A METHODOLOGY FOR THE ADOPTION OF INFORMATION SYSTEMS IN LEAST DEVELOPED COUNTRIES (LDCs)

Case Study Ethiopia

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ABSTRACT

Ethiopia is one of the United Nation's Least Developed Countries (LDCs), and is
ranked as one of the absolute least developed in terms of information and
communications technology (ICT) development and penetration. Ethiopia has
only 0.5 Internet users per 100 residents and 6 telephone lines per 100 residents,
which is one of the lowest penetration rates in the world. Additional issues include
the limitation of most Internet access to cities and a monopoly
telecommunications provide that controls all ICT development. Although Ethiopia
does have some positive signs of development, including establishment of tertiary
educational programs designed to improve skills, Ethiopia is still lagging
significantly in terms of its ICT development. This research project takes a case
study approach to identifying issues in ICT development in Ethiopia. Using a
combination of primary and secondary sources, including previous analyses,
government and NGO reports, and primary interviews with ICT professionals and
policymakers in Ethiopia, the research examined the current state of
implementation, barriers and challenges, and ways that these barriers could be
overcome. These findings were then used to generate recommendations for
Ethiopian government policymakers. Research generally indicated that significant
problems included lack of human resources and awareness of ICT and associated
issues, failure to fully develop the infrastructure, and the need to privatize the ICT
infrastructure to promote development. Other issues included that where there
were expansion initiatives, there were still challenges in quality of service. This

analysis concludes that privatization of telecommunications activities or stronger regulation is the main factor in improvement of ICT services in Ethiopia, and that this type of modernization must be done in order to allow Ethiopia to catch up in terms of its ICT development.

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LIST OF ABBREVIATIONS AND SYMBOLS

ICT Information Communication Technology

FDI: Foreign Direct Investment

LDC: List Developed Countries

R & D: Research and Development

TFP: Total Factor Productivity

S & T: Skill and Training

MCIT: Ministry of Communication and Information Technology

MOST: Ministry of Since and Technology

AAU: Addis Ababa University

EIPO: Ethiopian Intellectual Property Office

GO: Government Organization

NGO: Non Government Organization

GDP: Gross Domestic Product

PSCAP: Public Center Capacity Building Program

IDT: Information Diffusion Theory

UN: United Nations

HDI: Human Development Indicator

ADSL: Asymmetric Digital Subscriber Line

WOREDA NET: Electronic Government

SCHOOL-NET: Electronic Education

ITU: International Telecommunications Union's

IDI Information Development Index

NFR: Near-field communications

GPRS: General Packet Radio Service

OLPC: One Laptop Per Child

€ The euro (currency code: EUR) official currency of the Euro zone

$ The United States dollar (currency code: USD) official currency of the United States of America

1   INTRODUCTION

We live, according to a popular observation, in an Information Age. However, this age, and the association of information and communication technologies (ICTs) with it, has not penetrated everywhere. Wealthier countries and corporations have enthusiastically embraced the use of ICTs (which include both mass communications and interpersonal communications based on the Internet and phone systems), using them to drive economic growth and change modes of work (Rahman, 2007). The use of ICTs is seen as a major national advantage in competition, which provides increased efficiency and knowledge and human development capacity (Rahman, 2007). However, countries with fewer resources and advantages have had difficulty in taking advantage of the opportunities that ICTs offer. This could be particularly important for least-developed countries (LDCs), which have the lowest levels of economic and human development and require the most substantial assistance in economic growth areas (Rahman, 2007).

According to Rahman (2007), there are three theoretical perspectives on the use of ICTs for economic development. These perspectives include the modernist perspective, the dependency perspective, and the human development perspective (Rahman, 2007). The modernist perspective on ICT observes that more developed countries have been successful at leveraging a skilled workforce, entrepreneurship, and capital and technology in order to continually update production modes (Rahman, 2007). This perspective argues that poorer countries can use ICTs, which are relatively lightweight in terms of its capital requirements, to improve their economic position through human resource development (Rahman, 2007). However, the dependency perspective refutes this, noting that local context and culture and a history of colonization and exploitation will affect the ability of poorer countries to gain advantages from ICT (Rahman, 2007). Instead, this perspective argues, a focus on ICTs will only further enrich richer countries that continue to exploit poorer countries by using them as a source of cheap information technology labor (Rahman, 2007). However, the third perspective, the human-centered perspective, is the most compelling of these three perspectives because it is the only one that goes beyond the development of economic capacity. Instead, the human-centered perspective focuses on "enhancing the choices available to the masses and providing them with better

opportunities to compete on a level field, with improved systems. These basic systems to improve standard of living like education, health, development of democratic systems by introducing transparency, and participation at all possible levels (Rahman, 2007, p. 44)." This perspective, which is reflected in the United Nations (UN) Human Development Indicator (HDI), focuses on holistic indicators of economic growth and human prosperity, rather than simply focusing on the development of economic earnings. Thus, the understanding of ICTs in terms of their ability to improve human life, as well as simply expand international earnings, is important for its integration into development contexts.

ICTs can be regarded in a number of different ways when considering its ability to support development. First it can be viewed as a commodity, or as a means to earn foreign exchange income; for example, the location of ICT facilities in a given country provides a direct means to access increased foreign earnings (Rahman, 2007). Second, ICT can be seen as a means of improving efficiency and management of economic development activities (Rahman, 2007). Third, ICT can be seen as a driver of general economic growth at the macro level, allowing for companies to build strategic advantage in the global marketplace (Rahman, 2007). These three perspectives are not necessarily incompatible; however, as ICT can play multiple roles within a single economy and can provide substantial support in each of these areas (Rahman, 2007).

This research is intended to examine the development possibilities for the introduction and expansion of ICT use in least-developed countries (LDCs). LDCs are countries with the lowest level of economic and human development in terms of the UN HDI rankings (UN-OHRLLS, 2005). LDC status places a given country in priority status regarding development and also sets specific development priorities and focuses, especially capacity building and economic development (UN-OHRLLS, 2005; UN-OHRLLS, 2011). However, in order to fully understand how LDCs can affect development, it is necessary, as the dependency perspective suggests, considering the context and conditions that development is taking place in (Rahman, 2007). In keeping with this need to consider specific context, this research uses a case study approach to examine a

specific LDC (Ethiopia) and identify initiatives that are being used to introduce and leverage ICTs and what the implications of this introduction may be.

Africa is one of the most poorly developed countries in the world, and represents one of the major areas of focus for development activities. Countries that are ranked as LDCs and their development partners require substantial focus on eight specific priority development areas, including increasing production capacity; focusing on agriculture and food security, trade, commodities, and human development; managing crises; improving financial resources; and maintaining good governance (UN-OHRLLS, 2011). This development structure provides specific focuses for development activities. Major trading and development partners receiving exports from Ethiopia include China, the Netherlands, and Somalia. China, Saudi Arabia, and India are major importers into Ethiopia. There are some specific development priorities that can be identified for ICT in Ethiopia. The UN-OHRLLS (2011) statistics, collected in 2009, shows that there are 6.0 telephone subscribers per 100 inhabitants, and 0.5 Internet users per 100 inhabitants. Although this is a dramatic increase from previous periods (2005 figures indicated only 1.4 telephone subscribers and 0.2 Internet users per 100 inhabitants (UN-OHRLLS, 2011)), there is still a significant gap in access to Internet and communications technologies to the Ethiopian population. According to recent figures, there are a total of 908,900 landline telephones in use in Ethiopia (ranking 82nd in the world), along with 6.517 million cellular phones (ranking 92nd in the world) (CIA , 2011). Furthermore, telecommunications services are monopolized by the state-run Ethiopian Telecommunications Corporation (ECT), which provides inadequate connectivity for the majority of Ethiopians (CIA , 2011). With an estimated 447,300 Internet users, this shows a very low penetration of ICTs into the Ethiopian population (CIA , 2011).

2   RESEARCH FRAMEWORK

Given the conditions that are currently in place in Ethiopia in terms of its economic development and growth, it is necessary to formulate a specific research approach that will meet the specific requirements of the location. The research framework includes clear identification of the research problem as well as formulation of objectives that can help to meet these objectives. This section also includes a discussion of the research methodology used, which is a qualitative case study based on analysis of existing information regarding implementation of ICTs in Ethiopia.

2.1   Research Problem

ICTs can be used to provide several short-term and long-term economic development advantages, including acting as a source of human resource skills development, export income and foreign exchange, foreign direct investment (FDI) income and increased employment, improved management, efficiency, and transparency, and increased overall economic growth (Rahman, 2007). The use of ICTs also has the power for individuals to be able to access vastly increased knowledge and economic development information, as well as communicate across a substantially broader area of development (Meso, Musa, & Mbarika, 2005). The use of personal information technologies, especially mobile technologies, provides a substantial benefit from this personal access (Meso, Musa, & Mbarika, 2005). Furthermore, research in Kenya and Nigeria shows that personal ICTs such as cellular phones provide not only direct access to information and services, but also improve interest in accessing external services and information that increase overall commercial use of ICTs (Meso, Musa, & Mbarika, 2005). Thus, the introduction of ICTs within the LDC has a substantial potential benefit for the economy. ICTs are even seen by some commentators as a key link to globalization and development, as a means of overcoming the so-called 'Digital Divide,' or gap in knowledge and access between ICT users and non-ICT users (Akpan, 2003).

Regardless of the potential benefits of ICT for the LDC, there are ongoing barriers to implementation of these technologies within many LDCs. LDCs are often focused on development of agricultural technologies and food security, and many do not have the internal communications infrastructure required to implement widespread ICT use (McPhail & Rice, 2009). There are also issues with human capital development, which means that LDCs must often gain access to skills required for ICT development from outside (McPhail & Rice, 2009). Furthermore, this lack of internal capital development and prioritization is exacerbated by the external conditions, including the majority-English and Chinese World Wide Web, which can stymie the use of ICTs for information access and utilization in LDCs (McPhail & Rice, 2009). Thus, the problems of implementing ICTs in LDCs are not just structural, but are also based on the internal and external conditions within the country. Furthermore, ICT implementation can often be reprioritized in policymaking and resource allocation due to attitudes regarding the usefulness of ICT in the development process, as well as lack of knowledge regarding the potential benefits of ICT implementation of various sorts (Imran, 2009). Thus, there can be significant challenges to implementing ICT in LDCs.

The implementation of LDCs is particularly weak in Ethiopia. Ethiopia, with only 0.5 Internet users per 100 residents and 6 telephone lines per 100 residents (UN-OHRLLS, 2011), has one of the lowest rates of basic communications technologies in the world. Its ICT sector is almost completely undeveloped. However, the Ethiopian government does have a formal ICT policy in place. The overarching goal of this policy is: "to vigorously promote an ICT-driven socio-economic development process and transform Ethiopia from an agriculture-based economy and society to a predominantly knowledge- and information-based economy and society with deep-rooted democratic culture and good governance (WITFOR, 2007)." This policy has a series of objectives and strategies intended to implement these objectives in place. However, the effectiveness of this policy is not clear, as it has only recently been developed and is not yet fully implemented.

The main research problem is how Ethiopia can effectively implement ICT strategies and policies that will improve its economic development position. This will include issues such as building basic ICT capacity (including physical infrastructure and human capital requirements) as well as integrating ICT into existing and new economic sectors. Ultimately, the research problem will be to determine how Ethiopia can use ICTs to their own best advantage, as well as overcoming challenges faced in this process.

2.2   Research Objectives

There are four main research objectives that will be met in this research. These research objectives have been formulated with the research problem in mind. The research objectives include:

1. To describe the current state of development of ICT in Ethiopia and identify current initiatives and policies that are intended to support ICT capacity building. Furthermore, the existing programs and policies will be assessed for effectiveness and compared to programs in other least developing countries.

2. To identify challenges to effective ICT implementation in Ethiopia and determine the means to overcome these challenges.

3. To identify areas for improvement in current initiatives, in comparison to existing development programs and technologies in other areas, and to determine what potential benefits would be found from making these changes, as well as what risks these changes would imply.

4. To make recommendations about improvements to existing ICT use, programs and policies.

2.3   Research Methodology

The research methodology chosen for this research is a qualitative case study, which will be based on synthesis of existing research and information. The case study approach uses a single case (such as an individual, a firm, an organization, or a country) as the basis of the research (Denzin & Lincoln, 2005). The case study then makes use of all available existing information about the case, including policies and published material, interviews and studies, and any other sources of information available, to analyze a given situation and complete the objectives of the research, including identifying causes and determining recommendations for improvement (Denzin & Lincoln, 2005). Case studies can include qualitative data, quantitative data, or a combination of both types of data in order to provide the analysis.

There are a number of advantages to the case study approach, which excels at integrating the specific focus of the research with the context, history, and external factors involved in the situation (Denzin & Lincoln, 2005). It is also ideal for identifying solutions and approaches for the research problem, in comparison to other cases or the existing literature (Denzin & Lincoln, 2005). The case study is the best choice for examination of historical situations; situations that are unique, situations that have not been explored in detail and for pragmatic research intended to provide recommendations for a single organization (Creswell & Plano Clark, 2010). The case study approach does have some weaknesses, including that findings cannot be generalized and that selection of evidence for the case can make it vulnerable to researcher or respondent bias (Creswell & Plano Clark, 2010). However, these issues can be overcome with careful attention to bounding the generalization of the study, as well as carefully selecting data and analysis approaches to ensure that research bias is limited (and acknowledged where it occurs) (Denzin & Lincoln, 2005).

The process of case research is a six-stage process, corresponding to the six main responsibilities of the researcher (Denzin & Lincoln, 2005). These stages include bounding and conceptualizing the objective of the research; selecting research

questions or topics; finding data patterns related to these topics; triangulation and interpretation; selecting interpretations; and finding assertions about the case (Denzin & Lincoln, 2005). Within these six stages, the first two chapters of this research have corresponded to bounding the objective and selection of research topics. The remaining stages (including data collection, finding multiple interpretations, selection of interpretations, and finding eventual assertions about the case) will be detailed in the next several chapters.

2.3.1 Data Collection

The data collection process will focus on existing data, including (but not limited to): existing analyses of Ethiopian ICT use; policies and regulations as well as other Ethiopian government publications regarding the use of ICT; publications from non-governmental organizations (NGOs) regarding the use of ICT; existing data and figures regarding this use; and data from other countries that can be used to support analysis and interpretation. Additionally, theories of ICT implementation for development will also be sought out in order to support the formation of recommendations. The data collection process will include a search of libraries, online databases, and the World Wide Web for data that has been previously published, as well as draft implementations and other information available.

Interviews were conducted with Directors and ICT Officers of the organizations. Questions asked during the interview sessions were open-ended and semi-structured. Questions were more specifically structured to reflect on the objectives of this study. We conducted the interviews between July and September of 2011.

2.3.2 Data Analysis

The data analysis approach will use an inductive approach. The inductive approach begins with observation (describing the situation that can be seen in

Ethiopia), and then moves through processes of identifying patterns and forming tentative hypotheses regarding the situation that is under study (Trochim, 2006). The analysis process begins with a basic description of current ICT use in Ethiopia, the actual interview conducted during the study as well as identification of the existing policies and programs that are intended to support and increase it and the goals and objectives of these programs. The analysis then examines the outcomes of these programs and determines how well the programs are accomplishing their objectives, as well as considering how well the objectives will actually meet the needs of the Ethiopian economy. The analysis process will then compare existing programs within Ethiopia to programs that have been successful in similar LDCs and other situations, which will provide some insight into how these programs could be improved in practice. The final element of the analysis will be the process of recommendation generation, based on the analysis of the existing programs and their performance as well as consideration of how these programs could be improved. This analysis will be presented in four stages, including description, strengths and weaknesses, comparison to other programs, and recommendations generation. The ultimate goal of this research will be to provide a combination of technical and policy analysis that can be used to support development of a stronger and more robust Ethiopian ICT economy.

2.3.3 Validity and Reliability of The Data

The validity and reliability are the most important factors to measure the quality of the data conducted empirically. According to (Carmines, 1979 p, 11-13) and (Arlene Fink, 1995,p,92), reliability focuses on the particular property of empirical indicator's the extent to which they provide consistent results across repeated measurements. Reliability concerns the extent to which an experiment, test, or any measurement procedure yields the same results on repeated trials. The data for this study was collected directly from the ICT polcy makers in Ethiopia and workers working in the department of ICT. Other relevant data was collected from different offices connected with information technology such as the Ethiopian tele-communication agency and Ethiopian Science and Technology

Minster. Therefore we believe that the reliably of our data to some extent is fulfilled with these condition. Additionally, there were some related questions which measure internal consistency of the respondents' answer.

3   LITERATURE REVIEW

This literature review is intended to provide a theoretical foundation for the research and discuss various elements and practices in ICTs in developing countries that have been previously remarked on in the literature. It was conducted using a search of several databases, in which keywords and specific topics were searched and browsed. This search was then consolidated into the most appropriate sources for discussion of the topic. The literature review examines several key elements of the discussion in the use of ICTs in Ethiopia. These issues include the concept and status of the digital divide, overall importance of ICTs in developing countries and their scope, ways in which ICTs have been implemented in support of economic development and challenges that are seen in use of ICTs in developing countries.

3.1   The Digital Divide

The core issue in this discussion is the problem of the digital divide. The digital divide can be defined as "a persistent separation among those who have adequate computer resources, including social resources, such as support staff, teacher training, and scheduled upgrades, and those that do not (Ransdell, Baker, Sealy, & Moore, 2006, p. 239)." This gap is not primarily technological in origin, but is instead due to the political, social, and economic structures on which digital technology relies (Ransdell et al, 2006, p. 239). This gap, rather than the simple provision of services, is the potential sticking point for Ethiopia. However, there is a question of how deep the digital divide runs and how fast it is being closed. Ransdell et al (2006, p. 239-240) point out that English language literacy is required to partake in much of the World Wide Web resources, making a de facto divide between those that speak English and those that don't. Other barriers

include lack of mental, material, skills, or usage access to Internet resources (Fuchs & Horak, 2008, p. 100).

According to Fuchs and Horak (2008) there are a number of impacts of the digital divide on Africa generally. First, Africa has one of the lowest rates of Internet use of all countries, with only six of 57 countries surveyed in 2006 having higher than 10% access rates; conversely, 20 countries had access rates lower than one percent (Fuchs & Horak, 2008, p. 104). The countries with the lowest access rates also had one of the lowest Human Development Index (HDI) rankings in the world, making them least-developed countries, a situation that the authors describe as "digital Apartheid (Fuchs & Horak, 2008, p. 105)." This situation was largely attributed to the relative rarity and high cost of communications services, which depressed participation; however, neoliberal educational and management policies, which prioritized opening market access to the Internet, never addressed the problem of skills or mental access (Fuchs & Horak, 2008, p. 109). Thus, the digital divide is a pressing problem for African countries.

Although a digital divide does exist, there is evidence that rather than widening as expected in previous research (Fuchs & Horak, 2008, p. 110), this gap is actually narrowing, thanks in large part to lighter-weight technologies that have increased material access and lowered the skill barriers to participation (James, 2009b, p. 319). As James (2009b, p. 319) points out, the growth of users in China and India and dramatically increasing use of ICTs in these countries has increased the rate of participation by those in developing countries. Furthermore, even if the percentage of people using ICTs in developing countries is lower than in developed countries, in absolute terms this is still likely to be higher (James, 2009b, p. 320-321). In a general sense, thus, the digital divide is relative rather than absolute, and is not intended to specify a measured gap in use of ICTs (James, 2009a, p. 1124). The relative closure of the digital divide as developing countries gain more access to technologies previously constrained to the developed world is, in James's (2009a, p. 1124-25) inevitable. However, it still must be considered in the equation of why and how African countries such as Ethiopia lag behind in ICT use and how this situation can be improved.

3.2   Importance of ICTs in Developing Countries

There is a great deal of research that supports the importance of ICTs for developing economies. For example, one article notes, "Businesses in emerging markets tend to apply known IT solutions more effectively to improve business processes and revenues compared to their counterparts in matured markets (Murugesan, 2011, p. 7)." This indicates that firms in developing countries have a substantially much higher return to their investment than do firms in developed countries. However, the impact of ICTs in the developing economy goes beyond the simple increase in business efficiency. One study found that an increase in the use of mobile phones (as will be noted below, the mobile phone is a highly adopted technology in the developing world) led to an increase in economic terms, with a special influence being seen in national output (Sridhar & Sridhar, 2007, pp. 47-49). This study shows that developing countries, which experience higher rates of growth in capital as well as in labor, are clearly benefiting from the increasing penetration of information technology.

There are a number of ways that ICTs could be used to support development, including a focus on specific groups, practices, or other social concerns, or promoting local development of knowledge bases (Walsham & Sahay, 2006, pp. 10-11). Some of the ways in which ICTs have been used to assist development include: sustainable development practices, adaptation and cultivation of ICTs, and management of relationships such as sectoral, cross-cultural, and public/private sector interfaces (Walsham & Sahay, 2006, p. 16). To some extent, all of these issues are important for developing countries, as it is these issues that determine how well the country will be able to manage its growth over time. However, societal issues and infrastructure issues are major issues of concern, since these issues are often ignored in other contexts (Walsham & Sahay, 2006, p. 18). There are a number of ways the importance and use of ICTs in developing countries are talked about, including "as a process of technology and knowledge transfer and adaptation to local social conditions; as a process of socially embedded action; and as a process of transformative techno-organizational intervention associated with global politics and economics (Avgerou, 2008, p.

133).” However, all of these discourses identify a key issue with the ICT use in developing countries; namely that it serves not only to change practices, but also to change minds and ways of thought.

3.3   ICT Access and Uses in Developing Countries

One of the major issues for discussion is how ICT can be provided and used in developing countries. There are a number of novel methods of providing ICT access used in various developing regions (although most are not all used in the same area). However, a more common connection to ICTs in developing countries is increasingly frequently the use of mobile phones. ICTs may be used for e-commerce, e-governance, or information seeking across developing countries.

3.3.1   Uses of ICTS

One particularly common use of ICTs in the developing world is in education, as promoted by programs such as One Laptop Per Child (OLPC) (James, 2010b, p. 382). OLPC’s aims were to provide a cheap, simple, lightweight computer that could be used by the child at school and at home, in order to both learn about ICTs and provide information access (James, 2010b, p. 382). However, this use is not always positive. James (2010b) argues that the OLPC’s position that children should have their own computer is not grounded in any particular rationale or guideline, and in fact the concentration of computer hardware that this causes resource imbalances in vulnerable regions (pp. 382-385). Furthermore, he argues that this density of computer hardware is far higher than in most schools in developed nations (which average around five students per computer), and that this degree of computer hardware concentration is not required to teach children effective computation skills. Thus, this could be one area where ICTs are not as effective as they could be, due to over-density in a specific area that does not provide immediate effects.

Another area where ICTs are used in developing countries is in agriculture. A case of mobile phone use by commodity traders in rural markets (Aker, 2010) is discussed in more detail below. There is also other research suggesting that small indigenous agribusiness firms are a significant proportion of the users of ICT, at

least in Nigeria (Aleke, Ojiako, & Wainwright, 2011, p. 68). This study indicates that there are a number of reasons why agribusinesses may (or may not) use ICT, including social concerns, dissemination of information about them, and ease of use and usability (including concerns such as affordability) (Aleke, Ojiako, & Wainwright, 2011, p. 76). Nonetheless, the increased availability of information for the agribusiness is a means of increasing the seller's or grower's information and creating a better deal, according to those that use it.

A third area of use, and one that is particularly problematic in terms of understanding how well (or even if) it works, is the area of e-government. According to theoretical models, "E-Government is seen as strengthening the performance of government and public administration, and an efficient and effective state administration is a necessary prerequisite for economic and social development (Schuppan, 2009, p. 118)." However, according to Schuppan (2009), there is little information about e-government implementation in African countries (which are commonly excluded from institutional analysis) and the information that is available is often not robust or methodologically sounds (Schuppan, 2009, p. 119). E-government offers a number of potential advantages for African countries, including "the general provision of public services, statistical and information processes, finance management and tax systems, public participation, and formalization (Schuppan, 2009, p. 120)." However, Schuppan's (2009, p. 125) analysis of e-government programs in Ghana, Kenya, and Tanzania (which intended to address a relatively small problem such as corruption reporting) showed a number of problems. These included long development times (6-9 years) as well as problems developing capacity. Ultimately, these projects had positive effects, including reduced costs and corruption. However, Schuppan's (2009) point that there needs to be a balance of the intended and unintended effects within this area still stands.

A final area where ICTs may be used is in the e-commerce area; however, once again this is a difficult area because of a number of potential barriers to traditional e-commerce (Kshetri, 2007, p. 441). Some of these barriers include a high rate of generally unbanked people and low use of credit cards, inadequate electricity and

communications infrastructure, political barriers or consumer preferences for face-to-face communications and personal sales relationships, and cognitive biases against e-business (Kshetri, 2007, pp. 445-446). Perhaps more common, at least in Africa, is an m-commerce (or mobile commerce) model, in which techniques such as near-field communications (NFC) are used to provide mobile phone users with the ability to make micropayments (Meso, Musa, & Mbarika, 2005, p. 114). Thus, when considering e-commerce and its use in developing countries, a broader view than the focus on Web sites accessed through computers (as is common in the developed world) is required.

3.3.2 The Special Case of Mobile Phones

Mobile phones are a special case in expanding Internet access, because of their increasingly widespread diffusion around poorer parts of the world, even though they do not typically provide the type of Internet access that many people from developed countries are familiar with. Use of mobile phones can be mapped for comparison using a combination of current penetration and growth rate, which allows for clear positioning for each country in regard to the use of mobile phones compared to others (James, 2010c, p. 137). The use of mobile phones opens up a range of novel communication issues, such as changes in information seeking behaviors and market behaviors. For example, an increase in mobile phone use in Niger between 2001 and 2006 led to as much as a 16% decrease in price dispersion (or difference in prices between local markets) for commodity grain sellers (Aker, 2010, p. 46). According to Aker (2010, p. 46) this has the net effect of reducing the degree to which farmers (particularly those in rural or remote regions that may not have access to multiple market data) are taken advantage of by existing market structures.

African use of mobile phones is particularly widespread. According to a 2009 study by the ITU, 60% of Africa has mobile phone coverage, with subscription growth at 49% a year from 2002 to 2007 (Aker & Mbiti, 2010, p. 1). This is substantially higher than the rate of growth associated with more developed regions such as Europe. As of 2008, some 376 million mobile phone subscriptions

were registered in Africa, and with a high rate of growth this is only likely to be further increased (Aker & Mbiti, 2010, p. 5). A substantial portion of the first wave of mobile phone adoption is attributable to businesses, and the first personal adopters were likely to be male, educated, young, wealthy and urban populations (Aker & Mbiti, 2010, p. 7)," but since that time the use of mobile phones has spread widely and now is cross-demographic. Benefits of mobile phone adoption in Africa include widening information access, improving firm efficiency, creating new jobs because of demand for services, increase communication ties, and open up development opportunities (Aker & Mbiti, 2010, p. 8). Ethiopia's own growth rate is somewhat undetermined. James (2010c, p. 138) did not explicitly rank Ethiopia within his analysis of penetration and growth rates, but according to existing figures presented in Chapter 1, the current penetration rate of mobile phones is approximately 7.7%. This most likely positions Ethiopia in a Low-High category (low penetration but high growth), which James (2010c, p. 142) notes is typical of African countries, and that Chad, Burkina Faso, and Yemen fall into this category as well.

3.3.3   Access Methods

There are a number of studies that address the development of various access methods that are commonly used for ICT access in developing countries. First, there are a number of models in development that address a low-cost means of gaining access without the landline infrastructure used in densely populated and more developed areas (James, 2010a, p. 372). For example, the African 'Wizzy Digital Courier' system stretches Internet access between several locations using physical transportation of data; Drishtee, a private company in India, uses a similar approach, while Computers on Wheels (also an Indian program) uses laptops on motorcycles to share an occasional Internet connection between several locations (James, 2010a, p. 372). The Indian system DakNet is one of the best developed, integrating short point-to-point links between locations and physical access in order to create a mobile Web (James, 2010a, p. 372).

There are also approaches to provision that do not depend on physical access or use. These so-called 'blending' programs (James, 2010a, p. 373) have a central point of one user, who then transmits information to non-users using such approaches as radio programs, phone calls, or in-person intermediation. Additional modes of ICT access include community institutions like telecentres, where regional residents can seek out use and training on information technologies, and sharing devices (which allow for information to be shared between users as well as centrally from a Web resource) (James, 2010a, pp. 374-5). Central to many of these types of technologically enabled access modes is the idea that simply offering the technology is enough to make some potential users try it (such as children); this is the core of the hole-in-the-wall computer system, for example, which is used in India to encourage children to learn to use computers without supervision. However, as James (2010a, p. 372) points out, the various types of access in use in any particular location may vary widely.

3.4   Challenges in ICT Use in Developing Countries

Many of the challenges in ICT use in developing countries, including inadequate physical infrastructure and problems of e-commerce and mismatches between social, economic, and political assumptions, as well as the problem of lack of homogeneity in information needs, have already been discussed. However, there are some challenges that should be examined in particular. One such challenge is the problem of cost of access, although whether this plays a role is not necessarily clear. One study found that the cost of using cybercafé computers posed a relatively limited barrier to their use; with most users choosing to prioritize the Internet access (as available) (Clark & Gomez, 2011, p. 1). This could be related to the Dutta (2009) example, in which she showed that education, rather than income, was the main determinant in use of such locations. However, the overall cost of provision on the large scale, rather than at the consumer level, can continue to be a barrier for provision of computing services, even when supported

with some level of consumer fees as are many cybercafés (Clark & Gomez, 2011, p. 2). Thus, cost is likely to be a significant barrier in effective implementation.

Another set of barriers can be described as getting symbolic acceptance by the community, stimulating valuable social activity in relevant social groups, generating linkage to viable revenue streams, and enrolling government support (Madon, Reinhard, Roode, & Walsham, 2009, p. 95)." These elements are required in order to make sure that the project can be appropriately implemented, and are particularly important for digital inclusion projects (or those meant to close the digital divide) (Madon et al, 2009, p. 96-97). However, ensuring that they are present is often a difficult task. This is to some extent related to the problem of information technology diffusion, or spread of IT through a population (Shih, Kraemer, & Dedrick, 2008, pp. 43-44). There are a number of problems identified with technology diffusion, including high hardware and communication technology costs, availability of complementary resources like communications infrastructure and human resources, and economic structure (Shih, Kraemer, & Dedrick, 2008, p. 45). These factors mean that the diffusion of technological innovation is relatively slow through the developing world, especially given a low governmental investment in development of IT infrastructure and services or in human resource development (Shih, Kraemer, & Dedrick, 2008, p. 45).

3.5   ICTs in Ethiopia

The final stage of the literature review is to specifically examine the range of research detailing the use of ICTs in Ethiopia. This research has primarily been conducted in the context of multi-country review of its use and development, although there have been some studies that have been conducted specifically in Ethiopia. This section provides an overview of the findings of this research across the past 15 years, including policy and practice-based research findings.

Ethiopia was one of the first countries in Africa to gain a permanent Internet connection in real-time (as compared to earlier point-to-point links) (Alemna, 1999, p. 169). Early development of ICTs in Ethiopia looked highly promising in the mid-1990s, since Ethiopia (along with Egypt) had significantly higher levels

of ICT skill in the population than many other African countries (Moyo, 1996, p. 118). Moyo argued that the rate of indigenous ICT development capacity was higher in Ethiopia even than in South Africa, which had a relatively low level of ICT development despite its comparatively high level of human resource development. Compared to other African countries, early Internet access was also relatively inexpensive in the late 1990s (although still exceptionally so for the average person), at around 19% of GDP per capita; this can be compared to the highest charge, of 69.8% for Mozambique (Oshikoya & Hussain, 1998, p. 118). Evidence suggests that investment in ICTs is associated with economic growth in Ethiopia, along with other developing countries (Yoo, 2003). Three areas of current concern in research in ICTs in Ethiopia within the literature include use of mobile phones, higher education, and telemedicine.

Economy	Rank 2009-11	Rank 2008	Rank 2007
Sweden	1	1	1
Singapore	2	14	15
United States	5	19	17
India	43	117	116
Tanzania	138	149	151
Ethiopia	147	154	153
Niger	154	158	157
Chad	152	159	159

Table 1 ICT development indexes - ranking

Study suggests that there is strong investment in mobile phones as a means of promoting ICT (Fleischmann & Srikantaiah, 2011, p. 3). Government and non-government actors in Addis Ababa and Debre Zeit and Nazreth are working to improve mobile phone applications that could be useful for development of ICTs (Fleischmann & Srikantaiah, 2011, p. 3). However, there are a number of impediments to the development of an effective mobile phone-based system, including a low number of subscribers (based on the relatively low per-capital GNA) (Fleischmann & Srikantaiah, 2011, p. 3). There is also a lack of development resources, strong customs regulations and resulting high levels of contraband and pirated equipment, too little training, and a significant focus on Addis Ababa, which starves other regions of development resources (Fleischmann

& Srikantaiah, 2011, p. 3). In order to leverage the effectiveness of mobile phones, there would need to be significant capacity building and planning (Fleischmann & Srikantaiah, 2011, p. 3).

ICTs have been used in development of higher education opportunities in Ethiopia, both as a practice issue and as a subject. Tertiary education reform that took place in the early to mid 2000s had a strong information technology component, with ICTs being seen as a way to link structural reforms and improves teaching in the universities (Saint, 2004, p. 85). Private tertiary institutions were the main places where information sciences were being studied at the time (Saint, 2004, p. 90). However, the 2003 National Capacity Building Plan targeted ICTs as an area of training for the next five years, in order to build capacity and improve the ability to train ICT graduates (Saint, 2004, p. 94). Additionally, costs for access to ICTs (including purchase of equipment) were added to the budget for students in 2003 (Saint, 2004, p. 99). The teaching of advanced ICTs began in the public university system in 2009 with the establishment of an Information Systems PhD program at the University of Addis Ababa, one of two large public universities in Ethiopia (Negash, Watson, & Straub, 2008, p. 67). This program, which would operate initially with foreign professors, was intended to reduce the tendency toward brain drain, or transfer of high-skilled individuals to countries that have higher payment rates (Negash, Watson, & Straub, 2008, p. 71).

Another area where ICTs have been studied in the Ethiopian context is in telemedicine and e-health. The use of ICTs and health technology is driven by the World Health Organization (WHO) in an effort to combat the spread of HIV/AIDS and make the most of scarce medical resources; it is a common practice across Africa (Bukachi & Pakemham-Walsh, 2007, p. 1624). One such system, Health InterNetwork Access to Research Initiative (HINARI), began in 2002 to offer health professionals in Africa access to up to date health research, in an effort to combat the high cost of access to these journals (often higher than the per-capita GDP of the country) (Bukachi & Pakemham-Walsh, 2007, p. 1626). However, this does not overcome basic connection problems, which continue to be problematic given that many medical professionals within Ethiopia do not have

routine broadband access (Bukachi & Pakemham-Walsh, 2007, p. 1626). A different type of health ICTs is telemedicine, which allows remote specialists to communicate with on-site caregivers to provide diagnosis and treatment assistance (Bukachi & Pakemham-Walsh, 2007, p. 1627). Telemedicine began to be used in Ethiopia in 2001 and is now used at ten hospitals and 29 clinics (Kifle, Payton, Mbarika, & Meso, 2010, p. 329). Some of the specialties that telemedicine is used to support include radiology, dermatology, ophthalmology, and pathology; each of these specialties has its own set of equipment and connections to specialists in various areas to provide advice (Kifle, Payton, Mbarika, & Meso, 2010, p. 329). However, these programs continue to be difficult to use, prompting concerns that medical specialists may not make strong use of them (Kifle, Payton, Mbarika, & Meso, 2010, p. 339).

The literature review chapter above discussed the existing academic knowledge regarding implementation of ICTs in Ethiopia and in developing countries generally, detailing their benefits as well as obstacles to putting their use in place. Addtionaly what has been done to overcome the obstacles has been discussed. In following section of the research, information collected from various sources, including interviews from Polcy mekers, ICT professionals, development agencies and organizations, the Ethiopian government, and existing studies, is used to demonstrate the current state of ICT development in Ethiopia and to discuss the potential for improving the use of ICTs and leveraging this use for economic and human development.

4   CASE STUDY ETHIOPIA

4.1.1   The Current State of ICTs in Ethiopia

Despite the early promise of ICT development in Ethiopia, it has largely foundered due to lack of connectivity. With an internet access rate of only 0.42% in 2008, Ethiopia has one of the lowest rates of Internet access in Africa (compared to an average of 5.34%) (Chekol, 2009). According to the International Telecommunications Union's (ITU) Information Development Index (IDI), Ethiopia ranks #147 out of 159 countries in terms of information access and technology (Adam, 2010). There is only one internet provider (the state-owned monopoly Ethiopian Telecommunications Corporation), and most people access the Internet through Internet cafes (Chekol, 2009). ETC is an ineffective monopoly and is overseen by a regulator that is seen as illegitimate and weak, reducing the public support for ICT services (Adam, 2010). This both limits access geographically (most cafes are in Addis Ababa) and in terms of access (which is slow and unreliable) (Chekol, 2009). It is clear that at least in terms of open access to citizens, Ethiopia lags far behind in its use of ICTs.

4.1.2   Policies

The 2002 draft of the National Information and Communications Technology (ICT) Policy is no longer available for study. However, its stated vision was "to improve the social and economic well-being of the people of Ethiopia through the exploitation of the opportunities created by information and communication technologies, for vitalizing and ensuring the establishment of a sustainable democratic system and good governance, and for achieving sustainable, rapid socio-economic development (Chekol, 2009)." This policy was implemented with the establishment of the Ethiopian ICT Development Authority (EICTDA) in 2003; the EICTDA was tasked with implementing the pillars of the ICT Development Policy (Chekol, 2009). In the ICT for Development Plan 2010, there is an implementation of ICT for education planning, including three different initiatives (the National SchoolNet Initiative Program, the National ICTs in

Higher Education Initiative, and the National ICT Education, Training, and Awareness Initiative) (Chekol, 2009).

There have been a number of laws passed that also improve the regulatory environment for Ethiopian ICT. The foundation of the Ethiopian Intellectual Property Office (EIPO) in 2003 consolidated intellectual property protection regulation, and since that time a number of laws regarding copyright, trademark, and general intellectual property enforcement have been passed that improve the overall environment in this area (Chekol, 2009). There have also been improvements in constitutional protections for access to information, such as the Freedom of the Mass Media and Access to Information Proclamation, which enforced the constitutional right of all individuals to information from public bodies as well as information from mass media and the Internet (Chekol, 2009). However, some services such as voice over IP (VoIP) continue to be banned (Chekol, 2009). There are a number of other policies that are seen in the implementation of various elements of the ICT policy.

4.2   Review of Objectives

The objectives of the research can be restated briefly as follows:

1. Describing the current state of ICTs in Ethiopia, including current initiatives and policies, and assess these policies for effectiveness.

2. Identifying challenges to effective ICT use in Ethiopia and ways to overcome these challenges.

3. Identifying areas for improvement in existing programs and performing a risk-benefit analysis.

4. Making recommendations to improve ICT use and policies within Ethiopia.

4.2.1   Policy Implementation and Effectiveness of Regulation

There are a number of concerns with policy implementation and the effectiveness of regulation within the Ethiopian ICT sector. Adam (2010) notes that the Ethiopian Telecommunications Agency (ETA), the regulatory agency that is tasked with overseeing the ETC and ensuring that telecommunications regulations and policies are implemented, is perceived to be weak and does not have the degree of consistency or regulatory power that would be required to fully ensure regulation effectiveness. Furthermore, there are allegations that the ETA has strong ties to the ETC, preventing the effective regulation of the state monopoly company and impeding the efficiency of the regulatory process (Adam, 2010). There are also strong concerns that the investment in infrastructure and services that is required by the various ICT policies is not being made, which would obviously have a strong implication for the overall effectiveness (Adam, 2010). Discussions with policymakers and practitioners of ICT also led to the impression that although there were relatively strong policies in place, these policies were not being implemented strongly enough to make sure the requirements were being met. In particular, there was an impression among these policymakers that there were routine misses for educational and connectivity policies, and that these were not prioritized in the policy implementation realm. Because of this, the policy implementation within this area is believed to be weak.

4.3   Challenges and Overcoming Them

There are a number of challenges identified in the Ethiopian ICT context in addition to simple policy implementation that need to be discussed. Some of these issues include development of infrastructure and adopting new technology to support ICT services, the problem of competition and revenues, and human factors involved in the adoption of ICT and technologies. These issues are discussed below in order to demonstrate how these factors are playing a role in technology development and what can be done about them.

4.3.1   Infrastructure and Technology

One of the most persistent challenges is the limitation of available infrastructure and technology. The landline technology for broadband provision within Ethiopia is substantially limited, and must be built up along with transportation and electricity infrastructure; this is a large-scale development project that has not yet been implemented (Chekol, 2009). There have been a number of movements toward the infrastructure development process. According to the Ethiopian Tele communication one major attempt was connecting 10,000 rural villages using a $1.9 billion investment from the Zhongxing Telecom Corporation. However, this infrastructure assembly attempt was not successful, as according to Adam (2010) the effort to expand services was accompanied by a drop in the service quality of broadband services. Moreover another major technological challenge Ethiopia is facing Lack of fonts, keyboards, and Unicode for local languages; a large number of local languages. The majority of the interviewed individuals had mentioned that language is one of the major technological obstacles in adoption and localization of ICT.

> *"We should have a standard authority for the common usage of localization. Support to Ethiopic script (full), devising means to provide content with local relevance."*

> Mr. Teshome Sahilemaria (MOST)

One obvious way of overcoming infrastructure problems is the use of mobile technology, which is cheaper and easier to deploy than landline stations. The Ethiopian government began to provide mobile phone users with Internet access using the General Packet Radio Service (GPRS) protocol in 2009.ETC also made

a commitment to improving landline infrastructure through the placement of 10,000 km of fiber-optic cables, which will substantially improve the availability of landline access (Chekol, 2009). Another Technological problem can be overcome by Designing fonts and keyboards, working with suppliers to create a common framework.

> *"Ethiopia is making effort towards make in more suitable strategy to the implementation of ICT some of the current conditions specifically the government's attitude towards supporting local ICT companies needs a great level of improvement.."*

Despite these infrastructure improvements there is still an exceptionally low rate of mobile phone penetration, and even lower landline use. The total subscriber base for telecommunications is only 6%, with only 1.1% of the population having landline communications access and 5.5% having mobile access (Adam, 2010). The table below compares the targets set by the ICT Policy and achievement by June 2009, demonstrating that there is a significant gap between the policy's intended position and reality. These targets are from the 2008/2009 ETC Statistical Bulletin, which was no longer available to the researcher. As these figures show, the fiber network expansion and the rural village outreach project were closest to completion (although as already discussed, the rural village expansion had its own problems including quality of service issues). This shows that although there is a clear recognition of the problems of infrastructure and connectivity, not enough is being done to overcome these problems.

Targets	June 2010 Target	Achieved by 2009	% of Target Achieved by 2009
Fixed Network	3,000,000	1,150,622	38%
Mobile Subscroption	12,000,000	4,051,703	40.5%
Fibre Network (km)	10,000	6,332	63%
Internet Subscription	150,000	71,059	43.4%
Rural Village Outreach	15,000	9,892	67%

Table 2 Targets for connectivity (2010) vs. actual connectivity (2009) (Source: Adams, 2010)

4.3.2 Human Factors

There are significant human factors in the use of ICTs in Ethiopia as well. For example, there is a substantial language and literacy barrier to use of the Internet; only 42% of Ethiopian adults can read and write, and the number of English speakers is very low, impeding the use of the Internet for communication and information seeking purposes (given that most of the Internet is in English). There is also a significant skills gap, with many Ethiopian adults not being conversant with ICTs or not seeing a need to learn to use them. Finally, there is the issue of regulation and normative borders surrounding Internet use.

A current research in Ethiopia reports that many Ethiopians view the Internet as a mass media form to be regulated or are uncomfortable with much of the information available on the Internet. As such, there are significant concerns for the development of Internet use as a reutilized part of daily life, due to both normative resistance to its use and lack of appropriate skills (literacy, English speaking, or ICT skills).

There are some policy efforts that are currently being aimed at improving the community acceptance of ICT technologies, including the ICT for Community

Development Strategy, intended to support health, agriculture, and education needs. This policy, which focuses on the development of community access centers, is intended to support development practices through offering services to communities. These efforts are in line with efforts in other areas to promote a community access model, in which equipment is shared and in which those that have higher levels of literacy, English language, or ICT skills can assist those that have lower skills levels in their information seeking activities (James, 2009a). These programs are also designed to promote community acceptance of ICT services and promote community learning practices (Madon, Reinhard, Roode, & Walsham, 2009). However, while these programs are steps in the right direction, more still needs to be done. In particular, notes that 12 community ICT centers have been developed, along with a limited number of other programs. Given the general lack of connectivity available within Ethiopia, it is clear that this program would need to be significantly expanded if it were to be developed into a full-time program. To some extent, there can be an expected improvement in ICT skills due to the educational policy development noted above; however, this will depend on how well (and if at all) these programs are implemented at the village school level. It should also be noted that higher education strategies cannot be relied upon to promote human factors development within the villages, due to the very low rate of higher education pursuit within Ethiopia. Thus, the main efforts in that regard are likely to come from the elementary education programs.

"The major problem in adopting ICT in Ethiopia and Africa for that matter is poverty in that both the government and the people have difficulty and coping up with the ICT technology becomes and shortage of mone education and in our case lahguage because Ethiopia uses a difffrent latter which is Fidele. So that is the biggest problem. The second problem on finding the

professional on ICT research and development"

Dr Temtim AssefaPHD(AAU)

4.4　Areas for Improvement and Recommendations

Within this section a number of areas for improvement are targeted and recommendations are made to improve these areas. The recommendations for improvement are focused on regulatory capacity and regulatory strength, human resources development (including basic skills and ICT skills), and improving the penetration of ICT services through the development of mobile networks and other lightweight networks. These recommendations are derived from the literature review, policy documents, and conversations with policymakers and regulators. It should also be noted that in many cases, the Ethiopian government and other organizations are already engaged in this type of capacity development. However, there are still significant gains that can be made within this area.

In order for any other effective changes to be made, Ethiopia's government needs to address the problem of regulatory capacity development and capacity planning. The current state of ICTs in Ethiopia is highly mixed; while the frameworks for ICT policy development are robust, there are significant problems with implementing these policy frameworks and regulatory strength, as well as resource capacity assignment.

Overall, the framework of policy that is in place is strong, and the emphasis on education and infrastructure capacity development within the policy is likely to improve conditions for the further significant planning needs. However, there are significant gaps within policy implementation that need to be addressed. Specifically, the ETA needs to have an increased level of institutional legitimacy and independence from ETC, in order to allow it to regulate the monopoly provider effectively. Moreover having community centers for farmers and other rular area residents get to attend courses like how to use the internet for free. The

Ethiopian Government could ramp up ICT knowledge by offering such courses at a small fee for a course.

4.5   Interview Insights and Information

In addition to the information gleaned from the above research, there are a number of insights that can be seen from the interviews that were conducted. There were 17 interview questions included in this research (included in Table 2).

There were nine respondents to the interview, including:

- An ICT Department officer from the Ethiopian Telecommunication Agency (A)

- An Information Systems Designer (B)

- A principle lecturer at the Universty of Addis Ababa Ethiopia (C)

- An Ethiopian Science and Technology Agency officer (D)

- An ICT worker (E)

- An ICT worker (F)

- An ICT worker (G)

- An ICT worker (H)

- An ICT worker (I)

Table 2 identifies general trends in the interview responses for each of the research questions. These general trends or themes are then supported in the discussion of the interviews with specific quotes from the respondents, which support and demonstrate specific aspects of the problems involved.

Item	Question	Number of Responses	Response Themes	Quotes
1	How is ICT adopted in Ethiopia?	5	IT is adopted through education, research, NGO programs, government agencies, and ETC. There is a growing awareness of the uses of ICT.	
2	As a director/ICT officer what do you think are the problems in adopting ICT in Ethiopia?	7	Lack of awareness, infrastructure, government action, technical skills, illiteracy, and poverty.	*The major problem in adopting ICT in Ethiopia and Africa for that matter is poverty in that both the government and the people have difficulty and coping up with the ICT technology becomes and shortage of money. So that is the biggest problem. The second problem on finding the professional on ICT and poor learning curve.*
3	What is the current state of development of ICT in Ethiopia?	8	Development is at an early stage and needs attention.	
4	What are the challenges to effective implementation in Ethiopia?	8	Lack of education and skilled manpower, brain drain, lack of private ISPs, lack	

Item	Question	Number of Responses	Response Themes	Quotes
			of ICT infrastructure and cost of equipment	
5	How are these challenges overcome?	8	Awareness, education, government and media coverage, and increased support from universities.	
6	How do you think they can be improved?	4	Education, support from the government, improved media coverage, private sector support, and rules and regulations	
7	What are the mechanisms that are used to overcome the problems?	2	Improving ease of use and increasing bandwidth.	
8	Do you believe there is a problem related to localization of ICT?	8	There is a problem with localization.	
9	If yes, what are the problems associated?	5	Lack of fonts, keyboards, and Unicode for local languages; a large number of local languages	

Item	Question	Number of Responses	Response Themes	Quotes
10	What mechanisms are used to overcome these problems?	5	Designing fonts and keyboards, working with suppliers to create a common framework.	*We should have a standard authority for the common usage of localization. Support to Ethiopic script (full), devising means to provide content with local relevance.*
11	Do you think adoption of ICT for Ethiopia is unimportant?	7	It is very important.	
12	What is your reason for this?	4	It is important for economic growth and transformation.	*It's quite important; actually, the county recognizes it as being one of the most important focus areas in its growth and transformation plan.*
13	How does the country benefit from adopting ICT?	7	Information sharing, modernization of data and production, and economic growth.	*Since ICT is mainly dealing with data, communication and speed, any country can benefit from it. Having an organized and timely data, decision makers can device their plans accordingly Proper communication helps the government as well as citizens to create online friends and entertainment.*

Item	Question	Number of Responses	Response Themes	Quotes
14	Do you think using ICT for Ethiopia is an effective means for growth?	8	IT is an effective means of growth.	
15	Is it possible to explain the usage of ICT in terms of economic profitability, low initial cost, decrease in discomfort, savings in time and effort, and the immediacy of the reward?	4	Yes.	
16	Do you think existing ICTs' are compatible to the needs of organizations in Ethiopia or in your organization?	6	While the existing technologies are a good start, there needs to be more emphasis on developing new technologies. Responses are mixed.	*Yes and No, the country is making effort towards make in more suitable strategy to the implementation of ICT some of the current conditions specifically the government's attitude towards supporting local ICT companies needs a great level of improvement.*
17	What do you think about the complexity of ICT in Ethiopia or in your organization?	4	Technology is not more complicated in Ethiopia than elsewhere.	

Table 3 Interview response trends and narrative elements

5   CONCLUSION

5.1   Interview Review and Findings

Overall, the responses to the interviews are consistent with the information that was found through the secondary literature. Of particular interest is the general feeling that Ethiopia does not have a more complex ICT environment than other countries, but instead faces about the same amount of complexity that other countries do. Overall, there is a general sense that there is a strong need for specific improvements (including improving infrastructure and improving localization features) that is seen in the responses. There is also the need to develop better educational aspects, in order to improve the technology skills and improve awareness. The responses also indicate that the government needs to both take a stronger hand in education, awareness, and policy development, and to allow private ISPs to engage in the market in order to improve services. Moreover the problems of illiteracy and lack of English speakers means that in addition to ICT capacity development, the Ethiopian government faces the not-insignificant problem of developing basic skills before ICT can even be used to any great extent. Given that 42% of the Ethiopian adult population is illiterate, this is likely to be a significant issue and one that needs to be resolved before policy and infrastructure changes can have a great effect.

5.2   Result

This research has highlighted a fundamental truth about ICTs and their use in Ethiopia. Although the government and NGOs recognize and even promote the needs of ICT in the development process, little is being done to actively develop ICT infrastructure or human resources capacity. This results in a serious gap in

ICT implementation that cannot be overcome through political discussion or private action, particularly since Ethiopia does not allow for private competition in the ICT sector in any sense. Instead, the monopoly dominance of ECT prevents innovation and increased penetration of ICT, particularly in lightweight deployment sectors like mobile technology. Although an effective regulator could potentially reduce the problems involved in this type of oversight, the ECA, which is charged with regulating the ECT, does not take a strong enough role in regulation or in forcing changes to modernize and expand the current infrastructure. Without either aggressive regulation to help increase the willingness of ECT to expand ICT infrastructure and services or opening the market to private competitors, it is difficult to see how Ethiopia will reach a critical mass of penetration required for ICT to have a significant impact on development.

One of the clear finding is literacy, which is a big stumbling block for adopting ICT in Ethiopia, clearly if one can not read or write it is very difficult then to introduce ICT. On the other hand one can argue that ICT can be used to improve literacy rates.

5.3   Discussion

This research has largely been consistent with the expected findings given the literature review in terms of the potential impact of ICT development on Ethiopia, as well as areas of discussion regarding the lack of development. One area of particular surprise was the relative lack of NGO involvement; although this was cited in the research as a major factor in development, most government initatives are conducted through the ETC. This leaves a great deal of room for development using approaches like those profiled by James (2010a), like hole-in-the-wall

systems, mobile systems, and community centers. This is suggested as a major area for future development and research.

The findings of the research were also consistent with the literature on the digital divide, particularly the evidence offered by Fuchs and Horak (2008) and Ransdell et al (2006). In particular, the lack of localization (including both hardware and software localization and failure to include local scripts in Unicode, disallowing the use of most Ethiopic languages on the Internet without alternation) is consistent with the discussion offered by Ransdell et al (2006). The low rate of English language literacy, along with other factors like low skill levels, lack of awareness, and lack of acceptance of the benefits of the Internet, is also consistent with the existing research by these authors. Another factor that was mentioned in the research is that of brain drain, or loss of highly skilled Ethiopians to countries that have better pay rates. This is also mentioned in the literature as a major factor in promoting the differences in technological implementation in LDCs (Negash, Watson, & Straub, 2008). Overall, these findings continue to suggest, as is consistent with the literature, that there is a gap between government priorities (which support increased ICT development) and actual capacity building activities that could be used to improve outcomes.

6   LIMITATIONS AND FUTURE WORK

This research process does have some limitations. The first issue is that as a case study, it only applies directly to Ethiopia, as it reflects peculiarities and conditions that are not in place in any other country. In fact, this is particularly so, given the unique position of Ethiopia as one of the least-developed ICT environments in the world, moreover Ethiopia has a unique alphabetical latter which makes it even more difficult to adopt ICT. A second issue is that as a cross-sectional study, this research does not reflect any future developments that could change the ICT development focus. An area for future research is action research into policy development and activities that could help improve the ICT environment in Ethiopia. This research would provide information that could be used to create improvements in this environment.

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8   APPENDICES

Appendix1

THE QUESTIONNAIRE

Date of the interview _____

Name Of Agency

Introduction

Good morning/ Good after noon

My name is_____ I am a Business Information Technology student conducting ICT survy on Adopting ICT in least developed countries that is based on Ethiopia. I am interested in knowing what are the current initiatives and policies that are intended to support ICT capacity in Ethiopia, what are the challenges to effective ICT implimenation and how the challages are overcame.

Part 1a. Back ground information on the individual and his status in the organization

Q1.The occupation of the individual

Q2. Age of the individual

Q3. How many people work under him or with him?

Q4. How many years have you been working inICt industry?

Q5. Do you speak any other language than Amharic?

Part 2. The actual Semi structured interview questions

How is ICT adopted in Ethiopia?
As a director/ICT officer what do you think are the problems in adopting ICT in Ethiopia?
What is the current state of development of ICT in Ethiopia?
What are the challenges to effective implementation in Ethiopia?
How are these challenges overcome?
How do you think they can be improved?
What are the mechanisms that are used to overcome the problems?

Do you believe there is a problem related to localization of ICT?
If yes, what are the problems associated?
What mechanisms are used to overcome these problems?
Do you think adoption of ICT for Ethiopia is unimportant?
What is your reason for this?
How does the country benefit from adopting ICT?
Do you think using ICT for Ethiopia is an effective means for growth?
Is it possible to explain the usage of ICT in terms of economic profitability, low initial cost, decrease in discomfort, savings in time and effort, and the immediacy of the reward?

Do you think existing ICTs' are compatible to the needs of organizations in Ethiopia or in your organization?
What do you think about the complexity of ICT in Ethiopia or in your organization?

Apendeix 2 Ethiopian Amharic alphabet

	ä	u	i	a	e	ï	o
h	ሀ	ሁ	ሂ	ሃ	ሄ	ህ	ሆ
l	ለ	ሉ	ሊ	ላ	ሌ	ል	ሎ
h	ሐ	ሑ	ሒ	ሓ	ሔ	ሕ	ሖ
m	መ	ሙ	ሚ	ማ	ሜ	ም	ሞ
s	ሠ	ሡ	ሢ	ሣ	ሤ	ሥ	ሦ
r	ረ	ሩ	ሪ	ራ	ሬ	ር	ሮ
s	ሰ	ሱ	ሲ	ሳ	ሴ	ስ	ሶ
sh	ሸ	ሹ	ሺ	ሻ	ሼ	ሽ	ሾ
q	ቀ	ቁ	ቂ	ቃ	ቄ	ቅ	ቆ
b	በ	ቡ	ቢ	ባ	ቤ	ብ	ቦ
t	ተ	ቱ	ቲ	ታ	ቴ	ት	ቶ
ch	ቸ	ቹ	ቺ	ቻ	ቼ	ች	ቾ
h	ኀ	ኁ	ኂ	ኃ	ኄ	ኅ	ኆ
n	ነ	ኑ	ኒ	ና	ኔ	ን	ኖ
ñ	ኘ	ኙ	ኚ	ኛ	ኜ	ኝ	ኞ
a	አ	ኡ	ኢ	ኣ	ኤ	እ	ኦ
k	ከ	ኩ	ኪ	ካ	ኬ	ክ	ኮ

	ä	u	i	a	e	ï	o
h	ኸ	ኹ	ኺ	ኻ	ኼ	ኽ	ኾ
w	ወ	ዉ	ዊ	ዋ	ዌ	ው	ዎ
a	ዐ	ዑ	ዒ	ዓ	ዔ	ዕ	ዖ
z	ዘ	ዙ	ዚ	ዛ	ዜ	ዝ	ዞ
zh	ዠ	ዡ	ዢ	ዣ	ዤ	ዥ	ዦ
y	የ	ዩ	ዪ	ያ	ዬ	ይ	ዮ
d	ደ	ዱ	ዲ	ዳ	ዴ	ድ	ዶ
j	ጀ	ጁ	ጂ	ጃ	ጄ	ጅ	ጆ
g	ገ	ጉ	ጊ	ጋ	ጌ	ግ	ጎ
t'	ጠ	ጡ	ጢ	ጣ	ጤ	ጥ	ጦ
ch'	ጨ	ጩ	ጪ	ጫ	ጬ	ጭ	ጮ
p'	ጰ	ጱ	ጲ	ጳ	ጴ	ጵ	ጶ
s'	ጸ	ጹ	ጺ	ጻ	ጼ	ጽ	ጾ
s'	ፀ	ፁ	ፂ	ፃ	ፄ	ፅ	ፆ
f	ፈ	ፉ	ፊ	ፋ	ፌ	ፍ	ፎ
p	ፐ	ፑ	ፒ	ፓ	ፔ	ፕ	ፖ