative leaps ahead with new international bandwidth connectivity. Retrieved from http://www.seacom.mu/news/news_details.asp?iID=126

Sey, A. (2008). Mobile communication and development: a study of mobile phone appropriation in Ghana. (Doctoral dissertation). University of Southern California, Los Angeles, CA. 1-420.

Siebel, H.D., & Almeyda, G. (2002). Women and men in rural microfinance: The case of Uganda. Rome, Italy: International Fund for Agricultural Development.

SIMpill. (2006). SIMpill: How it works. Retrieved from http://www.simpill.co.uk/SMPL-how.htm

Singh, J.P. (1999). Leapfrogging development?: The political economy of telecommunications restructuring. Albany: State University of New York Press.

Singh, J.P. (2001). Communication, technology and development: Instrumentality, strategy and pluralism. Handbook of International and Intercultural Communication. Ed. William Gudykunst and Bella Mody. Thousand Oaks, CA: Sage.

Singh, J.P. (2010/forthcoming). [Review of Telecommunications Development in Asia 2008, by J. Ure]. *Telecommunications Policy.*

Sinha, C. (2005). Effect of mobile telephony on empowering rural communities in developing countries. *International Research Foundation for Development Conference on Digital Divide, Global Development and the Information Society*. Tunis, Tunisia.

Song, S. (2009, October 26). Fair mobile - a start [Web log message]. Retrieved from http://manypossibilities.net/2009/10/fair-mobile-a-start/

SouthAfrica.info. (2008, October). *South Africa's telecommunications*. Retrieved from http://www.southafrica.info/business/economy/infrastructure/telecoms.htm

Stanley, R. (2005). Village Phone: A tool for empowerment. Washington, DC: Grameen Foundation USA.

Statistics South Africa. (2001). *Census 2001*. Retrieved from http://www.statssa.gov.za/census01/html/C2001Interactive.asp

Steere, M. (2008, August 25). Cell phones promise fairer elections in Africa. *CNN*, Retrieved from http://edition.cnn.com/2008/WORLD/europe/08/25/Cellphonedemocracy/

Steinberg, J. (2003). Information technology & development: Beyond 'either/or'. *The Brookings Review*, 21(2), 45-48.

Stockholm Challenge. (2004). Village Phone Uganda. Retrieved from http://www.stockholmchallenge.org/project/data/village-phone-uganda

Stone, A. (1991). Public service liberalism: Telecommunications and transitions in public policy. Princeton, N.J.: Princeton University Press.

Technical Centre for Agricultural and Rural Cooperation (CTA). (2010, February). ICT update: Farmer services. Issue 53. Wageningen, the Netherlands.

Technology Strategies International (TSI) (2010). ICT investment opportunities in Ethiopia - news release. Retrieved from http://www.tsiglobalnet.com/ethnr.html

Thompson, M. (2004). Discourse, 'development' & the 'digital divide:' ICT & the World Bank. *Review of African Political Economy*, 99, 103-123.

Torero, M., & von Braun, J. (Ed.). (2006). *Information and communication technologies for development and poverty reduction: the potential of telecommunications*. Baltimore, MD: The Johns Hopkins University Press.

Tsigie, A., & Feyissa, G. (1999). Ethiopia: past, present, and future. In E. Noam (Ed.), *Telecommunications in Africa* Oxford: Oxford University Press.

Uganda Communications Commission (UCC). (2007). A Review of The Postal and Telecommunications Sector: June 2006 to June 2007. Kampala, Uganda.

Uganda Ministry of Works, Housing and Communications. (2003, October). National information and communication technology policy. Kampala, Uganda.

United Nations Development Programme (UNDP). Human Development Reports. Retrieved from http://hdr.undp.org/en/humandev/

UNDP. (2001). Nepal Human Development Report: Poverty reduction and governance. Retrieved from http://hdr.undp.org/en/reports/nationalreports/asiathepacific/nepal/name,2784,en.html

Unwin, T. (Ed.). (2009). *ICT4D: information and communication technology for development*. United Kingdom: Cambridge University Press.

Ure, J. (2008). Telecommunications development in Asia. Hong Kong: Hong Kong University Press.

van Audenhove, L., Burgelman, J.C., Nulens, G., & Cammaerts, B. (1999). Information society policy in the developing world: A critical assessment. *Third World Quarterly*, 20(2), 387-404.

Verclas, K. (2009a, June 30). Google launches health and trading info services in Uganda (but at a high price) [Web log message]. Retrieved from http://mobileactive.org/google-launches-health-and-trading-sms-info-services-uganda-high-price

Verclas, K. (2009b, March 20). Mobile activism in African elections: A paper and a missed opportunity [Web log message]. Retrieved from http://mobileactive.org/mobile-activism-african-elections-paper-and-missed-opportunity

Verclas, K. (2010, January 11). Scaling mobile services for development: what will it take? A MobileActive white paper. *MobileActive*, Retrieved from http://mobileactive.org/scaling-mobile-services-development-what-will-it-take

Verhovek, S.H. (2000, November 3). Bill Gates turns skeptical on digital solution's scope. *The New York Times.* Retrieved from http://www.nytimes.com/2000/11/03/technology/03GATE.html?pagewanted=1

Wallsten, S. (2001). An econometric analysis of telecom competition, privatization and regulation in Africa and Latin America. *The Journal of Industrial Economics*, 49(1), 1-19.

Wanjiku, R. . (2010, February 9). Ethiopia IT sector to grow, but government role questioned. *Computerworld Kenya*, Retrieved from http://www.thestandard.com/news/2010/02/09/ethiopia-it-sector-grow-govt-role-questioned

Waverman, L., Meschi, M. & Fuss, M. (2005). The impact of telecoms on economic growth in developing countries. In Africa: The impact of mobile phones. The Vodafone Policy Paper Series, Number 2, 10-23.

Wellenius, B. (2006). Extending communication and information services: principles and practical solutions. The World Bank (Ed.), *2006 Information and communications for development: Global trends and policies* (pp. 41-56). Washington, DC: The World Bank.

Wilson, M. (2003). Understanding the international ICT and development discourse: Assumptions and implications. *The Southern African Journal of Information and Communication*, 3, 1-14.

Wines, M. (2006, August 24). Africa adds to miserable ranks of child workers . *The New York Times*. Retrieved from http://www.nytimes.com/2006/08/24/world/africa/24zambia.html

Wireless Federation. (2009, April 23). Uganda's telecom penetration to reach 17Mn by 2012. Retrieved from http://wirelessfederation.com/news/15507-ugandas-telecom-penetration-to-reach-17mn-by-2012/

World Bank (2009). Status of projects in execution – Fiscal year 2009 for Ethiopia. Operations Policy and Country Services. Washington, DC: The World Bank.

World Health Organization (WHO) (2008). Country cooperation strategy brief: At a glance, Uganda. Geneva, Switzerland.

World Health Organization (WHO). (2009). Global tuberculosis control: A short update to the 2009 report. Geneva, Switzerland.

Wu, I. (2008). Who Regulates phones, television and the internet? What makes a communications regulator independent and why it matters. *Perspectives on Politics,* American Political Science Association, 6, 769-783.

ZTE Technologies. (2009, June 12). *Contributing to the development of Ethiopia with wisdom and strength*. Retrieved from http://wwwen.zte.com.cn/endata/magazine/ztetechnologies/2009year/no6/articles/200906/t20090612_172517.html