University of Agder

The impact of ICT use for Drought Early Warning System in Karamoja

An assessment of e-readiness of ICT factors for DEWS

"A case study conducted in Karamoja region, Northern Uganda"

By

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This master thesis is carried out as a part of education at the University of Agder and is therefore approved as a part of this education. However, this does not imply that the University answers for the methods that are used or the conclusions that are drawn.

Abstract

The study assessed the e-readiness of ICTs factors for Drought early warning system. It examined the availability of ICTs factors in Karamoja. It employed qualitative research strategy. E-readiness refers to the degree of preparedness by a community/country to participate in the networked world. The word has different meaning to different people. E-readiness is subjective. So there are different elements to evaluate when the readiness of a project/community is assessed. The study has assessed the readiness of ICTs infrastructure, policies, costs, e-skills and institutions. It was found that two constraints hindered ICTs infrastructure to get e-ready; resigned investment and connectivity's constraint. But the available national policies converge to universal access and other international policies. This means that national policies is enabling factor ICTs to be used in Karamoja. But the problem with these policies lies in poor implementation. The availability of e-skills are limited in Karamoja. Although the communication services are getting cheaper, it is still very expensive in Karamoja. Finally, the impact of non-e-ready ICTs factors on DEWS is negative. It was found that these factors cause DEWS to fail. On the other hand, there are other factors which may contribute to DEWS to fail. |Despite these challenges, there is a systematic progress when it come to ICT use in Karamoja. This means that ICTs can be developed to build the resilience of poor people in Karamoja.

Key words: Impact, Drought Early warning System, ICT

Acknowledgements

Dedication

I dedicate this work to my motherMs. Maryan Hassan Yusuf.

Declaration by Candidate

I, Ibrahim Hussein, hereby declare that this thesis "The impact of ICT use in Drought Early Warning System (DEWS): An assessment of e-readiness of precursory ICT factors for DEWS in Karamoja: *A case study of study of DEWS project in Karamoja, northern region of Uganda* has not been submitted to any other universities than University of Agder, for any type of academic degree.

Norway	Ibrahim	15.12.2015
Place	Ibrahim Said Hussein	Date

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Abbreviations

ACTED: Agency for Technical Cooperation and Development

Airtell: Telecommunication company in Uganda

DANCHURCHAID: Danish Church Aid

DDRROPM : Department of Disaster Risk Reduction of Office Prime Minister

DEW:" Drought Early Warning System

DFID Department Foreign International Aid

E-skills: Electronic Skills

EWS: Early Warning System

FEWS NET: Food Early Warning Network

FOA: Food and Agriculture Organization

GB: Gigabit

ICT: Information Communication Technology

ICT4DEWS: Information Communication Technology For Drought Early Warning System

INGO: International Non-Government Organization

ISDR: International Strategy Disaster Reduction

ITU: International Telecommunication Cooperation

MAM :March, April May

 Mbps: Megabits

MDG: Millennium Development Goals

MIT: Ministry of Information Communication Technology

MTN: Telecommunication cooperation

NDG Nokia Data Gathering

NGOs, Non-governmental organization

 CBO: Community based Organization

NRI   Networked Readiness Index

ODK: Open Data Kit applications

PEAP : Poverty Eradication Action Plan

PIP: Public Infrastructure Providers

RCDP: Rural communication development psolicy

RCDF: Rural communication development fund

SDG: Sustainable development goals

UCC: Uganda Communication Commission

UNDP: United Nation Development Program

UNESCO United Nation Education Social Cultural Heritage

USD: United States Dollar

UTL: National telecommunication in Uganda

UGS: Uganda Shilling

VSAT: Very Small Aparatus Terminal

XX: symbol used for organizations/telecom firms in Karamoja

Background

I wanted to understand contextual factors affecting when ICT for development project is implemented in Karamoja. Karamoja is least developed region in Uganda. It was recently when the first female doctor graduated. It was noted the parents have less interest in sending their kids to school. The public services are not adequately available in the region. The basic infrastructure is not well developed. The same is true to the telecommunication networks is scanty.

Additionally, using ICT for development is innovative topic. It has its challenges. Because the relation that exit between ICT and development is complex. Such complexity influences the success and failure of ICT projects, when they are implemented in developing world, like Uganda. It was noted that majority of ICT projects fail in developing countries (Heeks, 2008). ICTs factor such as physical access to networks which are non-e-ready is one of the key causes driving ICTs project to fail (Ojo, et al, 2008 P.42).

The department of development studies of University of Agder proposed several topics of ICT4D. One of them was the use of ICTs for disaster risk reduction. Hyogo framework Apprach (2005) promotes preparedness and prevention to reduce disaster risks. Early warning system (EWS) is one means to prevent and prepare at risk communities. So I selected EWS to be the development topic to be integrated into ICTs. My supervisor advised me to focus on one of the four components which EWS consists of: risk knowledge; monitoring; dissemination; early response. I chose the risk knowledge because it is the only component that was integrated for mobile technology to gather data in Karamoja.

The purpose of this research is to understand the developmental impact of ICT use for DEWS. It assesses the e-readiness component of ICTs value chain activities. There are two ways that e-readiness of ICTs factors can be assessed; one is to look the presence and the absence of those factors which are prerequisite for the use of ICTs. Therefore, the study assesses the availability and the absence of ICT infrastructure, e-skills, policy, and institutions to understand their impact on building resilient rural communities in Karamoja.

Chapter One: Introduction

1. Introduction

The study employed qualitative research strategy. It selected the ontological constructionism which assumes ICT factors get e-ready is not a pre-given condition and diverse actors have a role in creating the minimal necessary requirement for e-readiness in Karamoja.

The progress of activities in ICT4D can be investigated by using ICT value chain model (Heeks, 2009). The model divided the progress of ICTs in four stages, readiness; availability; uptake and development impact. The relation that exists between these stages is sequential and rational progressing from one stage and moving sequentially to another. E-readiness assessment typically measures the systemic prerequisites for any ICT4D initiative e.g. presence of ICT infrastructure, ICT skills, ICT policies, and so on (Heeks, 2008). Therefore this study employed ICT value chain model. It investigated the presence and absence of the systemic prerequisites for mobile technology to understand their impact on DEWS.

The e-readiness guides the development efforts by providing benchmark for comparison and gauging the progress (Bridges, 2005, p.16). Due to this reason conducting e-readiness assessment is important for development project. E-Readiness is the degree to which a community is prepared to participate in the Networked World (Sachs, 2005, P.7).

According to Sachs (2005) a minimum necessary requirement for readiness is to access communities an adequate network infrastructure. Without that access to global communications networks, no community can participate in the Networked World. The community's access to the hardware and software for network interface is determined by a combination of availability of networks and affordability of services. E-readiness assessment helps strategic planners to understand whether a minimum necessary requirement for readiness is available in the context where a development project is being implemented. Therefore, it is salient for designing development project to achieve development goals.

Therefore, this study investigated the impact of the mobile technology on DEWS, especially achieving DEWS to developmental goals. Drought early warning system is one among other the

measurements suggested to reduce the negative impact of droughts on at risk communities (ISDR, 2005, p.4).Drought Early Warning System (DEWS) is defined as the provision of timely and effective information, through identified institutions, that allow individuals exposed to a hazard, to take action to avoid or reduce their risk and prepare for effective response (ISDR, 2003).

DEWS consist of four main interlinked components – a risk knowledge, monitoring, dissemination and early action. Each component is integral to the other. The first two elements of EWS perform the most significant tasks. This relates to risk identifications. The risk identification process is done through weather monitoring and assessments. This composes of three different types; vulnerability, hazard and impact assessments.

These assessments gather vulnerability data, hazard and socio-economic impacts of droughts from at the risk community. These data are thus analyzed to evaluate risks and estimate the risk level. Such analysis is performed along other analyses such as socio-economic cost-benefit analysis to establish priority and acceptable risk level and elaborations of scenarios and options.

DEWS project was established in 2009 in Karamoja region and the method employed to gather the stated data was primarily paper-based. So the challenge was delays in producing real time warnings. Therefore the problem was linked to technology used to data gathering (World Bank, 2013). Nokia Data Gathering (NDG) was integrated in data gathering system to tackle the delays in early warning message..

This study assesses the e-readiness of ICT precursors for ICT uptake in DEWS presuming that contextual factors enable or constrain the ICT uptake in DEWS. Heeks and Stanforth (2015) envisaged that the role of ICT in development can be understood in three aspects. The *context* is what this study is interested to investigate *e.g.* (infrastructure, policy, skills, data system), and *process such as* converting the input into ICT deliveries *and Impact* (outcome of development*).*

 In other words, ICT value chain model of Heeks builds on a standard input—process—output model with the context, process and impact which are divided into four components; readiness, availability, uptake and development impact. In this case, the researcher intends to understand the impact of ICT on DEWS investigating the readiness of infrastructure, e-skills and affordability (Molla& Heeks, 2009).

This paper structured in six chapters. Chapter one introduces the study and its objectives. The literature review is presented in chapter two, chapters three discuss the research methodology and chapter four presents the findings and discuss them. The implication of the study is presented in chapter five and finally a conclusion is drawn in chapter six to wrap out the findings and make recommendations, based on what was learnt during the study.

1.2 Problem statement

The risk knowledge component of EWS represents only one of several sources feeding DEWS with relevant primary and secondary information. Some of these sources are external. DEWS have little organizational influence over their success and failure. The meteorological department of the ministry of water of Uganda is typical source providing DEWS with scientific climate information. FEWS Net (Famine Early Warning System Network) represents another source of unreal time rainfall estimates to DEWS. Other sources with useful information concerning with livelihood and vulnerabilities of communities may be unwilling to share by the time these information are needed (**xxx**). Due to lack of coordination, EW messages get delayed and IFAD experienced this problem in Ethiopia as diverse stakeholders are involved in the process of generating EW messages (xx).

These evidences support that the effectiveness of DEWS depends both on external and internal factors which the organizations has or not a control over their contribution to DEWS. When DEWS was designing the mobile technology for data gathering, it concentrated all efforts on three fundamental factors, which they were seemingly perceived to be the only critical factors influencing the failure or success of DEWS. Developing relevant *data collection parameters; the community's participation and employing appropriate technology* in DEWS received the attention of planners (World Bank, 2013). In other words, DEWS considered those factors which were thought to be those enhancing the operational effectiveness of EWS.

Compelling reasons to argue are that different factors and actors contribute to both the success and the failure of endeavors of Early warning systems. Among these include ICT factors which are forerunners for ICTs use for DEWS. This means that these also account for a piece of other contributors which enabling/constraining to the success of DEWS. Importantly, ICT factors which enable/constrain DEWS to be connected into networked world needs understandings.

Although the aim of this study is far beyond understanding ICTs as enabling or constraining factors and much of such understand is related to the role of ICT in development.

This starts with assessing the e-readiness of ICT factors, prerequisite for adopting ICT for DEWS to achieve development goals. The study investigates to the extent which ICT factors are e-ready and impediments experienced by DEWS with factors assigned to lower degree readiness and linking the e-readiness to development impact. Since the relation between the ICT and development is unclear, the same holds true too for relation between e-readiness of ICT factors and developmental impact. Except that e-readiness component has not a direct relation with developmental impact, as it is placed in the diagram of value chain model as front-loading element which on the other the polar is placed development impact component.

Most importantly, Drought Early Warning Systems is generally meant reducing drought risks, and its negative impacts on people, environment and economies. The two most critical attributes which are prerequisite for effective EWS are a real-time and a reliable warning message which is features those had been, and still are missed in DEWS. Since information resource represent critical factor for DEWS which relies on data gathered by its systems and those that are fed by other agencies, so delaying data gathering process was a challenge for delivering a real-time message to beneficiaries.

Therefore, DEWS linked initially the problem to means by which the data was collected (the paper based data collection), despite that the system got automated, and there had been well developed parameters for data collection, parishes are being involved in the process, and yet the problem is existent. So it can be argued that the automation of the broken system will not result in the problem to get fixed. Even though the system gets automated, the early warning message which was designed as preparedness and prevention mechanism is going to turn as a late warning, especially when delivering a real time and warning message gets delayed.

1.4 Main Objective
The main objective of the study is to understand the developmental impact of ICT use for DEWS by assessing the e-readiness of ICT factors prerequisite uptake in DEWS to make development impact in Karamoja.

Despite this, a local readiness index is absent. Regions adopt disproportionately in ICTs and attract unevenly to telecoms and technology firms to operate in Karamoja. Uganda is one of the poorest country in the world, and yet counties and sub-counties are disproportionately represented in the poverty. An estimated 82% of Karamoja population live in poverty compared to 32% of the national average (World Bank, 2006 in OCHA, 2009, p. 4).

Specific Objective

- To investigate the degree of ICTs precursors that enable ICT uptake and use for DEWS to achieve development goals.
- To understand that findings of e-readiness assessment can be used to direct the ICTs uptake in DEWS to achieve a development goal.
- Understanding the impact of contextual factors on the use of ICT for DEWS to its goals.

Research questions

1. How can the impact of e-readiness of ICT factors be used to build resilience of poor people in Karamoja

1.7 Specific research questions
1. What are the degree of e-readiness of ICT factors to build the resilience of poor people in Karamoja
2. *How do ICT factors which are non- e-readiness impact on DEWS to reduce drought risks in Karamoja?*
3. How could e-readiness assessment be used to enhance the readiness of the current and potential implementers of DEWS to build the resilience of the poor people?

1.3 Study area
The DEWS project was carried out under the Drought Preparedness Consortium led by DanChurch Aid and supported by the European Commission's Humanitarian Aid and Civil Protection Department. The first kind of Drought Early Warning System (DEWS) project has been implemented in Karamoja Agency for Technical Cooperation and Development

(ACTED).With that reason, the study selected Karamoja to be the site for the case study (ACTED, 2013, p.5).

Karamoja is situated in north-eastern Uganda along the borders with Sudan and Kenya. Karamoja is a semi-arid region of Uganda comprising the five districts of Abim, Kaabong, Kotido, Moroto and Nakapirpirit. With an estimated population of just over 1.1 million people, the majority of the population subsists through agro-pastoral or purely pastoral livelihoods. The poverty in Karamoja region has already weakened the capacity of the people to cope with the effects of the droughts. An estimated 82% of Karamoja population live in poverty compared to 32% of the national average (World Bank, 2006 in OCHA, 2009, p. 4). The Ministry of Health's 2008 statistics show that the worst districts for malnutrition are Moroto and Nakapirpirit, which have GAM rates of 15.6% and 15.1% respectively, compared to 10.9% Karamoja-wide (Powell, 2010,   p.   4).

Figure one A map showing Karamoja

The problem statement

Rationale to opt for the above outlined aims and research questions is that current DEWS in Karamoja adapted the mobile application for data gathering with the assumption that the

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technology resolves previously experienced shortcomings in data gathering. Lately DEWS acknowledged that almost similar challenges are still there – absence of real time warning and reliable warning messages. Therefore, automation alone was inadequate to solve the problem of EWS. Previously, the problem was linked to the internal system -- the method and tools used for data gathering. Conversely, external forces drive DEWS to fail. Three factors were taken into account when Nokia Data Gathering (NDG) was designed for DEWS: -the optimal data collection parameters, community participation and accessibility of mobile technology and networks coverage (World Bank, 2013). After the system had been functional for few years, DEWS is still ineffective failing to deliver Early Warning message to community in Karamoja. Much blames are now pointed to network facilities and communication services available in the region

It is now recognized that ICT contextual factors have a negative impact on the inputs prerequisite to produce ICT deliverable and contribute to achieving drought risk reduction goals. Any development project, using ICT to achieve a development goal, requires an adequate public ICT infrastructure supporting the system to function in Karamoja. The above outlined challenges raised questions to the researcher about the degree of ICTs precursors being e-ready to enable DEWS adapt ICT for development purpose and how low degree of readiness impact the use of ICT for DEWS in Karamoja. Additionally, such projects desperately need skilled people available locally who are able to set up, maintain and fix the trouble in the IT system. However, the prices of ICT services are affordable to local people and DEWS obtain the benefits of ICT. This study assesses the systematic perquisite for ICT4DEWS.

Karamoja is referred as a less attractive to telecom firms, because of majority of her population live outside of urban cities, they are relatively poor, and they do not have interest in using communication services that are disintegrated to their lifestyle. The second question attempts to find answer how unfavorable conditions impact the use of ICT for DEWS in Karamoja. The third question relates to how can the findings of the study be used to direct the ICT use for DEWS to make development impacts? Findings of much e-readiness assessment end up in the planning process to close identified gaps. DEWS was not generally designed to intervene at the risk community with early livelihood actions to reduce the negative impact of droughts on them. It left this role to development partners and public institutions engage while it expected that these agencies will react early enough to the warning. It was then an obvious that the bureaucratic decision making had hindered the development partners and public institutions to respond early to EW messages

issued. The same applies to DEWS itself; the mobile for data gathering is divorced to make a development impact. The study attempts to find answer to how can the findings be used to direct the use of ICT for DEWS to make development impact.

Chapter Two: Literature Review and Theoretical framework

Introduction

This study assesses the e-readiness of ICTs factors which are prerequisites for ICT use for DEWS in Karamoja. The region has some of the worst indicators for health, nutrition, education, food security, civil security, and poverty (Mubiru & Magunda. Magunda, 2010 P.6). As mentioned, the region is lagging behind the rest of the country. This means that public services and infrastructure are not well developed. So implementing ICT project is challenging in this context. Therefore underdevelopment by which DEWS works for the region to get developed, may also hinder DEWS achieve its goals. So it is important for the study to understand whether ICTs factors are enabling or hindrance for DEWS achieve its objective.

ICT projects are associated with failure (Justice, 2012, P.196). Li and Seale (2012) noted that readiness assessment should be carried out so as to understand and mitigate the challenges that are likely to be presented by e-health implementation. Other authors resonate repeatedly over ICT initiatives having a reputation of failure in both developing and developed countries. The reasons may vary, depending on factors that are specific to a given context (Bridges 2005b).

However, multiple factors are at play when an innovation is successful or failing. Readiness is one those factors (Ojo, et al, 2008 P.42). There is a need to assess the preparedness of those factors, so as to effectively and efficiently use ICT for development (Kalema and Kagesi, 2014,P.132). Bridges (2005b) found that conducting e-readiness assessment within the country is extremely worthwhile as the process can facilitate and fuel concrete planning and can therefore foster positive change for country development.

This chapter reviews existing literature of e-readiness of ICTs factors, e.g. ICT infrastructure, e-skills, affordability, policy, and technology. Different people define differently E-readiness. So it can have different meaning to different people. Some definitions refer it as a tools used to measure the readiness of sectors or actors or organizations. As its definitions vary, its results may

also vary (Bridges, 2005a, p.16). Other models define e-readiness as perception. So assessments employed this theory measure the perception of human over the importance and relevance of ICTs. One of these studies assessed organizational readiness for e-learning and focused 8 categories: (1) Psychological; (2) sociological; (3) environmental;(4) human resources; (5) financial readiness; (6) technological skill (aptitude); (7) equipment; (8) content readiness (Chapnick, 2000; Aydin, Tacsi,2005,P.245).

Although e-readiness models vary in strategies, they all aim at understanding the ability of target participants to obtain the benefits of the ICT or factors constrain them to reach the benefits. For example, e-readiness was defined as the degree to which a country, nation and economy may be ready to obtain the benefits of the information Communication Technology (Dada, 2006, P.1). So models considered e-readiness as tool, they aim to understand the ability of consumers, businesses and governments to utilize ICT to their benefit (Chanyagorn & Kungwannarongkun 2011, P.100).

Literature of e-readiness

As I mentioned in the preceding paragraphs, different models of e-readiness evaluate precursory factors but these models differ the perspectives by which these factors are looked. For example, e-health projects assessed focused on core readiness; engagement readiness; structural readiness; societal readiness; acceptance readiness and use readiness (Kalema and Kgasi, 2014, P.133). The objective of these studies is to understand the degree of institution's preparedness to adopt technological innovation which entails the preparedness of healthcare institutions or communities to the changes that are brought by ICT innovations, for a community to be ready for e-health (Kalema and Kgasi, 2014, P.133).

All the assessment considered socio-economic factors compared between the rural and urban areas' e-readiness and found evidence of a digital divide of varying proportions. Other have looked at gender equity in access to ICT and found in Uganda overall equality in internet use. *A few assessments looked at poverty levels, the extent to which economic status affects access to ICT, and/or the use of ICT as a tool in the fight against poverty* (Bridges, 2005a, P.53).

On the other hand, those assessments looked at levels of infrastructure and access to ICT in business. Most of basic indicators employed in these assessments do not give full view of the local situations affecting the availability of ICT (Bridges, 2005a, P.53). Therefore*, the first step*

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is to consider whether ICT is available and physically accessible to the people and organizations involved with or affected by the project or policy. But in developing countries, it is also important to think very broadly and consider geographic, environmental and contextual challenges that can affect physical access to ICT (Bridges, 2005b, P.5). ITU (2015) defines ICT infrastructure as a set of interconnected network elements that support telecommunications. The basic facilities and systems comprised of network nodes (i.e., switches and/or routers) and the means to connect them (i.e., wired (cable or fiber) or wireless) for the purpose of communication between two end-points (ITU, 2015).

Bridges defines physical infrastructure as telecommunication infrastructure, internet access, bandwidth, pricing and reliability. Many assessments pointed physical infrastructure to be the major barriers to internet connectivity. Several reports suggested increased public access points. Uganda committed to enable access to ICT in rural areas (Bridges, 2005a, P.17&33&35). However, solar and other alternative power sources and wireless connectivity offer greater possibility for rural areas (Bridges, 2005b, P.5). Most studies which assessed the availability of wireless and cable internet access, found scant evidence of the presence of wireless access Bridges, 2005a). For example, *the extent of penetration for Internet access alternatives would be determined by the level of interest, ICT literacy, and price* (Bridges, 2005a, P.37).

Affordability of access to ICT

Affordability is defined the ability to pay the prices without hardship It is subjective; big variation in people's needs and resources, and poor correlation between affordability and acquisition (ITU, 2003, P.5)."The affordability problem is, of course, tied directly to the general conditions of poverty" (Bridges, 2005b,P.6). An affordable universal service is one in which the "cost of average monthly usage is a small percentage of monthly gross national income (GNI) per capita" (Dymond et al. 2010).

Generally, broadband can be considered affordable when it is at or below 5% of the average monthly income (ITU, 2010).The changing situation in the uptake of different ICT services and their relevance in delivering access to today's information society, it increased the importance to measure broadband. A Fixed broadband continues to be a critical service for achieving the full

benefits of the Internet as a development enabler, as it remains to be the primary means to accessing high-speed, high-capacity and reliable Internet services (ITU, 2012a, ITU, 2013, p.78).

Pricing packages which are structured per minute or hourly can limit users time online, therefore it inhibit the use of the network for many activities (Sachs, undated,:7). Almost every assessment pointed high cost of infrastructure, bandwidth and telephone charges as hindering to access and use of internet (Bridges, 2005a, P.39). Technology convergence is one strategy to bring cost down (Bridges, 2005b, P.6). It is believed that high costs are the greatest barriers to widespread access and use of ICT (Bridges, 2005a,P.84).

Digital skills

Any technology will be insufficient if people do not understand how to put it to effective use as part of their lives or their work (Bridges, 2005b,P.6). "Digital skills are subjective as the technological landscape is continually evolving". Emerging technologies create new skills requirements while making other skills redundant. In this sense, a digital competency is required almost all the time and it is defined is advanced skills and knowledge a user must have to render a particular job (ESDL, 2013).Skills e-readiness gauges the ability of a society to make effective use of ICTs ……. (WEF, 2013:7).

Digital competency refers to the required skills and knowledge specific for one's role in the workplace. (Empirica, 2009). e-Skills Forum used to gauge the deficiency of digital skills in three ways- skill shortage, skill gap and mismatch. It concentrates its investigation on demand side of digital skills, i.e. on the institution's requirements with regard to digital competency, ICT4D practitioners and skill development. It will not deal with the supply side of digital experts and skills such as assessing numbers ICT graduates or other related studies which university and colleges produce in every year.

A skill shortage refers to an insufficient number of skilled people in the labor market or in an occupational segment. A skill gap is a competence shortfall between the current and needed competence levels of individual staff within organizations. Mismatch finally, refers to possible differences between the competences of a trainee or graduating student and the competences expected and needed by the (prospective) employers. Mismatches can arise from curricula misalignment (Empirica, 2009).

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Policies and legal framework

ICT policies and the resulting legal and regulatory framework can either foster or hinder the effective, widespread use of ICT, depending on the principles that shape it and how they are implemented (Briges,2005b,P.10). Liberalization of telecommunication sector as strategy to reduce the cost received the attention of the all researchers. Others commented on areas where ICTs policies are lacking. Only a few reports gave a comprehensive overview of the legal framework affecting the use of ICT (Briges,2005a,P.8).

Shortcomings were noticed. Most assessment reported existing gaps. They provided recommendations to policy makers to close that gap. It was acknowledged that it is time to stop carrying out e-readiness assessments to identify only the existing gaps (Bridges, 2005). Therefore, e-readiness efforts should guide country's national development goals to have a strong focus on poverty alleviation and socio-economic development (Bridges, 2005).

Human development must be employed to guide the policy making process to address the impact of non-readiness/readiness on the development. So e-readiness assessment must be guided human development principles to look the problem with development lenses. E-readiness assessments must gauge the impact of e-readiness and non-e-readiness is having on development goals. 1,506 e-readiness assessments later –- there is insufficient hard evidence indicating the extent to which these efforts have had significant impact on development (Bridges, 2005, p.91).

It is necessary decision-makers to obtain such planning because of knowing where the country currently stands in terms of ICT availability and use, enable them to plan toward their goals (Bridges, 2005, p.16) Different organizations use differently findings of the e-readiness assessments. Many organizations incorporate information into planning (UNESCO 2005).Development projects (e-health, e-learning) utilized the information for project planning (UNESCO, 2014;Ojo, et.al 2008). With this stance, the e-readiness reports are useful tool for understanding and identifying threats and key opportunities in ICT innovations (Brakel & Mutula, 2006, P.214).

The limitation of e-readiness

A large variety of e-readiness tools currently exist (Dada, 2006) It was noted that most of these assessment were not designed to address development problems. *There was no stated objective for researchers to consider specifically development goals.* Except that most assessments in varying degrees of detail considered inequalities in ICT access and use throughout society (Bridges, 2005). Therefore, the objective to conduct e-readiness must be countries or regions to become e-ready so as to integrate ICT into development problems. MDGs currently SDGs provide targets and indicators for some of the most important socioeconomic issues, and are thus a useful focus for efforts harnessing ICT (Bridges, 2005a, P.90).

A commonly cited problem that existed with e-readiness assessment is the fact that there are many different types of measures are available today, and that there is not standardization (Dada, 2006, Bridges, 2005). It is not precise whether widely used indicators created by the International Telecommunication Union (ITU) must become standard (Dada, 2006). It is also important to find a balance between the harmonization of indicators and respect for local differences, so that country specific context and nuance can come through in the results (Bridges, 2005).

The available indicators reflect to describe the current situation of ICT but not looking beyond the use and availability. They must look beyond the availability of ICT and measure its use and impact at a more granular level (Bridges, 2005). Speaking in the context of e-government, Bannister (2004) points out those e-readiness indicators often measure those factors that lends to themselves to such measurements. Such measures are often superficial, and do not represent the nature of the situation (Dada, 2006).

As Bridges report points out that limited information is known about the real impact of e-readiness assessments on development. This is a challenge for the efforts to link e-readiness into development. *It is obvious that ICT needs to be integrated into efforts working towards the MDGs* currently SDGs(Bridges, 2005a). But so far ICT is failing overall to deliver on this potential because many initiatives lack experience with ICT and fail to integrate and use it effectively in what they do(Bridges,2005b,P.3). But the question is: Are the MDGs the best goals for e-readiness? It depends on the country and the context. The MDGs were not seen as relevant to all of the countries that conducted assessments under this initiative (Bridges, 2005a).

Conceptual framework

One of the major concerns for sound ICT4D impact evaluations has been the need for an increase in reliance on relevant theoretical or conceptual foundations to guide the evaluation process (Gomes, Heeks, 2010). This section discusses the ICT value chain model which guides for the study in gathering and analysis of data. This means that data that was planned the study to gather comes from the readiness component of ICT value chain. Traditionally, e-readiness assessments were expected to yield two simple outputs; first to identify the existing gaps in ICT precursors, and secondly to follow actions plan intended to close a gap. Recently, this use has been viewed as a narrowly defined goal. Therefore, linking e-readiness to broader developmental impact needs researcher to understand the contribution of e-Readiness value component to development in Karamoja. This is what drove the study to employ ICT value chain model to understand the role of e-readiness of ICT precursors for DEWS on development in Karamoja (Molla & Heeks, 2009).

The value chain is based on the standard input - process-output model linking resources and processes to create a sequence of linked ICT-for-development resources and processes. The model can be used for projects and policies in various ways: to trace their history; to analyze their content; to assess and evaluate (Heeks, 2010). It systematically analyzes the stages an ICT initiative traverses over time (Molla& Heeks, 2009).

However, e-readiness can be used as a tool to judge the impact of ICT use for DEWS on building the resilience of poor people in Karmaoja (Bridges, 2005). The progress of activities in ICT4D can be investigated using the ICT4D value chain model (Heeks, 2010). Sachs explained that participating in networked world means users getting connected through internet and wireless devices without being imposed any limitation in the geographical spot they live, whether it is being in rural or urban areas. They are enabled to make online transactions and accessing to online database and market information. The data collection and analysis in the study will be guided by the ICT value chain model to direct the data gathering process into development impact. The e-readiness assessment can be used to direct the development by providing benchmarks and gauging for comparisons and progress (Bridges.org 2005).

The Heek's model is divided into four main targets to assess the impact of ICT4D: - Readiness, Availability, Uptake and Impact assessments. E-readiness assessment typically measures the systemic prerequisites for any ICT4D initiative e.g. presence of ICT infrastructure, ICT skills, ICT policies, and so on (Heeks, 2008).The readiness component is generally situated at the front box of the standard input-process-output diagram, and it has direct and sequential relation to the input factor. However, the relations between the elements in ICT value chain are presented, and assumed to move sequentially in linear. The input element is linked to ICT4D resources and processes (Molla, Heeks,2009)
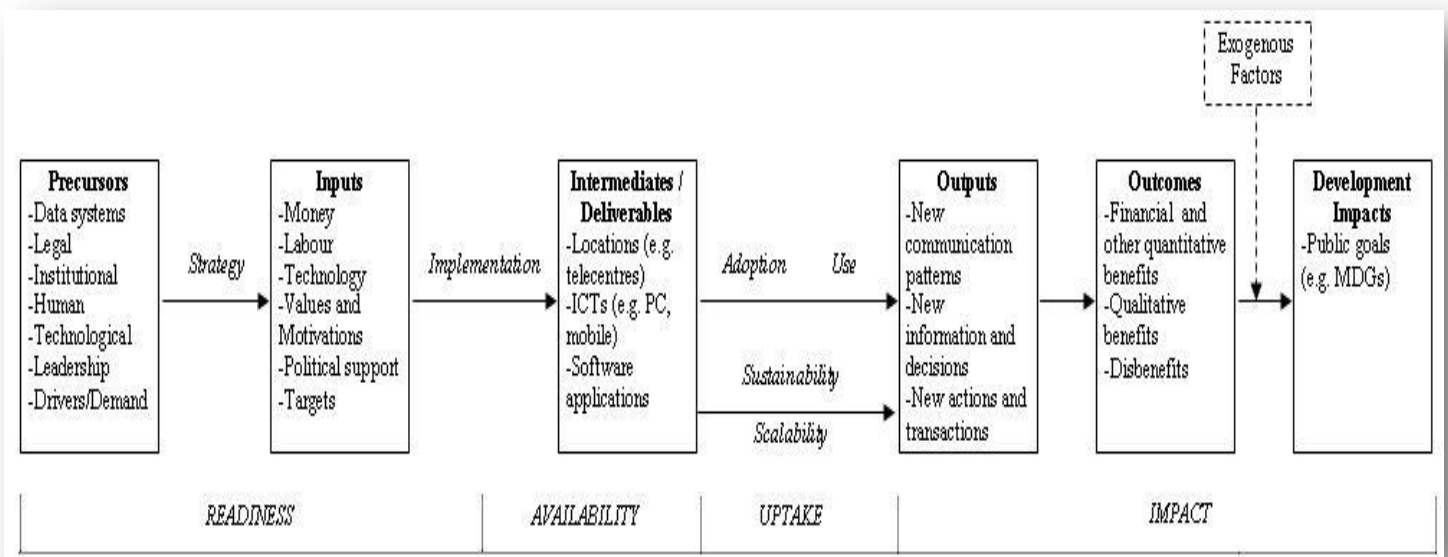
Figure 2 ICT value chain model

Chapter Three: Methodology

3. Introduction

This chapter presents strategy, methods, and techniques employed by the study to collect and analyze data and finally write its findings. It discusses briefly methodological theories with relation to epistemological and ontological considerations to understand different perspectives which an acceptable social reality can be defined. It explains choices in methods by forwarding justifiable accounts for preferring a method over the other. The choices that have been made include a research strategy, techniques for data collecting, methods for selecting participants etc.

3.1 Methodological theory

Methodological theory can be used to explain a relaity (Punch, 2014, p.14). There are two contrasting ways that a reality can be explained in the social science research; epistemological and ontological theories (Bryman, 2012). Therefore, the methodological theory employed by this study assumes that social actors accomplish precursory ICT factors to be e-ready in Karamoja and this reality is not external which society has not a role in fashioning it.

Methods of inquiry are based on assumptions-assumptions about the nature of the reality being studied; assumptions about what constitutes knowledge of this reality and the assumptions about what therefore are appropriate methods of building knowledge of this reality (Punch, 2014, p.14). For instance, the positivism is an epistemological position that assumes the application of the methods of the natural sciences to the study of social reality and beyond. Conversely, constructivism or interpretivism holds that people are different from objects of the natural sciences so a strategy is required to study social science to grasp the subjective meaning of social action (Bryman, 2012, p.30).

There is a connection between the methodological theory opted and how to define the nature of the reality being studied. This influences the position that a researcher stands in relation to that reality and what falls within and outside the reality. In the coming sub-sections explains the nature of phenomena that this study investigates.

3.2 The nature of the reality being studied

Becker (undated) was quoted that *people create culture continuously* which is why there is no set of cultural understandings…...that provides a perfectly applicable solution to any problem -- people have to solve their problems in the course of their day. So they must remake solutions by incorporating their understanding to the new situation in the light of what is different from the early situation (Bryman, 2012, p.34).

This is meant that ICT factors to be e-ready is fluid and fragile which people continually must construct and reconstruct by maintaining ongoing interactions, communication and negotiations (Neuman, 2014, p.104). The status of e-readiness of factors which are precondition for ICT use for DEWS is often regarded as an emergent reality by which social actors create it. Most importantly, investigating constantly helps researcher understand social actors' perceptions with regard to the reality of ICT factors to be e-ready, and its effects on drought risk reduction. Consequently, it attempts to understand the reality that ICT factors which are prerequisite for the use of ICT for DEWS are e-ready and the linkage between e-readiness of these factors and the prevention and preparedness of community against drought risks in Karamoja.

3.3 Appropriate methodological theory

The researcher opted ontological constructionism to explain the reality of e-readiness of ICT factors prerequisite for DEWS to prevent and prepare drought risks before turning into hazards. As Neuman (2014) states that constructivism refers to perceptions and actions of social actors who are creating social meaning. Since e-readiness of contextual factors of ICTs precursors consists of various social actors who interact to create meaning of ICT use for DEWS, (service providers, international organizations, local and central government authorities, and policy makers, donors and community leaders and beneficiaries) (Bryman, 2012, p.34).

Social researchers often apply one of two contrasting methodological theories in their studies to explain about the social world. These are epistemological and ontological views which vary their positions in relation to the application of natural sciences to study for the social world. For instance, *an epistemological position known as positivism* advocates the application of natural sciences to the study of social reality and beyond. This perspective involves testing hypotheses to

explain universal laws, while accepts as genuine knowledge only phenomena and hence knowledge confirmed by the senses (Bryman, 2012).

On the other hand, authors who have been critical to the application of scientific methods to study social world, have been influenced by different intellectual traditions -- people and their institutions which are fundamentally different from that of the natural sciences (Bryman, 2012).So the central point lies upon the question of whether social entities can and should be considered as objective entities that have a reality external to social actors, or whether they can and should be considered social constructions built up from the perceptions and actions of social actors. *Ontological constructionism* is concerned with social entities and how the reality of social world is considered which perpetuate contrasting views compared to positivism (Bryman, 2012).

In other words, this research is not employing objectivism or epistemological view to explain a social reality as external to social actors. Because it does not intend to develop explanations in the form of universal laws, that is to develop nomothetic knowledge (Punch, 2014, p.17). It will not test findings of the study to prove or disprove a theory in relation to development impact of use ICT for DEWS. The methodological theory which the study selected will directly influence research strategy to be chosen. Positivism is associated mostly with quantitative methods and constructivism is associated with qualitative methods (Punch, 2014, p.17). This means that constructivism theory which was opted in this study is mostly indicative that the study employs qualitative research strategy to gather data and this will be discussed in details in the next sub-section.

3.2 Qualitative research strategy

The objective of the study was, understanding the degree of e-readiness of ICTs factors for DEWS, from social actor's perspective which their interactions create whatever that status is being in Karamoja. To explain this social reality, and what might be regarded as an acceptable knowledge, the study employed ontological constructionism which implies that a social phenomena is not out there and spate from those that are involved (Neuman, 2014). It also selected qualitative method as a research strategy.

However, there are several reasons that led the researcher to employ qualitative research strategy in the study; first researcher had an intense and/ prolonged contact with people at the 'field' or

life situations. These situations were typically 'banal' or normal ones, reflecting everyday's life of individuals, groups, societies or organizations (Punch, 2014, p.119). Secondly, qualitative strategy fits characteristics of a primary and secondary data which the researcher interested exclusively to gather during the field visit, i.e. non-numerical data. As Bryman and Burges (1999) indicated that soft data (words) are main characteristics of qualitative research. The term 'qualitative research' denotes an approach to social research in which quantitative data are not collected or generated. Therefore, gathering quantitative data was irrelevant to the characteristics of the study. Apart from that, there is other account justifying qualitative strategy to be relevant to the objectives of the study. This refers that a theory is generated out of findings of a primary and secondary data of the study.

Qualitative strategy was an appropriate method which connected research questions, and the data to be gathered to an expected outcome of the study. As noted the inductive approach was also opted to define the outcome of the study; a position which a theory should fit in this study, i.e. there is no a theory to test but it intends to produce a theory. It was the relevant method to choose since, the researcher's role was to gain a holistic overview of the context and the case under the investigation: their logics, their arrangements, their explicit and implicit rules (Punch, 2014, p.119).. Finally,

The fact that qualitative strategy has been the selective method connects characteristics of data, relations between the study and the methodological theory to research questions. Additional selections with regard to research design have to be made to carry out the research; this includes determining research design that fits appropriately to research strategy and research questions. The next sub-section addresses further about research design.

3.3 Research Design

The researcher argues that investigating the ICT factors being prerequisite for ICT for DEWS to be a case worthy studying in its own right. A *case research design* has been chosen for this study to discover important features and develop an understanding about e-readiness of ICT factors being prerequisite for using ICT for DEWS. Revisiting the problem statement of the study demonstrates that ICT factors in Karamoja represents a fragile of constraints which hinder activities of DEWS and its stakeholders be connected into networked world. Therefore,

understanding implications of e-Readiness on DEWS and its stakeholders to be connected into networked world, is as well important. The aim of the study is by far more understanding in only technological contribution of these factors, but adapting ICT for DEWS' contribution to developmental impact in Karamoja.

Therefore, the case study is often regarded best strategy to conceptualize and understand features belonged to a case. Since the case under this study has boundaries and Punch (2014) defined the case as a 'bounded system' which has boundaries (p.122). The most commonly feature of the term 'case' is associated with studying a location, a community and organizations (Bryman, 2012).

Consequently, Karamoja region of Uganda has been selected to be the specific location under the investigation, and e-Readiness of ICT factors being precursors for ICT for DEWS to be also the case under the investigation. **Thereby, Bryman (2012:69) distinguished the idiographic approach of a case study from other designs. This means that the researcher should be concerned with an elucidation of a unique feature of that case under the investigation. Additionally, another line of reasoning which is one of the characteristics attached with the case study**, **is the involvements of the researcher of this study in data gathering and process of analyses,** The case study design employed in this study intends with appropriate tools and procedure to collect qualitative data. This involves specifying tools and procedures to be applied in data collection and analysis and the subsequent section explains in detail the topic.

3.4 Qualitative Data collection

The study combined two methods to gather data; i.e. semi-structured interviewing, and secondary document data analysis. Data collection methods refer to techniques to be used for collecting data (Bryman, 2012). Qualitative social science researchers investigate spoken and written representations and records of human experience, using multiple methods and multiple sources of data. Several types of data collection methods might well be used in one qualitative project (Punch, 2014, p.144).

The total participants interviewed were nine people with different background and profession. And Four different policies were also reviewed and analysed. A snowball sampling technique had been selected to identify participants under the investigation. The researcher contacted three organizations which implemented mobile for data gathering by email and phone to explain the objective of the study and concept note had been sent to those whom have requested it. Such communication had helped them to identify right persons with relevant background to attend the study. When these people interviewed, some of them proposed potential participants whom they deemed to have experiences or characteristics relevant to the objective of the study (Bryman, 2012).

The table below demonstrates sources and techniques employed to gather data

Type of organization	Interviewees	Other similar projects	Methods of data collection
International and UN agencies	Project officer 3 persons (Three of them are involved in DEWS) Country director 1 person Total four international organization	1 person (mobile for data gathering project in Uganda)	Semi-structured Interviewing

Local NGO ICT organization	Director of the organization	ICT4D	Semi-structured interviewing
University	Lecturer at the faculty of ICT	ICT4D	Semi-structured Interv.
University	Director at ICT center	ICT4D	Interviewing
Telecom firm	Officer at big telecom firms	Service provider in Karamoja	Interviewing
Financial institution	IT officer	IT expert	Interview
Ministry of IT	Officer	National ICT Policy	Email
Document analysis		Policies and other reports	Web-browsing
Total person interviewed	Nine persons (two female and seven male)		

3.4.1 Interviewing

The study employs a face–to-face semi-structured individual interviewing technique to gather data. As it is in a concord with research questions, qualitative research strategy and constructivism consideration by which the study adopted. Additionally, interviewing is probably deemed to be the most widely employed technique in qualitative researches (Bryman 2012:469). *It is a very good way of accessing people's perceptions, meanings, and definitions of situations and constructions of reality. It is also one of the most powerful ways we have of understanding others. As Jones* (1985:46) puts it (Punch, 2014, p.144).

The advantage of employing interviewing in data gathering is that a *researcher frequently begins the investigation with a fairly clear focus, rather than a very general notion of wanting to do research on a topic* (Bryman, 2012, P.469). This allowed interviewer to have had an opportunity to cover a wide range of instances, and typically refers to a context which the interviewer has a series of questions. He/she usually has had some latitude to ask further questions in response to what were seen as significant replies. This was particularly intended to let interviewees express their point of views on the issues that are covered in the interview (Bryman, 2012).

The interviews were audio-recorded whenever it has been possible during the interviewing and were immediately transcribed after the interviews. One of the main reasons that the researcher needed to record and transcribe interviews were to examine what interviewees had said and in the way they said and what they ought to say. If this aspect to be fully woven into analysis, it is necessarily for a complete account of series of exchanges in an interview to be available. This means getting an appreciation of what interviewees see as significant and important with relation to each of your topic areas (Bryman, 2012: 482.473).

The researcher developed an interview guide with lists of key points to be covered in interviews. Questions in the guide covered on three main issues of e-readiness to find answers for the general and specific research questions. The link between ICT value chain model and the interview guide had not been a straightforward. As Grounded theory emphasizes the researcher has to not start too many preconceptions both when creating the interview guide or collecting data (ibid, 2012).

For example, interviewing process had been to some degree flexible which let the researcher to exploit questions in the interview guide to lead coming new issues out. So the researcher was able gathering data and topics that loom up during the interviews. *A critical discussion point, therefore, is how grounded theory methods and the use of relatively neutral questions for gathering and analyzing data provide researchers with a means of generating a new and emic perspective; one that is rooted in the participant's perspective* (Elliot & Higgins, 2012).

3.4.2 Documentary data

Documents are defined as very heterogeneous group of source of information; company's documents have a great significance (Bryman, 2012:550). The study deems document as a source of useful secondary data for conveying analysis and triangulations in conjunction with interview. It will investigate both available documentary data about e-readiness of factors being prerequisite for ICTs use for development and other relevant documents which might be found are absent. These documents are those that had not been produced for the request of this study -- the study acknowledged their significance for the case under investigation.

However, there is a great deal of relevant information by which the form of text, policy and papers are portrayed in Uganda. Specific documentary data which the study interested in their investigation include ICT for development such as reports of e-readiness assessments, and current state of ICT situation in Karamoja, ICT policies, plans and strategies, other data about drought early warning and development reports.

Different authors disagree on which documents to be viewed as reality; i.e. as a social and organizational or distinct level of reality in their own (Bryman, 2012:554). Despite this, the study takes the view that documents to be viewed as distinctive level of reality as Atkinson and Coffey argued. They suggest that documents should be examined in terms of context in which they were produced and their implied readership. Therefore, documents that had not been produced for the purpose of the study will be examined both in the context they were produced and their implied readership.

Bryman (2012:555) explained when documents to be viewed in this way. Documents are significant for what they were supposed to accomplish and who they are written for. They were written to convey an impression. Consequently, it is anticipated that those documents that the researcher interested in their investigation will explain gaps that were thought to exist, challenges encountered and success achieved and the future plans which promote solutions to challenges in this field.

However, investigating these documents and people will also, in most cases, need sampling. Sampling is just as important in qualitative research as it is in quantitative research (Punch, 2014, P.160). The next sub-section illustrates the sampling techniques that this study employs to examine the case under investigation.

3.5 Sampling in qualitative research

For example, the researcher identified participants with the help of organizations implementing DEWS project. Their involvement in ICT for development was theoretically linked to the phenomena under the investigation. When the process of analysis was conveyed, the researcher picked also the next level of sampling such as Telecommunication Corporation, Academic and financial institutions with regard to new insights emerged out of data analysis.

Qualitative research strategy and research questions influenced researcher's decision to opt purposive sampling (Bryman, 2012). As Punch (2012) also indicated, the main factor that guides the participants to be investigated is their relevance to research question. Therefore, the researcher selected a purposive sampling which is a non-probability sampling to identify units under the investigation. This means that the researcher determined the nine persons participated in the study their relation to the research questions. It was checked and rechecked to ensure their relevance. So they were directly linked to research questions. In other words, the researcher did not select units investigated with random bases.

Initial participants had been identified with theoretical presumptions which guided by tracing their linkage to this study. As Glaser and Strauss (1967:45) defined theoretical sampling is a process of data collection for generating a theory. Whereas, analyst is being involved in the collection, the coding and the analysis to determine the type of data to be collected (Bryman, 2012, p. 419).

The study faced, as other qualitative researches do, a bottleneck for determining the size of units to be investigated to find reliable answers for research questions. Predetermining had been problematic with a relation to number of interviewees or documents attending in the investigation. This problem has influenced researchers know precisely when data gathering process should get stopped. Accordingly, the whole process was administered as an itinerary and the researcher moved in collecting data forth and back in a concordance with grounded theory analysis. Although following a set of criteria has been absent for judging explicitly whether data obtained are sufficient or not, theoretical sampling was employed to evaluate the adequacy of data gathered. In other words, this had concerned with determining data saturation about getting enough and reliable data (Guest et al. 2006:65; Bryman, p.426).

The theoretical sampling does not say something about persons and documents to be interviewed or studied, so the researcher employed snowball sampling to identify right persons participating in the study, so the subsequent subsection presents snowball technique to explain how the participants under the investigation have been identified.

3.7. Qualitative Data Analysis

The study applied grounded theory analysis to analyze data collected. Grounded theory was not opted because it is the most frequently employed qualitative data analysis strategy but, its relevance to research questions, research strategy and methodological theory. The objective the study intends to achieve is to generate a theory and the grounded theory analysis is generally oriented for generating a conceptual abstraction and structuring theoretical knowledge, (Punch, 2014, p.179). The problem of grounded theory analysis is its ambiguity with relation to the criterion employable to define a theory. So distinguishing for tools used for generating a theory and outcomes of that process is critical.

The central process of the grounded theory is coding (Bryman, 2012). Therefore, the researcher turned interviews into texts and refined gradually to fragment data into pieces and picked relevant pieces to give label to generate notes into codes. This process had been conveyed with regard to open coding, axial coding and selective coding but, not as distinctive approaches. The first level of coding in the data was generated substantive codes while the second level these codes get regrouped to form categories. This was in other words referred to be the first level of data analysis, the substantive codes were central in the data analysis process. The initial codes are more or less abstract concepts so further analysis in these codes was conveyed to group these codes into categories and interconnections between codes were established (Punch, 2014).

The researcher conveyed the analysis to produce abstract level concepts and propositions with which the grounded theory had been integrated into the final level of coding. Final level of coding was meant to find a higher-order and more abstract construct- the core category- which these hypotheses are integrated into a theory that describes and explains them (ibid).

Memos Memos can be used to assist the process of generating a grounded theory. Researchers write these notes to themselves, to remind themselves of any emerging ideas or concepts that they have observed as they read through the data. This can help the researcher to forge connections between categories of concepts, which in turn are used to formulate a theory. In "Research in focus 24.4" (on pages 573 and 574), Bryman gives an example of a memo he wrote for a particular research study (Bryman et al. 1996). As can be seen, it is quite detailed, so "memos" should not be confused with "scratch note

Why are Coffey & Atkinson critical of the way coding fragments qualitative data?

One of the problems with coding, identified by Coffey & Atkinson (1996), is that it involves extracting segments of data from their original context (e.g. an interview transcript), and so the researcher becomes less sensitive to what the data mean in relation to the narrative as a whole. It's as if the coding process, itself, destroys the narrative. Coding is not analysis; it is a tool of analysis. It therefore requires great sensitivity to the data as a whole (in the sense of an entire interview, for example), so that it will not degenerate into a way of separating data chunks for easier (but less authentic) mechanical processing.

3.7.1 Content analysis

The study selected to employ qualitative content analysis to analyse secondary documents. Because it adheres more to the principles of grounded theory: conceptual ideas emerge from the data, so that the researcher is constantly involved in revising themes or categories emerging from the document analysis. It is the most prevalent approach employable on analyzing non-numerical documentary data.

The process of analysis comprises finding by searching out underlying themes in the materials and analysing them (Bryman, 2012:557). The study employed the criteria suggested by Scott (1990) to evaluate the content analysis on documents not generated for the purpose of the research. The documents evaluated had been selected with their Authenticity, Credibility, Representativeness and Meaning. *Authenticity* is meant to be the evidence genuine and of unquestionable origin of the document. *Credibility:* is the evidence free from error and distortion. *Representativeness:* is the evidence typical of its kind, and if not, is the extent of its untypically known. *Meaning*: is the evidence clear and comprehensible meaning (Bryman, 2012: 544).

Official documents can derive from the state or from private sources, and may or may not be available in the public domain. They contain information that is produced in the course of the everyday work of an organization or other official agency, and have not been produced for the purposes of social research. There can be an issue of credibility with these documents, stemming from the purpose for which they were produced. Detecting the nature of the bias in this documentation can be a rewarding research pursuit.

3.8. Ethical consideration

The ethical issues become a topic of the concerning social research revolving around how participants of the study should be treated, and actions in which the researcher should or should not engage. Authors often differ quite widely from each other over ethical issues and questions. The ethical principles which are usefully divided by Diener and Crandall (1978) into four main elements: -Lack informed consent, do no harm, invasion of privacy and involvement of deception (Bryman, 2012). A consideration of these ethical principles was seriously taken, and the researcher assured to participants that these principles will strictly be followed not only during the data collection but even after the data collection ends.

Confidentiality and a deception were two key ethical issues that participants worried about during the field study. The participants of this study had an obligation to protect the organisational data and have formally been entitled to prevent it from a leakage, such data was what the study was interested in to investigate. In this situation, the issue of the confidentiality of data and the animosity of the participants was reassured to the participants. It has still particular difficulties to protect fully the confidentiality. As the qualitative research is less easy to protect the confidentiality and it needs a particular care to eliminate entirely the possibility of identification (Bryman, 2012). Furthermore, participants showed their concern to the use of the findings and data rather than the academic purpose mentioned by the researcher. Deception occurs when researchers represent their work as something other than what it is. To avoid a deception, they also sought a verification of the genuineness of both the purpose of the study and the institution the research was studying.

The ethical objection to deception seems to turn on two points; it is not nice thing to do. While the SRA guidelines recognizes that deception is widespread in social interaction, it is hardly desirable. Second, there is the question of professional self- interest. As the SRA guidelines puts it: It remains the duty of social researchers and their collaborators, however, not to pursue methods of inquiry that are likely to infringe human values and sensibilities (Bryman, 2012, p.143).

According to Bryman (2012) harm to participant involves lack confidentiality in their identity and records, even beyond the period of data gathering. In accordance with this, no personal information and names are involved and transcripts were anonymously coded. However, a particular care is needed as it may be easy for one to identify some of the respondents and the organization they represented. This is in breach of the ethical principle on confidentiality and anonymity of respondents.

Chapter four: Presentations and Discussion of Findings

4.1 Introduction

The aim of this chapter is to present findings of the study. It was also conveyed discussions to explain from different perspectives what the findings may mean by different participants. The findings were presented according to the research questions. The data presented here were collected through semi-structured interviewing and documents reviewed. It was interviewed by nine participants but only seven were analyzed their data because of data saturation were reached before the rest two are included the data analysis. These participants had relevant background to the research questions. The basic criterion was the participant's role in the DEWS project.

Secondly those who affect or have been affected by DEWS were also picked. The area the data were primarily gathered consisted of physical infrastructure; e-skill and prices charged ICTs. These are those elements that ICTs value chain model identified their availabilities or absences to be investigated. The data also came from secondary data such as policies. These policies were obtained by email from the Uganda Communication Council (UCC) and some other documents have been accessed from the internet.

1. What are the degree of e-readiness of ICT factors to build the resilience of poor people in Karamoja
2. *How do ICT factors which are non- e-readiness impact on DEWS to reduce drought risks in Karamoja?*
3. How could e-readiness assessment be used to enhance the readiness of the current and potential implementers of DEWS to build the resilience of the poor people?

E-Readiness of ICT Infrastructure

RQ1: What are the degree of e-readiness of ICT factors to build the resilience of poor people in Karamoja ?

In exploring the physical accessibility of ICT infrastructure to DEWS, two themes were identified; first resigned investment and Secondly connectivity barriers in Karamoja; the themes were derived out of coded text to answer infrastructural availability and access to connectivity. The resigned investment means when telecom firms stayed back to invest in the existing infrastructure or expand the coverage into the uncovered rural areas. The connectivity barrier means when the available connections impede DEWS to obtain the benefits of the networked world.

4.1.2 Resigned investment in infrastructure

Three telecom corporations operate in Karamoja. According to UCC secondary data, public infrastructure providers registered are estimated around 25 firms in 2009 in Uganda. Participant interviewed also told that only three (MTN, UTL, Airtell) of them operate in 2015 in Karamoja. That participant observed that *the market is becoming competitive, e.g. an example is where you find MTN, and you also find Airtell, while MTN and UTL telecoms claim contrarily to have the largest share of network coverage in the region.*

The study found the telecom market in Karamoja is not practically as neutral monopoly. The largest coverage is dominated by a single firm. This makes the market uncompetitive. An organization participated interviews, conducted network mapping survey. It discovered that MTN covers 70% of the region. This means that the remaining 30% is split between Airtell and UTL. The validity of this conclusion was not approved by the participant who worked for one of the two other firms operating in Karamoja. His answer supports that the market is monopolistic "most of the time organizations go to our telecom firm, and it has got the capacity in most remote areas where services are not accessible."

4.1.3 Scanty Network coverage

The scanty physical access to infrastructure is barrier for DEWS to obtain benefits of the networked world. Because physical networks is not accessible in the areas where DEWS gathers data. An interviewee argued that the problem is "They (operators) will not invest a lot money in Karamoja because of profit margins out from there are not expected." Another participant told that "they (operators) need to add more infrastructures, and they need to add more antennas and boosters all over the place cite that there is connection between districts between areas to boost up their system." Because *the biggest challenge, infrastructure is yet well established to cover all areas.* An interviewed observed. He continued his speech by saying that "e.g. If you move from Moroto to Kotido in between there is not network."

4.1.4 Connectivity barriers

Connectivity is barriers for DEWS. It impedes the project to obtain the benefits of the networked world. *There is no at a time that a paper based data collection will be stopped*, *due to the nature of ICT infrastructure development which results in the networks to disappear temporarily for a period such as for 5 day.* Another interviewee said. Unreliable connectivity delays raw data to be timely submitted. "They (enumerators) should send physically and go near to hub to send the data. The internet is completely unreliable."

The study found that the primary means to connectivity is wireless in Karamoja. A participant worked for telecom firm confirmed that that *dedicated internet which is supposed to use wired networks uses microwaves infrastructure to deliver it to customers. The fiber optic cable is not yet available in the region.* He also explained you *can only get wireless infrastructure for broadband; they use microwaves to connect from Kampala to Karamoja.*

"The main mode of access to internet is wireless and you know the wireless has got its own limitations." This was observed by a participant interviewed. He also continued his speech by saying that "we still need more wired access, for example fiber optic"

The study found that non-consumer facing system use technologies which are non-neutral to support all devices with 3G and 4G technologies. For example, two interviewees experienced connectivity barriers with their 3G devices. "That is right now a big issue because what is then in

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Karamoja is more often is 2G, even when I go to field is hard to get 3G fast internets." This problem was also observed by a participant interviewed *I go to my village my 3G equipment does not working just 2G or it is so slow, in Karamoja, I am sure will be that category.*

The ICT infrastructure is not well developed, but it is something *that I think has been given priority now especially in Karamoja, though it has been lagging behind where the telecommunication networks were problems.* Enumerators complained about the poor road infrastructure: "I cannot move five days rain the roads are bad even the cars cannot reach there.*"* Participant interviewed told.

4.1.5 Prices charged for the internet services

The study found that current prices set on communication services are expensive. It was not found that prices are barriers to current implementers of DEWS to get connected to the networked world. In reflecting to the affordability of the communication services in Karamoja, the study sorted out a critical theme i.e. resigned utility.

4.1.6 A resigned utility

The study found that the price set for internet is barriers for the district authorities to get the benefits of the networked world. When organizations with small resources prefer to buy cheap internet bundle with low speed and unreliable connectivity than fast internet and reliable connectivity, it means that they resigned their utility. This also means that higher prices set for the internet is barrier for them to choose higher speed internet.

A participant told that district authorities can buy 10Gb internet bundle for 163,000 UGS per month. He said that this amount is bit affordable to them. It was also found that with this price a user can access to shared internet bandwidth. The speed of the shared internet is not good and reliable. A participant who works for telecom firms stated that "(small users) they can buy internet, bundle for 80,000, 100.000 up to 200,000 Ugandan shillings, the connectivity from the customer to the first connection point , the quality is not very good" so he believes that "the challenges comes to small users subscribing a shared internet which comes cheaper.".

4.1.7 E-skills availability in Karamoja

In relation to whether adequate e-skills are available in Karamoja or not, the study picked up two concepts; skill shortage and skill mismatch. The researcher sorted out these themes with their relation to the skill availability in Karamoja. It was also found that DEWS has enough professionals to run the system. Because implementing organizations have got the capacity to manage the recruitment process and retaining professionals in Karamoja. It was also found that DEWS depend on expatriates with combined skills of IT and development to help them create mobile application and run the system. They also train local staff.

4.1.8. Skill shortage in Karamoja

IT skills are inadequately available in Karamoja. A participant interviewed explained the problem "it is a big, big issue in EWS even the software part of it, when it crashes at the district, the districts have to wait (us) the capacity of district is limited." He also mentioned that "the personnel that deals with (technical problem are no there) so it takes some time you (participant) to fix the laptops and to fix the machine for district come up and fix. So when the software or technology breaks down "I will have run for field and to go fix it and they will collect all the mobile phones in one place and will fix"

Another participant with ICT4D background thinks that "rural communities have not basic e-literacy skills which limit their usability of ICTs. Another participant told that "*Karamoja is different matter. I think there, if you take the ordinary person I am sure even do not have mobile phone, ..., computers skills that is even less*. He continued his speech by saying that "you do not find people residing there with skills. You have to take the skills from here to Karamoja that is expensive and if you want me to go and work in Karamoja you have to pay than you pay me in here, in that sense is expensive"

"The skills are also available" DEWS have employed enough professionals to run the EWS in Karamoja. A participant said that "the advantage is the capacity building officer that are recruited by (implementer) at every district, (they) have all these skills; they have skills on ICTs and (implementer) train the focal persons." He said that this time one focal point will be trained on all the aspects of mobile application so that it reduces.

4.1.9 Skill mismatch

It was generally found that the available local IT skills are ubiquitous but not to ICT for development. So this increases dependency of DEWS on foreign experts. It is expensive paying them. A consultant from Kenya was hired to develop the software of mobile application for DEWS. Another participant told that "the available skills do not married with specific needs of projects (DEWS). What we do is we train those people with e-skills on developing mobile application that is tailored with EWS how to do analysis and data collection in regard to indicators" So another participant discovered that ",…. we have full staffs that are working on it (mobile for data gathering) and two of them are international staffs..." She argued that the skills are available but the only gap that is there, the active people have nascent IT then they do not have ICT component. The reason was explained by interviewed lecturer "Because of you cannot train full ICT 4D LIKE experts given that there are so many disciplines involved, so we don't have that capacity fully"

Figure 2: shows the sources of e-skills employed in DEWS
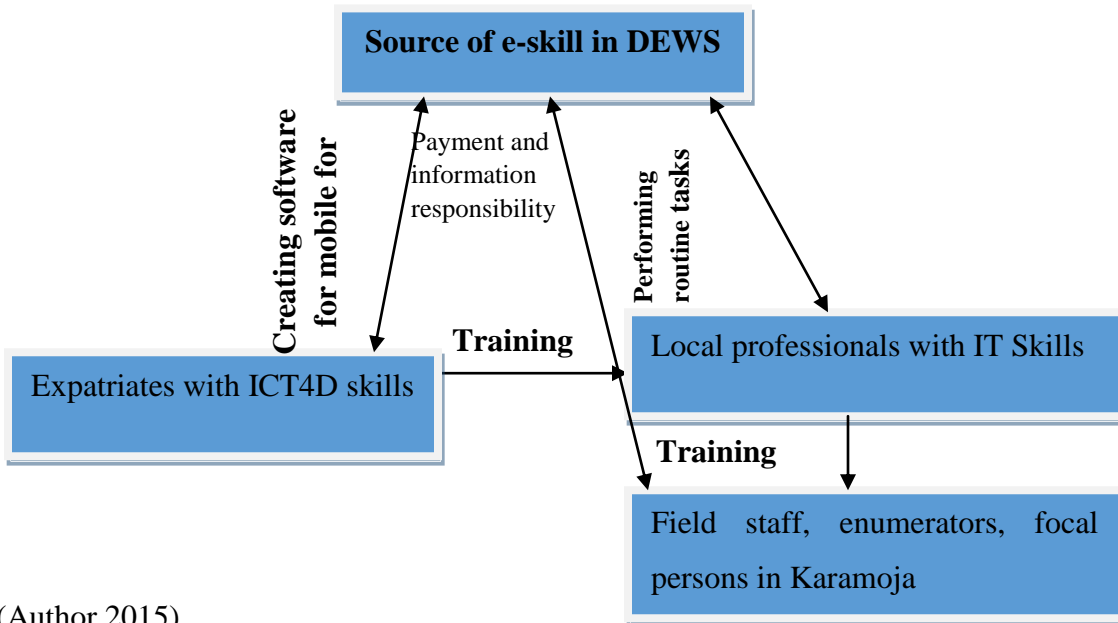
(Author 2015)

The figure shows that expatriates are hired to create software and interact with the main office but not field offices. They rely on information provided by the main offices and the professionals who are also stationed in the field. They also train local staff at the main office. The local staff trains also field staff and enumerators and focal persons to implement Mobile for DEWS. This looks like cascade training model. So these relations are not mutual. Expatriates maintain superiority in knowledge over the local

staff. The local staff has power when it comes to local knowledge which makes the expatriates dependent on them. The local staffs have higher power over the field staff. The power relation resembles cascade

E-skills are either is scarce and mismatch to those DEWS wants in Karamoja.   DEWS has managed to recruit professionals across the country and retain them in the region. Employees of DEWS consist of three groups; expatriates with combined skills who are recruited outside the country and they design mobile for DEWS and train the local staff at the headquarter office. The local IT professional with decoupled skills (IT and ICT4D) are trained on indicators and innovative skills missed.. The third group is focal persons, enumerators and parishes and partner's staff (local authorities). They are trained by local staff at the main office, and they travel frequently into the region either to fix the technology or provide training to them.

4.1.10 Institutional e-readiness

In exploring the readiness of current and potential implementers of DEWS, one critical theme was identified; the system's sustainability. The findings were picked with relation whether the institutions are e-ready to use ICT for building resilience of the local people in Karamoja.

4.1.11.Sustainability of the system

As findings show, the current implementers have the ability to absorb the skills and accommodate to the effects of non-e-ready ICTs factors. For example, when the available skills mismatch to needed skills, the current implementer were able to hire expatriates and *train those people with IT skills on how to do analysis and data collection in regard to indicators.* As it was presented in e-skills section.

But the sustainability of the DEWS is threatened with discontinuity after it is handed over the district authorities. A participant with experiences about local projects funded by international organizations argued that "it is very common to find situation, where when the projects ends, institutions cannot afford to sustain the internet connectivity." A theme was identified under the institutional readiness is *a system's sustainability*.

A system's sustainability refers to the continuity of the existing systems without relying on external foreign after it is taken by the district authorities. It is theoretically addressed in the handover strategy--district authorities are expected to take on DEWS. So "the handover strategy pays attention to cost factor and it purposes to use equipment and system which has lower recurrent cost and we are think about bearable cost. We need to modify the system itself and installing solar panels, providing generators to provide reliable electricity and computers." The same participant told that "We (implementer) are advocating the government to provide budget

to district to run the system. There is budgetary restriction and introduce a system with lower maintenance."

The study found also that the financial and technological sustainability is not enough to make the system sustainable. Another participants with ICT4D background argued that broken system cannot sustain so long "ICT uptake and uses, is contextual depending that issue, and do not focus on the technology so much and understand the problem, and see whether the technology is the best thing to solve that problem….we are trying to automate the broken system, if something that does not work in manual   then you think it will work in technology that we have seen so many problems."

4.1.12 Available Policies

In relation to policies available for ICTs use, it was found that policies are generally available and aligned to international policies. These policies support ICTs to be adopted for development purpose. There are strategies to expand the connectivity into the rural areas. But, the problem is poor implementation. The study discovered four policies created for a) National Information Communication Technology policy for 2014 to 2019 (A completed draft), b) Rural communication development policy, c) Regional Communication Development and d) Data protection and privacy bills (draft).

RCDP intends to facilitate achieving the development agenda of the government and it was derived from Millennium Development Goals (MDG) and Poverty Eradication Action Plan (PEAP. The government wanted to provide connectivity to 42 sub-counties in rural areas, yet the connectivity in rural areas is very scanty. The main underlying topics in the MIT policy are: the extension of the national backbone infrastructure and addressing last mile challenges; the promotion of reliable and affordable ICT services in rural, remote and other underserved areas.

The underlying topic in the rural communication development policy developed by UCC is *rural development needs*. Under the RCDP, the Rural Communication Development Fund (RCDF) has been created and the main themes in the policy are access to minimum basic ICT services in underserved areas and private involvement in the process. UCC policy has very specific objective to *Increase coverage and broaden basic ICT services.* From 2009-2015, the policy

expected deploying at least 800 public pay phones per year in underserved areas through a combination of support to rural-based micro-enterprises and private/public partnerships (PPP).

4.2. Discussions

4.2.1 Introduction

The study found that there are two barriers impeding the readiness of ICTs infrastructure in Karamoja i.e. resigned investment and connectivity. This means that the physical access to infrastructure hinders DEWS to access to physical networks in the areas the data is gathered. It was also found that the current network coverage in Karamoja is scanty. The coverage is limited only towns excluded the access from those who live outside the towns in the region

Connectivity barriers impeded the activities of DEWS in the areas the network is accessible. The network signal is patchy – going offline or networks get down for days. The price charged for broadband internet is very expensive. Only users with strong financial capacity can afford it. Others resign the utility of the internet. Finally the professionals with e-skills are scare in Karamoja. DEWS depend on IT professionals recruited outside the region and the expatriates with combined IT and development skills.

The study has employed ICT value chain to understand the e-readiness of ICT factors in Karamoja. It investigated the presence or absence of adequate ICTs infrastructure, sufficient e-skills, enabling policies, prepared institutions and drivers and affordable prices for using ICTs. The link between ICT and the MDGs translates meaningfully into the e-readiness arena (Bridges, 2005a, P.93). Therefore, it was assessed also the impacts of the factors with low e-readiness have on DEWS and the institutional readiness was also included in the examination. The results of these elements are discussed in next sections.

The aim of this section is to discuss the findings presented in the section A of the chapter four. This is important. Because the researcher discusses and comments on results in the light of ICTs value chain.

Research questions
1. What are the degree of e-readiness of ICT factors to build the resilience of poor people in Karamoja

2. *How do ICT factors which are non- e-readiness impact on DEWS to reduce drought risks in Karamoja?*

3. How could e-readiness assessment be used to enhance the readiness of the current and potential implementers of DEWS to build the resilience of the poor people?

4.2 e-Readiness of ICTs elements in Karamoja

4.2.2 ICT infrastructure e-ready in Karamoja

The answer to the first question is based on the results presented in the precedent section. Two challenges impede ICTs infrastructure to get e-ready; resigned investment and connectivity barriers. This means that the available ICTs infrastructure has lower capacity to enable DEWS to get benefits of ICTs in Karamoja.

Telecom firms excluded their intention to enable DEWS to access to the network signals and the communication services in Karamoja. Because the network coverage is not accessible to the target beneficiaries of DEWS project, they are settled outside the network coverage. The population who live in urban cities are estimated around ninety thousand (UNFPA, 2014). So DEWS gathers data outside the network coverage areas. "When enumerators intend to send data, they must travel into nearest towns to access to networks. Because, *if you are in town; all services are available* (Personal interview, 2015). The people in towns constitute ten percent of overall population (over a million) in Karamoja (UNFPA, 2014).

The available ICT infrastructure is barrier for DEWS to achieve its intended goals in Karamoja. "The infrastructure seems sometimes inadequate to support the transmission of the big data (Personal interview, 2015). The ICTs infrastructure is not well developed in Karamoja (Personal interview, 2015). (Company xx) network failed us because of (company XX) network can be down for one week, yet data has to be submitted, you cannot submit when (company XX) network is down another time we have to move long distance to send the data (Personal interview, 2015). The finding was supported by many other assessments that indentified the poor state of basic telecommunications infrastructure as a major barrier to internet connectivity (Bridges, 2005a, P.32).

4.2.3 Explaining ICTs infrastructural barriers

As Neuman (2014) states that society create meaning with their perceptions and actions. So they must remake solutions by incorporating their understanding to the new situation in the light of what is different from the early situation (Bryman, 2012, p.34). This means that different persons can view differently the infrastructural readiness. Therefore, the connectivity can be a problem for some people, while others may view the problem is the financial capacity of the users. So the connectivity problem is subjective which can be looked at different perspectives, not only from the perspective of DEWS which consider inadequate ICTs infrastructure in Karamoja as barrier.

The connectivity problem in Karamoja could be considered as personal judgment referable to either through the options available to users or the users' knowledge obtained through experience or learning which enables them to compare the quality of current service with that was accessed or learnt can be accessible. (see figure: 2). For example, a participants who have been in Sweden explained that "The quality of the internet; it is okay in our context but it is not high speed as Norway and Sweden" (Personal interview, 2015).

Accessing to the high speed internet is also a choice (see figure 2). The service provider argued that users make the choice of the quality of the services to be accessible to them. " Big organizations, they do not get challenges, the challenges comes to small users, because to get the quality network the infrastructure need expensive equipment so for organizations that is not big problem, they can buy but for small users who want internet for 80,000, 100.000 up to 200,000 Ugandan shillings, the connectivity from the customer to the first connection point , the quality is not very good that is where the problem comes but for big organizations they get the perfect network" (Personal interview,2015).

The problem is a matter of financial and limitations in skills, not the available infrastructure. For instance "you resort more expensive solutions like having satellite connections you can get 2G which is not probably convenient and still the cost is expensive" (Personal interview,2015). *VSAT is not practical as (XX organization) does not really need and it is expensive. The Office of Prime Ministry had established its own VSAT and the challenge is the routine maintenance the system requires and highly subscription fee to pay monthly.*

The problem of connectivity can be linked to the management or inadequate bandwidth accessible or limited skills in designing networks (see figure 2). "Rural wireless networks usually share a low-bandwidth, costly link to the Internet amongst a large user base. This means that any inefficiency in the network can render a slow shared Internet link almost unusable" (Almeroth & Zheng, 2013 p.80).

A study carried out by Kenyan Education Networks explored the causes of the connectivity challenge in university campus. The problem was initially linked to the infrastructure, especially the means to connection, such as lack of wired connection, fiber optic cables. Later on, many students surveyed reported that the speed of the internet connection to be slow in the campus compared to alternatives internet speeds accessible to them such as mobile internet or those available outside the campus. In this case, the problem is linked to the bandwidth allocated to the universities were inadequate or that campus networks were not well designed and managed to provide superior services (Kashorda, Waema 2014, p.125).

The problem of the connectivity can be also linked to underdevelopment and poverty. The region scores low in all walks of human development. The region has some of the worst indicators for health, nutrition, education, food security, civil security, and poverty (Mubiru & Magunda; Magunda, 2010 P.6). It is estimated that 82% of Karamoja population live in poverty compared to 32% of the national average (World Bank, 2006 in OCHA, 2009, p. 4). So that is why the ICTs infrastructure available scores low. Other e-readiness studies found that there is a strong positive relationship between such exogenous influences as national culture and socio-economic factors and network readiness (or the ability to benefit from ICT use nationally or regionally) (Ifendo, 2008, P.8).

The relation that exists between the readiness of ICTs infrastructure and the human development in Karamoja is, both of them need to be developed (see figure 2). The Government of Uganda has also linked the development of ICTs infrastructure with national development goals (MIT, 2014). For example there are policies created to promote the extension of national infrastructure backbone to cover across the entire country. One of the main underlying themes in these policies is to address rural development needs. RCDP is intended to facilitate achieving the development agenda of the government and it was derived from 'Millennium Development Goals' (MDG)/SDG and Poverty Eradication Action Plan (PEAP) (UCC, 2009).
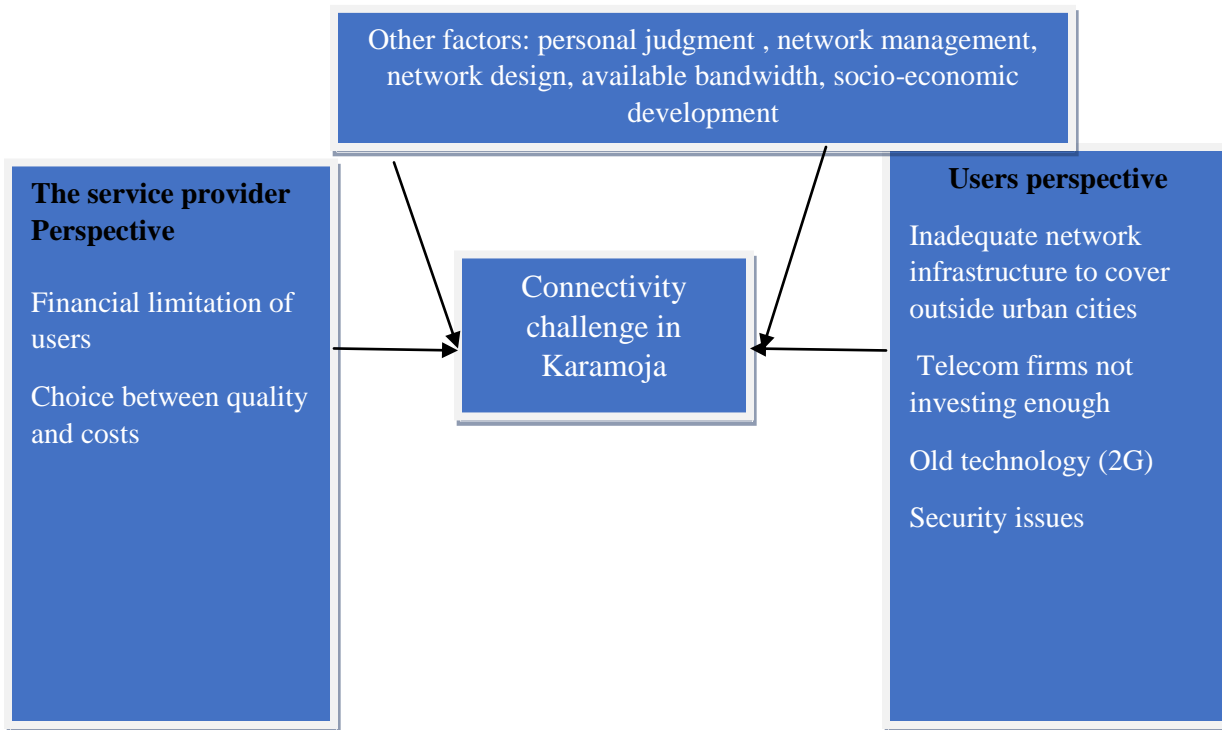
Figure: 3 different actor's views to explain about the connectivity challenge

The users and the service providers explain differently the problem of connectivity. Users or DEWS complain about inadequate ICTs infrastructure. So they link the connectivity problem with the ICT infrastructure. DEWS complain about few telecom firms that operate in Karamoja. The old technology in the system which compromises nodes (switches or routers), these elements cause the network coverage to be scanty and the quality of bandwidth accessible to be patchy.

The service providers also think that the connectivity problem is a choice made by the user. First they provide dedicated and shared internet, if you opt to shared internet the quality of the connection is not that good. Only big organization can choose the dedicated services and they access good quality.

Other studies confirmed that the infrastructure is not the only factor that contribute to poor connectivity. The management and skills can contribute the problem; the bandwidth available also played a role.

The study found the connectivity problem is subjective. The users judgment could be the problem based on the user's knowledge and experience. It needs careful explanation and understanding exactly factors that contribute the problem

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4.2.3 The cost of the communication services in Karamoja

The answer to whether the current prices set for ICT services in Karamoja is affordable or not in Karamoja, it was found that the communication services is relatively expensive in Karamoja. Even though the costs have gone generally down, they are substantially higher for the average income levels people and organizations in underserved in rural areas (UCC, 2009, P17). According to the national ICT policy, the cost of accessing to the internet is relatively high in Uganda. For instance it costs consumers for accessing to good internet speed USD $600 per Mbps (MIT, 2014).

Karamoja region is relatively poor. Therefore the affordability of ICT service is problem for the local users. The district authorities resigned their utility when they buy shared internet bundle. The important question worth asking is, whether there is a relation between the higher cost charged for the access to communication services and the district authority's choice to buy the cheapest internet with lower bandwidth and unreliable internet accessible for users. Yes there is. "They (small users) who want internet can buy for 80,000, 100.000 up to 200,000 Ugandan shillings the connectivity from the customer to the first connection point, the quality is not very good"(Personal interview,2015).

Other studies found that there is a direct relation between the expensiveness of the services and limited usage of ICT services. In communities where the sum of ISP and telephony fees is prohibitively high, a disincentive to network usage exists, and access is curtailed (Sachs, 2005, P.8). The report identifies affordability and infrastructure challenges as the main obstacles for access to and use of ICT (Bridges, 2005a, P.181).

Many country reports cited that the cost as the greatest obstacle to widespread access and use of ICT (Bridges, org 2005a, P.7).Are the higher prices greatest obstacle for the access to and use of ICTs in Karamoja? The answer is both yes and no. According to the perspectives of an interviewee who represented a telecom firm the cost is not obstacle but the financial capacity of the users is the obstacle. He argued that "Big organizations, they do not get challenges, the challenges comes to small users, because to get the quality network the infrastructure needs expensive equipment so for organizations that is not big problem" (Personal Interview,2015).

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Current implementers view that "The districts have a budget to run the system and the internet subscription has already included the budget. The issue of subscription of cloud data storage that is we are working to find solution and maintenance. We (current implementers) are advocating the government to provide budget to district to run the system. There is budgetary restriction and introduce a system with lower maintenance" (Personal interview, 2015)

Is the cost for running the mobile for DEWS barrier for the local authorities? "The problem is the cost, the cost of system, including of training to give people skills empower people who are going the system, cost of training there are many local government who cannot afford to go digital to computerize because of the cost… when you are outside the priority is such that, to invest in digital system is a challenge" (Personal interview,2015) But the current implementer thinks that the cost is not big issue. He argued that the district authorities have limited capacity is now arguing that *EWS is cross-sectoral, they* (district authorities) *handle all the six sector of the distinct, so 20,000,000 UGS for them is not big, every sector can get 3,000,000UGS to a common pool and can be used but it was still a bit cost effective to them* (Personal interview, 2015).

But "the district have said, it is non-funding priority, it is not a priority now but they put the district development plan and they are saying continue educating us, one day it will become a priority" (Personal interview, 2015). The question worth asking is why the current implementers are pushing for handing DEWS over the district authorities? "We (current implementers) have exist strategy that is why every district we are given an office staff sitting in every district they are saying train our focal person do not leave now we don't have the knowledge to take it now (Personal interview,2015)

4.2.4 The e-skills availability in Karamoja

The answer to the research question one, whether the available e-skills is adequately available or not, demonstrates that e-skills is limited in Karamoja. Two critical problems were identified; skill shortage and skill mismatch. Therefore, DEWS recruited the professionals from other regions such as Saroti and Kampala. It employs expatriates with combined skills to design the mobile application together with DEWS staff and train the IT professionals with delinked skills (Personal interview, 2015). Currently, there are no IT personnel who perform the laptops,

machines for the district. So this is really setbacks for the district, they have to wait until the devices are fixed (Personal interview, 2015). The lack of technical support is a major obstacle to technology use in many developing countries, and skills transfer should be an element of any development project involving ICT (Bridges, 2005b, P.6).

The skills shortage is a threat for DEWS to recruit professionals and retaining them in Karamoja. Organization's resilience, in terms of management and financial capacity, determine the effects of skills shortage on DEWS. The current implementer recruits professionals with ICT skills across the country. They retain them in the region as capacity building officers. While others are based on Kampala but they travel frequently into the region. These professionals are trained and to update frequently their skills (Personal interview, 2015). For example, the capacity of district authorities is limited. They rely on the current implementers who provide ICT related trainings to focal persons who work in DEWS project in Karamoja (Personal interview, 2015).

The skill mismatch is also another challenge for DEWS. "Yes to some extent it (skills) is available that actually the way the technology use has developed the moment now that also brings another gap" (Personal interview, 2015). So when expatriates are hired, *it is expensive to pay but it is not expensive to maintain* (Personal interview, 2015).

UCC acknowledged that there are "Limited awareness and low skills among rural people to utilize and apply ICTs (internet, the data component of mobile phones) for economic development" (UCC, 2009,P.15). However, "if on the other hand, you are looking at civil servant at least people with the formal employment those are likely to have some exposure to computers therefore some skills, but generally populations in Karamoja I doubt there will be extreme" (Personal interview, 2015).

4.2.5 Policy readiness

The available policies promote the universal access and providing connectivity for rural people in Karamoja. They linked theoretically ICTs to rural development. The problem of these policies is they address last mile but such as public access point. Rural households are expected to indirectly benefit from ICT use through the entities, because of the intrinsic limitation of rural people's ability to harness ICTs (due to poverty and education/knowledge gaps) (UCC, 2009. p, 9).

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The policies do not come up strategies to build rural communication infrastructure. Passive infrastructure rights of way, permits, towers, ducts, poles, optical fiber, power supply, civil engineering, etc. (Norbhu,2014). Towers can be shared and In Madagascar, infrastructure companies are federated to build out shared towers. The operators contributed funds and bought services. In Burundi, Government of Burundi contributed a subsidy to ensure national coverage. Open-access networks (Norbhu, 2014).

The problem of rural connectivity can be addressed by looking it at three two perspectives; first making mandatory on Public Infrastructure Providers (PIP) to coproduce rural infrastructures as a shared infrastructure. Secondly, the intervention is expected to address the contextual issues including the poverty eradication and other developmental problems lagging the region behind the rest of the country.

So policies must create ICT business model that was guided by human development. This model must replace the current business model which was built on market freedom and neo-liberalism attitudes. Such policies must not be guided by *merely, orthodox development thinking embraces the fundamental principle of Marshall Plan -- injecting foreign aid in capital investment and infrastructure, developing countries accepted the assumption with expectation of economic growth. In this sense, they can potentially catch up for the development reached by industrialized countries (Adams, 2009, p.9).*

Karamoja needs a model that builds the infrastructure without thinking short term demand. One way to achieve that goal is building shared communication infrastructure among telecom firms to promote a fair competition and reduce the building and operating costs of maintaining ICTs infrastructures. For example Government of Burundi contributed a subsidy to ensure national coverage. Open-access networks (Norbhu, 2014).

This means that human development policy must guide the efforts to coproduce the infrastructure cost of investment and maintaining the towers. The policy should provide minimum standards for acceptable infrastructure to enable development projects to obtain the benefits of the networked world. Development strategy has to incorporate not only economic dimension but governance and human and social dimension (Hanna and Agarwala, 2002, p.8).

4.4 The impact of non-readiness ICT factors on DEWS

4.4.1 Introduction

Q2. How do ICT factors which are non- e-readiness impact on DEWS to build rural people's resilient in Karamoja?

The answer to the second question is, there are two ways that non-e-ready ICT factors can affect by DEWS to build the resilience of rural people in Karamoja: first, non-e-ready ICTs factors impede DEWS to produce early warning message; secondly it increases its dependency on external ICT skilled personnel. The central process of the grounded theory is coding (Bryman, 2012). Therefore, the answer to the second question was guided by the analysis made on the two categories identified when the text was coded and interconnections established between these codes. The answer to the second question was based on the primary data gathered through semi-structured interview.

"The term best practice has come under the fire recently in the ICT development community" (Bridges, 2005b, P.12). Therefore, the impact of non-ready ICT factors is subjective and contextual. ICT value chain model purports that the impact of ICTs on development can be understood through a series of key process with relation to project life cycle: design, operation and evaluation (Ospina et. al 2012, P.9). To answer the second question, it is important to reflect back the aim of the DEWS. It contains two folds; first to provide early warning on the increased risk of droughts and help initiate the implementation of drought preparedness measures (early action) (ACTED, 2013, P.5).

The study found that these objectives were not realized when mobile technology was implemented. It is noted through interviews that early warning was delayed and early action was not implemented. The main objective that the mobile technology was integrated into the system was "the mobile part makes the data collection to come on time, it makes the early warning system effective but also is cost effective that is why we took the mobile technology" (Personal interview,2015).

4.4.2 Adding value to the quality of early warning message

A point that needs a clarification is whether the problem is the limited capacity of DEWS or other factors that causes the failure in EWS or non-e-ready ICTs factors are real barriers averting DEWS to achieve its goals? The answer is complex. Since the study did not investigate factors that caused the failure. But the answer of the question can be looked at different perspectives.

Infrastructure were unsupportive

Generally the findings support that the available ICT infrastructure were unsupportive for the use of the mobile technology for data gathering. DEWS linked the infrastructure part to the failure. Due to this challenge, *the last about six months we* (DEWS) *have not been using the application* (Personal interview, 2015). A participant interviewed argued that the poor connectivity caused DEWS not to achieve its goals. *"It (network infrastructure) failed us because one week networks can be down yet data has to be submitted, you cannot submit when networks is down another time we have to move long distance to send the data"* Another participant explained: *the enumerators who are collecting data outside the coverage network area travel to district center to send the data* (Personal, Interview, 2015).

Limited Coverage

According to the findings presented in the chapter four, the network signals are not covered on the areas where DEWS's target beneficiaries are settled. They are estimated nearly million inhabitants who constitute the majority of the population in Karamoja. And vulnerability, impact and hazard data are collected in the areas outside the network coverage. Therefore, DEWS were excluded from accessing to good connectivity to contribute the development goals in Karamoja. The infusion of ICT into a country paints the existing landscape of poverty, discrimination, and division onto the new canvas of technology use (Bridges, 2005b, P.17).ICT must be physically accessible, appropriate to local conditions, and affordable (Bridges, 2005b,P.5).

Can DEWS control connectivity problem

The question is then; can DEWS have a control over the connectivity problem in Karamoja? The answer is no, but to some extent, it can add such challenges during the project design. External challenges are obstacles to the success of an initiative that are beyond the direct control of those implementing the project (Bridges, 2005b, P.17). There are few organizations who have

managed to move in equipment that has stabilized it for their own use, argued a participant (Personal Interview, 2015). Another respondent argued that "I will say internet availability in Karamoja will be very low, unless you resort more expensive solutions like having satellite connections" (Personal interview, 2015).

The practicality of establishing connectivity, independent from the local telecom firms, is questionable, a participant argued that VSAT is not practical as (XX organization) does not really need and, it is expensive. The Office of Prime Minster had established its own VSAT and the challenge is the routine maintenance the system requires and highly subscription fee to pay monthly. It is used in the emergency response (Personal interview, 2015).

A VSAT connection is not reliable also. A participant interviewed who used VSAT in 2009 told that it is expensive and the signal loses when it is rainy and it needs constant bandwidth upgrade and susceptible to virus and it is very expensive. Buying VSAT apparatus priced USD 20.000 and 736/526 bandwidth costed $1100 per month (Personal interview, 2015). That time all the prices of the internet and communication were very expensive in Uganda, but VSAT is often regarded as the most expensive solution compared to other arrangements.

Affordability is problem

The affordability problem is, of course, tied directly to the general conditions of poverty (Bridges, org, 2005b, P.6). But, district authorities view spending money on ICTs unimportant in Karamoja "they have said non-funding priority, it is not a priority now but they put the district development plan and they are saying continue educating us, one day it will become a priority (Personal interview, 2015).

As the findings in chapter four show, the district authorities are prepared to buy a shared internet bundle with the monthly fee 160,000 UGSH for 10GB (less than USD50) to access the internet. With this amount "…. the quality is not very good" (Personal interview, 2015).According to the national ICT policy, the cost of accessing to the internet is relatively high in Uganda. For instance it costs consumers for accessing to good internet speed USD $600 per Mbps (MIT, 2014). So the current implementers did not complain about the prices charged on the internet and they are concerned with the network coverage and the quality of the services accessible to them.

4. 4.3 the impact of non-ready e-skill on project design

The impact of skill shortage and mismatch is, the project activities are designed by expatriates who have limited cultural knowledge. So these experts rely on what they are told. Therefore, there is a high probability a gap to exist between the design and the reality. "We (DEWs) hired a consultant who did for us right now we are reviewing it" "(Personal interview,2015). Because, "The available skills are not married with specific skills that the project needs," (Personal interview, 2015). "There are many people with technological skills -- very good, but now people are unable to transform technology and now think it as humanitarian sense, serve a person how best you can improve person's life there is huge"(Personal interview,2015).
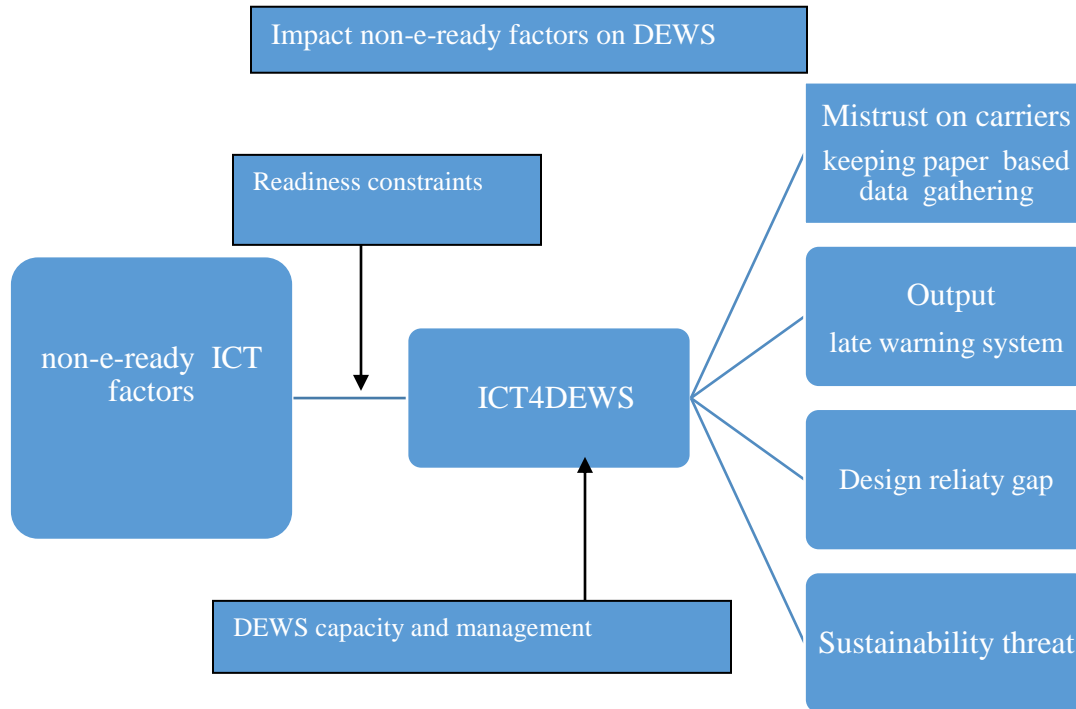
4.4.4 Design- Reality gap

During ICT4D 1.0, it seems that project designers often focused ICT application on a top-down determination of needs, rather than a bottom-up statement of wants (Heeks, 2009, P.18). The design-reality gap is also observable between the interventions that the project provides to the community and what beneficiaries really want. *You (DEWS) give the community people the information, hey rains are going to come in the next two weeks prepare your garden open your land plant majoring crops we do not have vegetables we do not have oxen to open the land.*" Because *The idea we had was that is let us provide the early information to the community to other stakeholders; to government, to donor so they will use it to do it early action but we have realized it does not happen the way we think*" (Personal interview,2015).

DEWS rely on expatriates to design the tools to be used in the project. But it is often desirable to have in the project *local experts with indigenous knowledge, and analysts who can outline essential questions and then perform rigorous diagnostics once data have been gathered* (World Bank, 2013, P.5). Additionally, DEWS has changed twice the technology it used for data gathering to enhance the efficiency of data gathering process-- it moved from paper based data gathering to Nokia data gathering application and again from NDG to Open Data Kit applications, so such changes may need new skills (Personal interview, 2015). "There are new fields mobile for development, where are you going to study; it is not there, you only have to study either online with certain institutions which are in the United States of America. There is no course for mobile development" (Personal interview, 2015).

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4.4.5 Sustainability threat

The skill shortage causes that project implementers to be unable to recruit the professionals within Karamoja. They must rely on skilled ICT personnel from outside the region. When they fail to attract and retain professionals, therefore, the impact of Skill shortage threatens the project's sustainability. RCDP included its threat analysis: a difficulty in attracting and retaining ICT skilled personnel in rural and underserved areas (UCC, 2009 P.15).

Who is going to stop the focal persons not leave from districts, when they decide to leave and take a new job with better pay after the project is handed over to district authorities? Although the current implementers managed to recruit professional outside Karamoja and retain them in the region, it is likely that district authorities to be able recruit professional outside the region and retain them in the region. Because their capacity is limited and they are dependent on current implementers *(*Personal interview, 2015).For example, the focal persons who are now trained to remain within the project, after it is handed over district *(*Personal interview, 2015). It is really a threat for the project's sustainability."They are saying train our focal persons do not leave now, we do not have the knowledge to take it (DEWS) now sitting the district they have assigned a focal person to (current implementer) who will be looking the things everyday" (Personal interview, 2015).

(Author, 2015) Figure 4: impact of non-e-ready constraints on DEWS

The impact of mistrust in carriers, late warning message, design-reality gap and sustainability threat as result of inadequate ICTs infrastructure which do not cover the networks in areas the enumerators gather the data causes delays in data submission which influence timely data analysis and finally late warning message is generated. Inadequate e-skills led DEWS to recruit on expatriates who do not know well local knowledge and reality. They keep reliant on what they are informed, so there is higher chance to design a good system but that is not reality.Mobile for DEWS project is foreign initiative. The local authorities will take over the management of DEWS. They are now dependent on the financial and technical support that is provided by the current implementer. So there is a threat towards the sustainability of the project. it will be hard to retain the skilled focal persons whom are trained to remain in the project, they are not able to pay good. Other factors contribute the problem, institutional capacity to manage the constraints and management of the project

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4.5 Usability of e-readiness assessment

4.5.1 Introduction

Q3. How could e-readiness assessment be used to enhance the readiness of the current and potential implementers of DEWS to build the resilience of the poor people?

e-Readiness is understood differently by people based on which perspective they look. From the most widely acceptable view, is people, projects and organization get to be networked. e-Readiness in this sense can be applied to an institution or a whole country (Najjar et,al 2003). The study employs the ontological view which holds that ICT use to be as situated and that its exact meaning depends on the context in which it is used t (Harindranath and Sein, 2007, P.5). Bridges (2005a) asserted that the e-readiness efforts should be linked to a country's national development goals, and focus strongly on a poverty alleviation and socio-economic development.

Institutional e-readiness

For local authorities spending on "ICT use is non-funding priority, and it is not a priority now but, they will put it in the district development plan and they are saying continue educating us, one day it will become a priority, it is something we are stilling pushing" (Personal interview, 2015). It is not obvious that their view is reflective to the underdevelopment that existed in the region. The region has some of the worst indicators for health, nutrition, education, food security, civil security, and poverty (Mubiru & Magunda; Magunda, 2010 P.6). It was also found that the education was not taken seriously in the past…it was hard to find who cherished education and who will be looked at as role model (in Karamoja) (New vision, 2015, p.43). Therefore, human development theory should guide any efforts aimed at enhancing e-readiness of local authorities in Karamoja.

ICT has only real impact when it is addressing need, such as drought risk reduction (Bridges 2005a, P.90). Therefore, it can also be argued that e-readiness has only real impact when it is addressing a need. E-readiness study shows that regions with higher levels of human capital and related resources have a relatively better showing on the network readiness index score than those with poorer statistic (Ifinedo, 2008, P.8). Therefore, development strategy has to incorporate not only economic dimensions but the governance and human and social dimension

(Hanna and Agarwala, 2002, p.8). The Governance issue is very salient for getting ICT factor e-ready in Karamoja. As the findings in chapter four show, policies are available -- very good policies which address underdevelopment in the region and digital divide in rural areas in Karamoja. The problem is those policies are hardly to trickle down and get executed.

To make development happen, the modernization theory asserts that the "underdeveloped" countries must transfer technology, ideas and values from those who had already industrialized (Heeks, 2009, P.22). Such essence of the modernization emerges within the efforts aimed at making the potential actors of DEWS e-ready. For example, the current implementers of DEWS-foreign organizations- are prepared to participate in the networked world in Karamoja. But the problem is the mobile technology is adopted to enhance the efficiency of early warning system, and it is considered as cost effective (Personal interview, 2015).

In other words, when the main actors who drive the ICT intervention are foreign experts from donor agencies and they prescribe the use of ICT for local actors, this is the characteristics of the modernization theory. For example, foreign agencies push the district authorities to adopt the technology in their day to day office work. So they are donated with technologies such as computers, modems, wireless technology, generators and solar panels. And they are subsidized with internet subscription fee, so they are prepare to run DEWS. Their staffs are also trained to ensure the sustainability of the project (Personal interview, 2015). "They are now demanding broadband, originally in 2009; they were saying give a focal person a modem and we give" (Personal interview, 2015). So adopting technology is remarkably progressing within the district authorities (Personal interview, 2015).

Important feature of modernization theory is when the primary purpose of using ICT is for a tool purpose. This means that ICTs is adopted as technical entity and a means to achieve something (Harindranath and Sein, 2007, P.5). When the ICTs are used for tool purpose, the integration process is dominated by techno-centric views. Heeks argued that projects that adopted technologies to enhance efficiency, they deliver a system that works technically but that fails to make a developmental contribution (Heeks, 2008). But, many authors described such progress as top-down initiatives. And the majority of projects prescribed by external actors have higher chance of failure (Heeks, 2008; Harindranath and Sein, 2007).

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Drought early warning system project

According to ICT value chain model. DEWS can be organized into a series of key process; design, operation and evaluation (Ospina et. al 2012, P.9).Therefore, E-readiness assessment can be used to guide these processes. The process was divided into two folds; non-ICT phase and ICTs phase (Ospina et. al 2012, P.9). Non-ICTs stage, it is mainly developed a robust early warning system to contribute to sustainable development goals. That system should be able to work well in manual system. And ICTs phase, the main focus is integrating ICTs into that EWS to make development impact. Subsequently, the technology is not the main focus. This will be helpful when the project is evaluated.

The Early warning system consists of four elements *risk knowledge, monitoring and forecasting, disseminating and communicating and early action and response* (IFRC, 2013). The adequately available E-ready skills can help DEWS to design a robust internal system. When the input resources are available and the leadership and the organization are ready, professionals with combined skills who have local knowledge may design DEWS, which focuses much, as Hyogo Framework Approach (2005) pointed out, on understanding and treating the root causes that turn droughts into risks -- hazards, vulnerability of the community, impacts and degraded environments.

It was argued that it is important agencies intending to automate traditional services improving the internal systems before citizens get served (UNWIN, 2005). It is important to developed strong non-consumer facing system to make the service delivery effective. According to World Bank report (2013), the three critical factors that were taken into consideration when DEWS had been integrated mobile technology, all of them were consumer facing elements; designing the optimal data collection parameters; a symbiotic partnership; accessible mobile technology with network connectivity. In fact these factors are very important.

The findings presented in chapter four shows that DEWS is currently dedicated only producing the most critical and complex task of EWS, i.e. generating early information and delivering to right stakeholders. The responsibility for performing the early response tasks was externalized. The findings demonstrate that when the responsibility of early response component is externalized, the negligence is often emergent reality and the external locus of control is exercised by stakeholders. However, a robust internal system is the key for the success. It is the

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foundation to be built upon the consumer facing elements. Therefore, designing early warning system, which its components are well integrated is salient, before mobile technology is being integrated with that system. As

As i discussed in the ICT infrastructure section, the constraints discovered, must be mainstreamed into the project management. Even when these consist of factors which might be uncontrollable. For example, unreliable networks and low bandwidth and bad roads are the factors causing the transmission of the raw data get delayed. So management techniques could be initiated to deal with such conditions. Walton and Heeks (2011) included factors, causing ICT project to fail, management and the leadership. Therefore, when there are effective management and leadership who are able to direct appropriately e-skill, EWS can be designed to make developmental impact.

At this stage, as World Bank (2013) introduced, it is important selecting a right set of ICT tools and applications and other factors that may contribute ICT project to succeed. So it is particularly critical to select a technology that works probably in complex settings such as Karamoja. As it was seen in preceding paragraph, drought data is time-sensitive and complex; as many actors are involved and various types of data are gathered such as hazards, climatic data, vulnerability and impact and environmental data. These elements need careful planning and creating integrated data system. One important issue to resolve is the level of reporting and frequency of data transmission (World Bank, 2013).

The data needs management. There are two ways to organize data management; back and front offices. They can be created with decentralized or centralized structure. Which model to choose will influence data management, such as frequency of the transmission and the level of the coordination level needed and the communication channels employable. In such situation like Karamoja, where the communication infrastructure is less supportive, it needs careful planning to determine which model is being appropriate for the project. The tasks the back office performs include storing and integrating data and identifying risk factors from the hazard and vulnerability perspectives to estimate the level of risk, establish acceptable risk level and evaluate the risks. It seems the most complex task is performed internally before information.

Such office enables development partners and public institutions and enumerators to coordinate internally and ensure smooth information flow to achieve internal efficiency. Definitely, the way

these offices are structured will influence the type of software and applications to be opted and the interoperability of the different applications and technology, if they are used (Crow, and Guide, 2009, p.290).

Chapter five Implications

Introduction

The aim of this chapter is to present the lessons learnt from the study. Findings indicate that five main themes can be incorporated into the development interventions to promote the capacity of people, environment and organizations in Karamoja. The study assessed e-readiness of ICTs factors in terms of their presence or the absence of ICTs factors, prerequisite for ICT use for DEWS. The relation that existed between the status of the ICT factors (ready and non-ready) and the development is complex. For example the answer to research question shows that non-e-ready ICTs factors impede the early warning system. It is not clear if the efficiency of early warning system is enhanced with ICTs factors which are e-ready.

Path to developing e-readiness in rural settings

The study learnt that different actors (local authorities, national and foreign organizations, telecom firms) carry contrasting views over the importance to be given investing ICTs related activities in Karamoja. As the finding presented in chapter four shows, investing in ICT related activities is non-funding priority for the local authorities in Karamoja. Conversely, the central notion of the national policies is promoting of reliable and affordable communication services in underserved areas like Karamoja (MIT, 2014).

Despite this, rural communication development has linked national development goals together with the extending the access to communication services in rural areas (UCC, 2009). According to the participants, it is unimportant for telecom firms to invest in Karamoja. Only few firms penetrated and the ICTs infrastructure is not well developed. There is a third actors in the region, foreign organizations, the current implementers of DEWS, is prepared to participate in the networked world. They invest continuously in technological based solutions. They donate regularly local authorities with technologies, provide training the local staff and subsidize running costs of local offices using the internet.

People must remake solutions by incorporating their understanding to the new situation in the light of what is different from the early situation (Bryman, 2012, p.34). Becker (undated) was

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quoted that *people create culture continuously* which is why there is no set of cultural understandings…...that provide a perfectly applicable solution to any problem -- people have to solve their problems in the course of their day (Bryman, 2012, p.34).

As the findings of the study show, a systematic progress in relation with the local authorities' ICT uptake in Karamoja has been noticed. Although telecom firms in Karamoja are still very few, the market is becoming more competitive; single operator has previously been dominating the presence in specific area, other firm is now extending its services in that market.

The study learnt that the local authorities and telecom firms hold similar view over the investment in ICTs to be unimportant in Karamoja. It is likely the local authorities' drive to be different from that of telecom firms. Additionally, the concepts built upon the rural communication development are analogous to that view held by the foreign organizations. For example, the government purposes to provide connectivity to 42 sub-counties in rural areas. Karamoja is one of the policy targeted areas. As the finding shows, the foreign organizations implemented mobile for DEWS in Karamoja. They donate technologies, provide ICT related trainings, and subsidize the local authorities with the running costs of internet. So the study treats them as one actor with different characteristics and interest. The telecom firms and the local authorities are considered as another with distinctive motives.

Central government and local authorities

The question is how can this situation be explained in terms of what the contrasting views means to human development in Karamoja? What does this mean to different actors? I discussed in the discussion section when the main drivers of ICT use is foreign agencies and its outcome. But the point here is the central government and the local government which are considered, in one sense the local actors differ in views. So how can we explain this difference?

The innovation is intention when the attention of that innovation is to address the needs and wants or problems of the excluded groups (Heeks et. al 2014, P.177). The rural communication development policy gives the priority for entities that serve for the communities such as NGOs, CBO and rural financial services (UCC, 2009. p, 9). Therefore, this policy has the intention the rural people to be included the innovation in Karamoja.

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According to Heeks et. al (2014) when the inclusion is arranged through proxy, it symbols for the lowest level of innovation inclusion. This means that the excluded groups are not involved in the process of innovation. Therefore, the difference that exists between the goals in the rural development policy and the view held by the local authorities can be described as lack of proper participation in the innovation inclusion process. In the discussion section, I have explained the modernization theory and human development, which consider differently such situation.

The question is how the opposing goals can be converged in order both of them to win?

Telecom firms and External agencies

The telecom firms and the current implementers of DEWS constitute other important groups with opposing views. The current implementers of DEWS invested in mobile technology to gather data which require ubiquitous network coverage and reliable connections. As the findings show, participants pointed out that the poor connection and scanty network coverage caused DEWS to fail to deliver its intended output. These participants suggested the development of adequate ICTs infrastructure in Karamoja. Telecom firms operate in towns in Karamoja. This means that people settled outside the towns are not the target clients. As I have discussed in the ICTs infrastructure section, different actors judge what can be acceptable connection in Karamoja. But these actors agree that there are people excluded from the physical access. So DEWS is also excluded from the access because it serves for them.

How to explain such situation? The study explains that these objectives of the telecom and clients are divergent, so the mentality dominated the whole process is win/lose. The point here is that the telecom firm fear to lose if they invest a lot of money in rural areas. As result of that decision, people in the outside the coverage area are the losers and telecom firms are the winners in the battle. So DEWS as its targeted beneficiaries, will also lose.

As the figure 4 was presented, the telecom and clients, like DEWS move opposed directions; for the telecom is for profit making and the DEWS is for human development. As the findings show, for the telecoms, they will not put a lot of money in where they know the demand is almost zero.

The question is how the opposing goals can be converged in order both of them to win. One strategy purposed is to reduce the cost of operators' investment in ICT infrastructure through

cross-sectoral infrastructure synergies. This means enabling operators to share of passive elements of infrastructure, such as towers, ducts, and rights-of-way (UNESC, 2014, P.V). So this requires an appropriate policy to be developed. That policy must mandate on Public Infrastructure Providers (PIP) to coproduce ICT infrastructures in Karamoja. This would not only cut costs of network expansion in all Karamoja, and it may possibly generate additional revenue.

Missing middle

| Few telecom firms operate in karamoja | Clients (DEWS) |

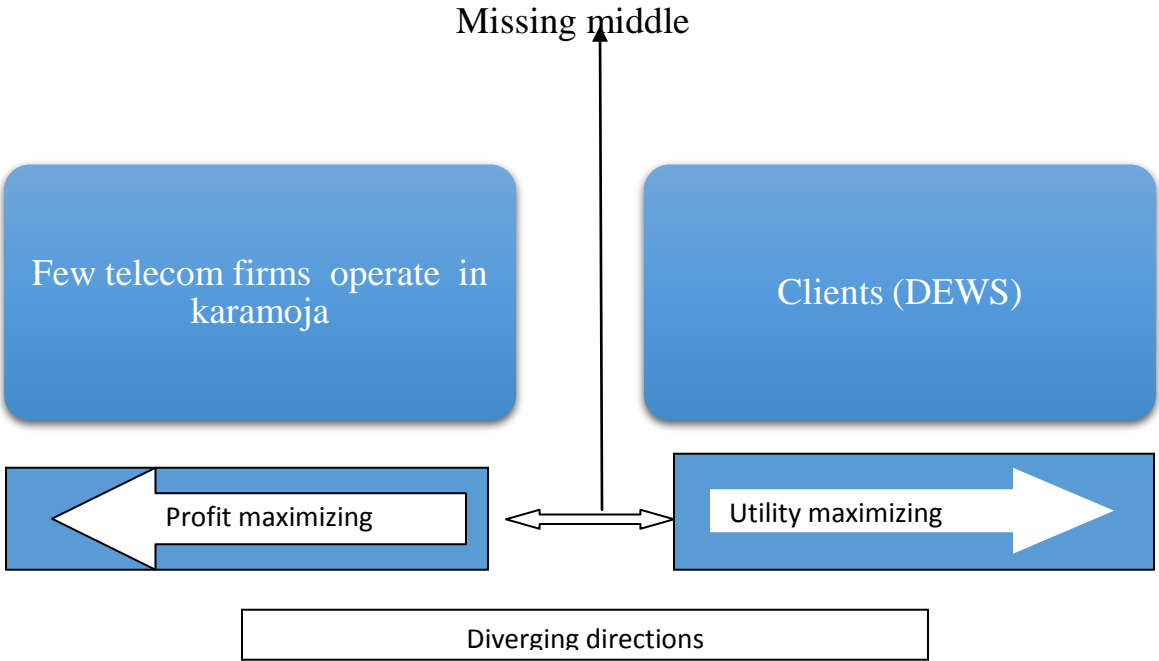Profit maximizing   Utility maximizing

Diverging directions

Figure 5 shows different directions telecom and DEWS is moving

Figure 4: shows that telecom wants to maximize only profits, so they will not achieve that goal by maximizing utility of the clients. Therefore, they will not establish ICTs infrastructure where the users are less like to consume communication services. On the other hand, DEWS's success depends on the quality of services provided and ubiquity of coverage. So DEWS wants to maximize the utility in the context that the demands are very low for communication services. Therefore, enumerators collecting data in rural areas must travel to district centers to access the internet and submit the data. When they arrive in towns, the networks may be down and signals get offline due to security reason or other reasons. The problem is there is a missing middle which makes the opposing goals convergent. That is the role of the government to mediate the contrasting direction.

Weakness of the study

ITU developed a set of quantitative indicators for e-readiness assessment and popular models embrace those indicators as they are relevant with the quantitative data that models gather. In other words, the study has not used directly those quantitative indicators available for a benchmark because of gathering qualitative data. Therefore, the indicators used in the study are subjective and difficult to replicate to other e-readiness assessment. Some of the participants being selected to participate in the study have considered themselves irrelevant as they were not involved in DEWS project. To understand the problem from the perspective of the supply side of telecommunication services (public infrastructure providers) was paid much intention. In other words, only demand side of the communication services have been gathered the data. Data gathered from a telecommunication firm was included in the findings to make sure the validity what service recipients were telling.

In addition to this, the study employed Heeks' model of ICT value chain which proposed four components (readiness, availability, uptake and outcome) to assess the impact of ICT use for development project. But it selected to focus on the readiness to gather the data from that component. Consequently the finding of the study is restricted when the data is gathered from a single component. In other words, the data were collected organisations directly or indirectly involved in DEWS project. The data collection could have been extended to the demand side of DEWS (the beneficiaries) if the outcome of DEWS is included in the area of the investigation.

Chapter Six: Conclusion

How can the impact of e-readiness of ICT factors be used to build resilience of poor people in Karamoja?

The three specific research questions have been answered according to the findings of the study. These findings were also consistent with the outcome of the previously conducted e-readiness studies. The first question addresses on the absence or presence of ICTs factors which are prerequisite for ICTs to be integrated into DEWS in Karamoja. The second research question asks about the impact of non-e-ready factors on DEWS and the final question raised the e-readiness of current and potential implementers of DEWS. These questions have been answered according to the findings of the study. The findings of the study were emanated from data

gathered from the participants through semi-structured interview and secondary data obtained from a participant and from the internet.

A key finding of the research shows that the present status of e-readiness for ICTs factors is lower than the minimal required standard which enables DEWS to participate in the networked world. The study concludes that the lower scores in human development in Karamoja contributed to ICTs infrastructure, e-skills, the prices of ICTs, local authorities to be low in e-readiness. As the findings presented in chapter four, show that 25 telecom firms registered in Uganda, out only three penetrated in Karamoja. *The infusion of ICT into a country paints the existing landscape of poverty, discrimination, and division onto the new canvas of technology use* (Bridges, 2005b, P.8).

Other studies including those presented in Bridges report demonstrate that the affordability problem is, of course, tied directly to the general conditions of poverty (Bridges, org, 2005b, P.6) One study found that regions with higher levels of human capital and related resources have a relatively better showing on the network readiness index score than those with poorer statistic (Ifinedo, 2008).

Therefore, it is a practical solution, as Bridges report (2005a) recommends, the e- readiness efforts to be linked to a country's national development goals and to focus strongly on a poverty alleviation and socio-economic development. Karamoja is least developed region. The people did not take serious education in the past. It was very recent when the first female medical doctor graduated (New vision, 2015, p.43). The education is central to the development of e-ready human capital, which is in turn an integral part of the growth of the local business sector and the implementation of programs at ground-level (Bridges 2005, P.86).

However, the government of Uganda developed the rural communication development policy and other development policies. These policies were conceptually linked the use of ICTs in rural area with rural development goals (UCC, 2009). As the findings show there is little progress in regard to achieving the rural development and universal access goals.

Therefore, the most significant challenge is not binding the e-readiness efforts to the national development goals. But it is related to the governance issues, such as poor policy implementation. The rural communication development policy was planning to achieve by 2015

deploying at least 800 public pay phones per year in underserved areas (UCC, 2009). As the findings discovered, ICTs infrastructure in Karamoja is not supportive for users to participate in networked world. The study concluded that ICT service providers want to maximize their profit. This objective seems unachievable deploying networks in rural areas in Karamoja. So the network infrastructures are accessible to people in towns in Karamoja.

Another important conclusion linked to the failure in the policy implementation, is the goals customers want to achieve diverges those of the service providers. For example, the operators want to maximize the profits. The users want to maximize the utility of the communication services, they are provided in Karamoja. So there is a missing middle which enables both actors to achieve their goals through win/win situation.

Therefore these problems must be treated with multi-dimensional interventions. First it is important actors understand the exact problems. Because of the connectivity problem is subjective. So, different social actors can explain that problem according to their perceptions, and knowledge, as discussed in chapter five.

For example there is a study conducted in Kenya which argued that the connectivity challenge cannot be resolved by establishing only adequate or new infrastructure, such as fiber optic cables. Because other factors contribute to the existence of the problem, so understanding and addressing the problem is salient. Other factors that cause the connectivity problem include the inadequate bandwidth allocation or internal networks infrastructure were not well designed and managed to provide superior services (Kashorda & Waema 2014, p.125).

Impact of non-readiness on DEWS

Institutional readiness

The study concludes that the current implementers of DEWS which are external actors, are e-ready. But the potential implementer which is the local actor is still progressing to be e-ready. So the sustainability of the DEWS is threatened when the project is handed over to district authorities in Karamoja. "Usually when you have development projects, it is funded by somebody else they can afford while it is in the project, when it stops being projects, I know there is always a problem,…. where when the projects ends, institutions cannot afford to sustain the internet connectivity, that I am afraid is very common" (Personal Interview,2015).

The DEWS is surrounded with two dangers which may blow up when the local authorities assume project's responsibility. The first challenge is the focus on technology and forgetting the system and the second is the sustainability of the DEWS. According to Harindranath and Sein (2007) these characteristics are the symbol of the modernizations perspective of development and the neutral view of ICT. For example, DEWS views the use of the mobile technology as tool for gathering data faster and it is the end instead of a means. Secondly, the main actors or roles in the initiatives of DEWS were driven and are foreign experts from international organizations, united nation organizations.

Sustainability failure is among other factors which cause ICT4D to fail in developing world (Heeks 2002b). It was found that such projects start up successfully but then close down after some time (Heeks & Walton, 2011, P.6). The solution is building the capacity of local authorities to get e-ready. This effort requires strategic partnership between the local authorities and supporters and decentralized strategy and (Walton & Heeks, 2011, P.17). The key points the need the local authorities to get e-ready should come from them and the development theory that guides the process should be human development perspective (Harindranath and Sein 2007, P.5).

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Appendix 2: Informed Consent form

Informed Consent Form

Ethical Consideration

Informed Consent Form For:…………………………………………………………………..

Introduction

I am Ibrahim Hussein, a student at the University of Agder, Norway and pursuing a programme in Development Management. I am the researcher for the study "The use of ICTs in Drought Early Warning System (DEWS) in Karamoja, Uganda." I invite you to voluntarily participate in this study. Please feel free to draw my attention to any concept or word in this form that you think needs further explanation.

Purpose of Research

The aim of the study is to investigate the impact of ICTs factors which are precursors on the use of ICTs for DEWS in Karamoja. To understand that, the study assess the readiness of the electronic factors such as IT infrastructure, e-skills and affordability of ICT services accessed by development project. It also wants to know how their availability or absence can be used to direct the ICT uptake in DEWS to achieve development goals.

.**Research Intervention**

The main tool for this conversation is an interview guide which contains a series of questions that cover fairly the main issues stated in the preceding lines.

Participant Selection

You were particularly invited for this study because your experience as an individual\agency can provide rich insight into the e-readiness of ICT precursors and ICT uptake in DEWS to achieve for development goals.

Voluntary Participation

Participation in this study is strictly *voluntary* and may not affect your personal evaluation either in this community\agency. A decision not to participate will also not affect you in any way. You may change your decision to engage in this study even as the discussion is on-going.

Procedure

The communication in the personal interview is carried out in English language. For the purposes of information control, the researcher might deem it necessary to record conversation for later transcription

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and data analysis. Please note that this may also be rejected by the respondent, if he\she is not comfortable with it. However, all interviews are given codes and not personal names.

Duration

It is expected that an average interview takes between 45-80 minutes.

Risks

This study has little or no effect on your health and psychological well being as no chemicals will be administered as experiments. Rather some questions asked may be sensitive, personal and might elicit emotional response. Whilst this is not intentional, when such situations arise the participant is under no obligation to continue with the discussion. Appropriate counseling, if it is necessary will also be provided by the researcher.

Benefits

The study does not promise payment or "gifts" in return for being a participant. It is strictly voluntary and for academic purposes ONLY. However, your decision to partake in this study will potentially help identifying new or confirming what is already known and may helpful for future studies in ICT for development.

Confidentiality

This study will maintain strict *confidentiality* with the information provided either on personal details or what is said. In no way will personal/organizational names be linked to what was said (where it is necessary, permission will be sought accordingly). All interviews are strictly identified by codes. *Anonymity* may also be pleaded by a respondent.

Right to Refuse or Withdraw

This is to reconfirm that the study is voluntary and you may withdraw at anytime without any cost to you or the research.

Who to contact

If you have any questions, you can ask me now or contact the address below for further explanation: ibrahh13@student.uia.no or ib.saed26@gmail.com   or oystein.sabo@uia.no

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Certificate of Consent

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study

Name of Participant………………………………………………

Signature……………………………………………………......

Date…………………………………………………………..

           (Day\Month\Year)   **Thumbprint**

                                                (For illiterates only)

Appendix 3: Interview guide

INFRASTRUCTURE
  1.0 GENERAL INFRASTRUCTURE

1.11 Would you mind telling me something about the ICTs infrastructure available and accessible Karamoja?

1.1.2 What do you most complain about in terms of the availability and accessibility to ICT infrastructure in Karamoja?

1.1.3 What can you tell me about the speed of connections and mobile network coverage which are accessible to DEWS?

1.1.4 How can the available infrastructure be used to facilitate the DEWS to integrate its use of mobile technologies into the Poverty Eradication Action Policy (PEAP)?

1.1.5 What are the other issues in regard to the availability or absence of ICT infrastructure you are not asked in the interview but you would like to add?

1.2 0 Infrastructure technology
  1.2.1 Hardware

1.2.2 Which market does DEWS procure the technologies? is it the local and international market?

1.2.3 What can you tell me about the interoperability the mobile technologies you use for gather data with other technologies? such as early response and dissemination?

1.2.4 What can you tell me about the coordination between enumerators gathering the data in the field and the people in main office and vice verse?

1.3 DATA SYSTEM

1.3.1 Are all data important for DEWS available and accessible to the project ? how? in electronic or on papers? Weather forecast, livelihood, vulnerability, drought impact data?

- Are these data integrated?

1.4. Infrastructure policy

1.4.1 What could you tell me about the policies and regulations which are available to develop ICTs Infrastructure in Karamoja?

2.0 Affordability of Access to Telecommunication services

2.1.2 How affordable is price for the internet and GSM broadband for DEWS in Karamoja?

2.1.3 What could you tell me about the recurrent costs for maintaining mobile data gathering system?

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2.1.4   What do you think about the prices? And these affect DEWS

3.0 Human/ Skills Readiness

3.1.1   What were the contextual factors available in Karamoja which motivated DEWS leadership to automate the data gathering process?

3.1.2   How does the absence of some of the contextual factors constrain DEWS' leadership to fully automate the traditional ways of doing the business of DEWS?

3.1.3 Who developed and maintain technically the IT mobile technology used for data gathering DEWS?

3.1.4 Did these people also have training in development or disaster risk reduction discipline? Do these people have combined skills in development and IT?

3.1.5 Can your organization/DEWS able to recruit competent ICTs staff in Kampala?

3.1.6 Does DEWS has enough local ICT professionals who can develop and maintain and support the ICT systems of EWS?

3.1.7 Where DEWS intends to go after it has adopted mobile technology in data gathering?

3.1.8 What else you would like to add in the interview in regard to your experience in skills shortage, mismatch or competency?

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