

The Possibilities of Improving Access to Healthcare Services with the Aid of Mobile Health in Uganda-an Investigation into Health Information Infrastructures and Users and non-Users Interest

A study of if Mobile Phone have possibilities of improving access to health care services of Uganda, In Kireka Kasokoso central Kampala in Uganda.

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Abstract

Background: The use of e-Health and m-Health, like mobile health, have been embraced by most developing countries Uganda inclusive, its applications to improve access to healthcare delivery to its people. In Uganda, the growth of information and communications technology industry has benefited the rural communities and created opportunities for new innovations, and their application into healthcare has reported positive results, especially in the areas of disease control and prevention through disease surveillance. However, most are mere proof-of-concepts, only demonstrated in use within a small context and lack sustainability.

This study shows contextual information and results from a chosen local village for patient groups using mobile phones about an existing opportunity to use text messaging for accessing one of the level four health care facilities. By investigating their experience after two months, the goal of my case is to aid in the development of this novel approach to health care services in Uganda. It shows opportunities and barriers of e-Health with a specific focus on mobile phone use in Uganda.

Methods: I first performed a literature study supplemented with hand searching of documents of the situation concerning digitalization and use of mobile phones in Uganda. I then set up an awareness meeting of non-users of mobile health and performed interviews of those who were already using mobile phones for health. This was undertaken between September and October 2018 and on collecting data, interview of respondents and observation of the responds.

Theories: Information infrastructure theory, installed based theory and grounded theory

Materials: Documents, articles, observational and interview data.

Results: In the literature study, I summarized conditions for mobile phone use in Uganda. In the group of those who were already using mobile phone for health purposes, I found that many users expressed its importance and benefits for their life style that was not the case before in getting access to healthcare. Non-users expressed eagerness of starting the use of mobile phone to access health care delivery, which would improve their health status. However, I found barriers connected to what may be denoted as the installed base of infrastructures, and social and cultural aspects that are complicating the best use of this technology.

Conclusion: For a new technology to exist within the use of information infrastructures, there must be old ones that it can be based on while changing the system. I concluded that there are structural, political and cultural challenges for improved organization and communication. I found out that the mobile phone for accessing health care delivery was very much acceptable in rural and urban areas of Uganda. However, there are many obstacles that hinder its acceptability.

Supervisor: Anne Granstrom Ekeland

Key Words: Mobile Health, Uganda

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Structure of the Study

This study is presented in six chapters. Chapter I includes the background of the study, Research questions and the purpose.

Chapter II presents the research setting. It explores existing literature on the use of information communication technology especially mobile phones for healthcare in Uganda, it also includes a review of some recent studies on the use of mobile phones for health interventions.

Chapter III describes the methodology used in this study. It includes the research procedures, data collection methods and analysis procedures.

Chapter IV presents the theoretical framework used as the basis for making analysis; it includes a review of the information infrastructure and the installed base. It presents the application of the model of mobile phone use.

Chapter V presents the findings of the study. It also presents the analysis of the responses.

Chapter VI consists of conclusion, including reflections of the findings. It also presents some recommendations for further research.

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Chapter I

INTRODUCTION

The thesis is a result of a major interest to investigate if it is possible for Uganda to implement use of mobile phones for health care purposes for all people in order to provide better access and improved health care.

In order to respond to this large-scale task, statistical material about health care in general, the use of mobile phones in health care and comparing characteristics from different periods would be important. It would also be important to thoroughly assess political, structural and social conditions for implementation through systematic assessments of experiences and scientific results. Such systematic assessment is beyond the scope of the thesis due to lack of time and economic resources.

However, I have put a lot of effort to collect and consider background material on the historical development and current situation of Uganda's health services, with a specific focus on the already existing information infrastructure, which is considered as a main condition for use of mobile phones for health care purposes. On this background, the thesis is also based upon an investigation of how non-users in a rural village of Uganda respond to the introduction of mobile phones for health care. The investigation was accomplished by setting up an awareness meeting and interview participants.

Moreover, I have investigated how experienced users of such services value the services through qualitative interviews. The empirical investigation serves to provide knowledge of two additional important conditions for large-scale implementation; the interest of non-users and the way experienced users value the services. I will at the end of the thesis, reflect on the combined results of conditions for implementation and use of mobile phones for health purposes in Uganda.

BACKGROUND, RESEARCH QUESTIONS, PURPOSE AND OUTLINE OF THE THESIS

The remarkable spread of mobile technologies as well as promotion in their inventive application to address health urgency has evolved into a new field of e-Health, known as m-health [1]. M-Health can be described as the emerging mobile communication and network technologies for healthcare systems [2]. It is also seen as a fundamental basic pervasive health-care which is defined as right time health services to anyone by removing locational, time and other restriction at the same time, increasing both the coverage and quality of healthcare [3].

The advent and utilization of m-Health are changing the way health services are being accessed, delivered and managed. M-Health accounts and utilization have already a very important and determinant role in reorganizing the traditional healthcare services and systems, which are based on the patient physical appearance at the hospital [4].

Uganda is a country where m-Health may have the potential to contribute substantially to the general health care. It is estimated that around 50% of healthcare in Uganda is delivered by public or government facilities and 50% by private providers. The public-sector facilities comprise of two National Referral Hospitals, Mulago and Butabika in Kampala, eleven Regional Referral Hospitals, 43 General Hospitals, and 112 District Health Center IV's, one per District. IV's offer primary services. Health Centers. Centers II and III provide diagnosis and maternity care, and health information is being disseminated to village households by unpaid volunteer Village Health Teams at the lowest level [5].

Basic health care services that are delivered in public hospitals and private health facilities are restricted by several factors, such as the distance to health facilities, availability of drugs, equipment, and training of health workers [6]. The mobile phone may be a promising tool of information communication technology in making a difference in the access to health care services delivery. Mobile phones can help by improving vaccine supply chains. By allowing real-time data of stock levels in remote facilities to filter back up the chain, it is possible to prevent unnecessary stock-outs and ensure that vaccines are available when infants and children are brought in to be immunized. Meanwhile, health-care workers in the field can be able to access health records and can schedule appointments using their phones. They can even issue automated text reminders to parents about when vaccine clinics are being held [7]. With mobile phones, patients can now consult doctors via the telephone like calling or by

sending SMS or email. Patients use the mobile phone and SMS to book appointments to meet their doctors, call for emergency services in case of accidents and even set reminders for taking medication [8]. Mobile phones also enable distance learning for health personnel and others interesting in researching on several health issues.

There are several sites available giving information HIV/AIDS and other diseases like Malaria. Further information can be shared through radio and television or on CD ROMS, by email or teleconferencing. By choosing a local village and setting up an awareness meeting for patient groups using mobile phones about an existing opportunity to use text messaging for accessing one of the IV's, and investigating their experience after two months, the goal of my case is to aid in the development of this novel approach to health care services in Uganda.

Research questions

1. What are the conditions for the development of mobile health in Uganda?
 - a) What characterizes the information infrastructure?
 - b) How do non-users consider use of mobile phones for health purposes in a rural village in Uganda?
 - c) What do users value about use?
2. How do the installed information infrastructure and non-users' and users' accounts align to provide current opportunities for use of mobile health?

Hypotheses

1. Healthcare in Uganda provides both possibilities and challenges for development of mobile health.
2. The awareness meeting will inform non-users of the possibilities in using a mobile phone for health purposes.
3. Non-users will help provide informed knowledge about what kinds of health problems that can be met by using a mobile phone, as well as limitations.
4. Users will experience several areas of improvement as well as challenges.
5. The investigation will provide new knowledge of conditions and challenges that should be addressed in order to further implement services.

The reminder of the thesis is structured as follows: First, I will present the scope of the investigation among non-users and users and an account of theoretical understanding of the research topic. After that, I will present the method used for part 1 that responds to research question 1a and is based upon literature search and retrieval of document from international organizations.

Then I will present the scope and method of the interviews and observations. The thesis then will present the results; the historical development and the installed base of information infrastructures in Uganda with specific focus on mobile phones. I will then describe the setup of the awareness meeting, the awareness information, and the agreement and interview guide for the interviews with the users. I will also present the results and analyze the experiences of the users. Already existing knowledge of advantages and disadvantages of mobile health in similar settings will be considered.

Chapter II

RESEARCH SCOPE FOR THE INVESTIGATION AMONG USERS AND NON-USERS

The first health contact for someone living in a rural area such as the Ugandan village Kasokoso would be a community medicine distributor or a member of a village health team (VHT). According to the Ugandan government's health policy, every parish is supposed to have one of these centers. A Health Center II facility, serving a few thousand people, should be able to treat common diseases like malaria. It is supposed to be led by an enrolled nurse, working with a midwife, two nursing assistants and a health assistant. It runs an outpatient clinic, treating common diseases and offering antenatal care. A Health Center III facility should be found in every sub-county in Uganda. These centers should have about 18 staff, led by a senior clinical officer, who run a general outpatient clinic and a maternity ward. It should also have a functioning laboratory. It should have a senior medical officer and another doctor as well as a theatre for carrying out emergency operations. Ideally, each district is supposed to have a hospital, which should have all the services offered at a Health Center IV, plus specialized clinics like those for mental health and dentistry and consultant physicians. At the top of the healthcare chain is the national referral hospital, located at Mulago in the capital Kampala. This is where some of the best medical specialist can be found, often working part time at private clinics to supplement their meagre government salaries.

Based on the Uganda's health sector, mentioned above, my empirical focus of this study is based on an awareness group based in Kasokoso and focused group is located at Bombo road in a specialized clinic of ear nose and throat. Which is located in the Banda and Kireka areas, sitting on a hill off Kampala-Jinja highway, five kilometers away from Kampala, it borders Kabaka Ronald Muwenda Mutebi's palace. Over 150,000 people who dwell on this land are low-income earners, soldiers, policemen, students, casual laborer's and refugees who ran away from northern Uganda and settled in Acholi quarters. Part of this area is a swamp that stretches from Butabika Its security is generally poor because most of the housings in the area are in open space and of semi-permanent standard with no major tarmac road.



THEORY

Understanding the situation as information infrastructure.

Mobile phones can help by improving vaccine supply chains in places such as Uganda. By allowing real-time data of stock levels in remote facilities to filter back up the chain, it is possible to prevent unnecessary stock-outs and ensure that vaccines are available when infants and children are brought in to be immunized. Meanwhile, health-care workers in the field can be able to access health records and can schedule appointments using their phones. They can even issue automated text reminders to parents about when vaccine clinics are being held [7].

With mobile phones, patients can now consult doctors via the telephone like calling or by sending SMS or email. Patients use the mobile phone and SMS to book appointments to meet their doctors, call for emergency services in case of accidents and even set reminders for taking medication [8]. Mobile phones also enable distance learning for health personnel and others interesting in researching on several health issues. There are several sites available giving information HIV/AIDS and other diseases like Malaria. Further information can be shared through radio and television or on CD ROMS, by email or teleconferencing

Information Infrastructures (II) are perceived as having complex, unbounded, and sociotechnical characteristics [9]. Hanseth and Lundberg N [10] define an information infrastructure as “a shared, evolving, heterogeneous installed base of information technology capabilities among a set of user communities based on open and or standardized interfaces”[10]. Information Infrastructures are not limited to technological systems.

Information infrastructures, while convenient by a community of users, compromise of shared resources for delivering and using information services to its users. It is important to identify to what degree acknowledged information systems are being transformed into information infrastructure system by their breakthrough in distance, vicinity, and integration into complex corporate wide and industry wide information infrastructures [11]. Additionally information infrastructures are regarded as a new class of information technology systems which also need to conform to a set of design requirements that are different from those of traditional information systems [12].

The installed base is an important factor of an information infrastructure, which is consistently created on or emerge from its existing base, according to Star and Ruhleder [9]. An information infrastructure combines and draws upon heterogeneous and diverse components that are not under the control of one designer. The installed base can be assumed as an assorted “network” of technical, organizational, legal, financial, and human components and as the accrued unceasing proceeding technologies that are institutionalized in the organization. This is the understanding I have of the universe within which my investigation takes place.

According to Aanestad and Jensen [13], technology along with mobile health should be connected or ingrained as an extension of other forms of technology to ensure effective adoption of information infrastructure that cannot be changed instantly but should be implemented in a gradual fashion and proceed through changing sub-networks [13]. Additionally, mobile health offers the promising for programs to add features like text messaging for appointment reminders, booster content to reinforce education that are easy and simple for organizations, institutions and clinics to adopt [14]. I consider processes of change, or the conditions for use of mobile phones for healthcare purposes within this perspective.

According to Hanseth and Lyytinen [10], “Overall, the evolution of infrastructures is both enabled and constrained by the installed base, that is the existing configuration of information infrastructure components.” Whatever is added needs to be integrated and made compatible with the existing base. This sets up demands for horizontal and/or backwards compatibility and imposes constraints on what can be designed at any time. Accordingly, “II evolution is path dependent and shaped by neighboring infrastructures, existing information technology capabilities, user and designer learning, cognitive inertia, and so forth.”

The information infrastructure is highly compatible as both governments and healthcare providers direct a considerable amount of resources towards achieving fully integrated healthcare information infrastructures, where interconnected and interoperable Electronic Patient Record systems are central [13]. However, in Uganda such implementation can be slowed down by the Uganda Revenue Authority (URA), confiscating project equipment and delay releasing them [8].

Infrastructures in use that takes place as new systems are adapted to interface with existing ones through combinations of improvisation, work practices, and continuing innovation by both designers and users. Monteiro et al., [15] and Pollock & Williams [16], argued that the

very concept of design as a local, punctual activity of system developers needs to be rethought, at least in the context of large-scale enterprise software infrastructures.

Infrastructures are ecologies or complex adaptive systems, they consist of numerous systems, each with unique origins and goals, which are made to interoperate by means of standards, socket layers, social practices, norms, and individual behaviors that smooth out the connections among them. This adaptive process is continuous, as individual elements change and new ones are introduced [16]. The account of possibilities and challenges posed by the theory is also underlying my thesis.

The use of information communication technology for health is also facing cost and infrastructural challenges. Not all medical units are computerized, and this makes it hard to implement telemedicine plans as proposed in Uganda's information communication technology policy. This makes some different infrastructure, like Installed base cultivation and gateways compressed [10]. This is because network can only be changed in a process where smaller parts, sub-networks, are replaced by new ones while at the same time the new sub-network works together with the larger network [10].

Method for the Literature Search

I started searching in 2017, when I was asked to choose the topic of my own choice; I then searched on google with the following key words:

How could mobile phone improve the healthcare of Uganda?

I got lots of articles which helped to consider that it would be reliable for me to go ahead with my topic. I got published articles which were complemented with a review of unpublished documents, that's the policy of e-health of Uganda.

When I used Google Scholar, the key words for search used were:

- using mobile health in Uganda
- e-Health in Uganda,
- telemedicine in Uganda,
- and electronic medical records in Uganda,

I used in my study about 60 resources from each of the key words searching in Google Scholar.

Searches used in PubMed, I used words with the Heading mobile phone in Uganda. I restricted my search to journals written in English in both databases. Some of my searches were limited to the last 5 years, but I also used articles as old as from 2011.

Based on the strategy described above, my study was not a systematic review as it may appear, but I used those articles to broaden my study.

Chapter III

Approach, Methods and Procedures for the Investigation Among Non-users and Users

RESEARCH APPROACH

Research approaches are plans and procedures for researcher that plan the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation, they are two types of research approach, quantitative and qualitative [17]. According to Popay and William [18], qualitative is concerned with negotiation and construction of meaning in a social intercalation. It focuses on the meaning that people attach to experiences, the relationship between knowledge, experienced action and social factors that shape the process. It says that people attach their experiences in a dependent social context. Methods are used when little is known about a subject and the researcher may have few opinions about the data which will be obtained [19].

A qualitative research approach in the interpretative tradition of information communication technology [20], was applied in this study. Qualitative research is designed to aid researchers in understanding persons and the social and cultural context in which they are situated [21]. This involves observing the behavior of and interviewing the subject without manipulating them in any way. The subjects are observed in a complete natural and unchanged natural environment [18]. Such evaluations are also used in the evaluation of the outcomes and may pick up small but extremely outstanding changes in people's conditions resulting from interventions, which structured methods would not be sensitive to.

Qualitative research methods like interviews, observations and document analysis are optimally suited to understand a phenomenon from the points of view of the participants and in its social and institutional context. Popay and William [18], argued that to understand why and how people behave within its social context [18]. It is able to answer questions what, why and how come a problem is occurring. It focuses on why new technology introduced is not working as planned [17]. Qualitative methods can also generate insights that can explain the effects of those peculiarities. Like, grasping a phenomenon like user resistance why does it exist, what does it exist of, and what are its effects. This can be done best by considering those practices closely, using interviews, and participant observations [17].

Qualitative researchers approach the world from a different perspective and set of understandings from quantitative researchers. Mainly rooted in an understanding of the social world that sees human action as being the force that creates what we perceive to the society [22]. It is grounded in a humanist which is much common to qualitative research, gives primacy to action over structure [23]. It becomes the goal of qualitative researchers therefore to try and see things from the perspective of the human actors. Qualitative research assumes that an experience near perspective, the researcher will not have the study predetermined concepts but it allows them to come from experience in the study field [18].

Additionally being neutral or an outsider in my project will give me the opportunity to be more critical or less biased in my investigation, there is a possibility of openness to what will develop [19]. Being an outsider can create some problems such as limitation to information access [19]. It is seen that it takes a lot of time to build trust with the staff. However, being an outsider enables the researcher to define his/her role fruitfully, according to Walsham, mainly insiders observe it tough to go out their role including to be drowned into certain activities throughout research involvement.

Qualitative research have different approaches; grounded theory, ethnography among others, according to Forsythe [24], Ethnography is the study of people in their own environment using methods such as participant observation and face-to face interviewing [24]. Researcher experience derives from recognizing that ethnography is an enterprise which is essentially concerned with cultured lives and with the way human utterances and field events relate to cultural wholes [16].

According to Dourish [25], Ethnography acts as a mediation point between a domain of everyday practice and a domain of technological design [25]. This means that people will encounter technology as something just as it was designed, to be incorporated into practice. Additionally, information infrastructures are regarded as a new class of information technology systems which also need to conform to a set of design requirements that are different from those of traditional information systems.

Ethnography suggests a different perspective on the creative processes whereby people put technology into practice. These are natural consequences of everyday action, not as a problem to be eliminated. The domain of technology (m-Health) and everyday experience cannot be put apart [25]. According to Aanestad and Jensen [13], technology along with m-Health should be connected or ingrained as an extension of other forms of technology to ensure

effective adoption of information infrastructure that cannot be changed instantly but should be implemented in a gradual fashion and proceed through changing sub-networks [13].

Additionally, m-Health offers the opportunity for programs to add features like text messaging for appointment reminders, booster content to reinforce education that are easy and simple for organizations, institutions and clinics to adopt [14].

According to Dourish [25], the focus of qualitative research is the ways in which practice brings technology into being [25]. From this perspective and drawing on the notions of reflexivity, it is suggested that what ethnography problematizes is not the setting of everyday practice, but the practice of design. Bansler [26] emphasized that the end users should take part in the design and implementation of information communication technology-based systems, because they possess accurate experience of the organization and the work processes. In that way they can consider the technical, social and human aspect of the system development [26].

Qualitative research describes users not as passive recipients of predefined technologies but as actors who collectively create the circumstances, contexts, and consequences of technology use. As stated, my case is interested in aspects of the ways in which people might configure, adapt, and customize technologies [25]. This focuses not on how people explicitly transform or program interactive technologies, but how those technologies take on specific social meanings through their embedding within systems of practice. Orlikowski [27] argued that individual's cognitive elements are the mental frames of indication about e.g. technology. When challenged with a new technology and its functioning one try to comprehend in terms of the present technological framework. If the technology is very different, however, the present framework might be unsuitable, and individuals will need to significantly change their frames in order to understand completely the new technology [27].

Walshman [28] argued that qualitative approaches of research start from the position that knowledge of reality, including the domain of human action, is a social construction by human actors [28]. It is concerned with the construction of meaning in social interaction [18], mainly focuses on people's meanings that attach the experiences, the relationship between knowledge, experience and action and social factors which shape the process.

Though, there are implication in the relationship between human action and communication technologies (m-Health) that neither an adoption nor an impact perspective can capture [29], where it is argued that, interrelationships between technologies and human system are

complex. In their review of the information science literature Orlikowski and Iacono [30] call this the dynamic interactions between people and technology [30]. Additionally Robson [31] argued that the only way to get the proper access needed to study people in real life settings is through proving your competence in supplying some kind of service [31]

According to Donner [29], the cultural context focuses on the usability of the mobile phone and the information systems [29]. For example, language differences create challenges for text messaging interfaces. Others suggest that different cultural conditions will lead to different attitudes toward, and or usage patterns of, technology (mobile phone) [32].

Lack of knowledge and skills about telehealth, and the absence of government policy and guidelines for the use of m-Health at hospitals, have been mentioned as major challenges to its adoption in Uganda [33]. Therefore, studies recommends designing a suitable and appropriate telemedicine framework that would lead towards adoption of sustainable telemedicine programmes in developing countries like Uganda [13]. This complies well with the goal for my case.

Information communication technology suggest reforms at the top-level institutions that shape telecommunications policy. Courtright [34] argues that established institutions like the World Bank need to account for local sociocultural and institutional conditions when designing policies and programs to encourage rural connectivity. Others call for improved analytic capacity and transparency to involve civil society in information communication technology policymaking [34]. The use of information communication technology for health is also facing cost and infrastructural challenges. Not all medical units are computerized, and this makes it hard to implement telemedicine plans as proposed in Uganda's information communication technology policy.

Karasti [35] argue that studies of information infrastructure need to conform to a set of design requirements that are different from those of traditional information systems [12]. Researchers are engaged in constructing the field through the myriad of choices they make about what aspects of the complex and extended phenomenon deserve their focus [35]. A necessary principle seen in studying infrastructure using ethnography is the obvious reflection on how the field is reflexively constructed, the implications it has in understanding of the phenomenon of study and for delineating the object of inquiry [36].

Additionally, the designation of an infrastructure is a definitive work. While studying complex, spatially and temporally extended phenomena that simply cannot be studied as

whole, awareness on how ethnographic fields are put together is important [36]. It is an existing action that all studies required whatsoever their complexity or duration. This means the study of infrastructure collaborate with the current considerations on how the ethnographic field is constructed.

Information infrastructures shape the possibilities for an ethnography of infrastructure. It takes note on the existing research both initial and current [36]. According to Hanseth and Lyytinen [36], the evolution of infrastructures “is both enabled and constrained by the installed base, that is the existing configuration of information infrastructure components”[37]. Whatever is added needs to be integrated and made compatible with the existing base. This sets up demands for horizontal and/or backwards compatibility and imposes constraints on what can be designed at any time.

Accordingly, “Information Infrastructure evolution is path dependent and shaped by neighboring infrastructures, existing information technology capabilities, user and designer learning, cognitive inertia, and so forth” [37]. The information infrastructure is highly compatible as both governments and healthcare providers direct a considerable amount of resources towards achieving fully integrated healthcare information infrastructures, where interconnected and interoperable Electronic Patient Record systems are central [13]. However, in Uganda such implementation can be slowed down by the Uganda Revenue Authority (URA) confiscating project equipment and delay releasing them [8].

The Qualitative Study

The aims of this study were best accomplished by use of a qualitative research design approach which I had planned. A systematic structure was needed, but flexibility was also needed.

This section provides in detail the methods and procedures used to accomplish the setout objectives. In choosing the specific techniques to obtain data during this investigation, I was guided by the following five criteria:

Suitability of the research objective; whether the method chosen was capable of reproducing the kinds of data needed to answer the question posed in the study by Forsythe [24]

Reliability; whether the method, if repeated by a different person at the same time, or the same person, would give the same results on a second time

Validity of the data collection methods; whether I was able to obtain measurements of what I was really trying to measure.

Representativeness of data collected; to what extent I could transcend the sample in the study to generalize about a wider population.

Administrative convenience; this involved consideration of cost, time and speed of obtaining information.

Between 13 September and 25 October 2018, a pilot study was conducted in Kasokoso surrounded by areas of Mutungo, Butabika, Kireka, Mbuya, Kirinya and Banda within Kampala central Uganda. The pilot study was intended to assess the use of mobile phone to access health care delivery in Uganda. Prior to this study, contacts via telephone were made to a health care provider who oversaw that area and who later introduced me to the local council women in charge to arrange a meeting with 10 women. This provided a useful relationship between the researcher and the interviewees. The first step in the process of conducting the study involved the development of instruments. The researcher in consultation with these women developed interview schedules designed to determine the use of mobile phone for healthcare delivery and opinions of the end users towards my study.

Research Setting for the Empirical Investigation

1. The Awareness Meeting with the Non-Users

I consulted a friend who works in the government hospital for advise on a site for an awareness group, and she introduced me to a local council woman at the community who was in charge of women's welfare in Kasokoso village, and this woman organized the meeting with the women for me. At first there were 10 women like I had asked her, but later when they had noticed that there was a snack every after each session this brought in many women in the awareness group, but I decided to have 20 women.

I used to have meetings every Tuesdays and Thursdays at around 14hours as suggested by these women, since they were all housewives. Our first meeting was on September 13, 2018 and this lasted for 30minutes, we started with a word of God then prayed, we got to know

each other, and I told them why I was there. I also asked for their consent if I could record and video them, which I would later delete after my research.

We used to meet outside at this local council woman's house, where she offered us mats to sit on and later offered something to eat.

These women explained that they experienced a strong attachment to their mobile phones with many sayings — I always carry it everywhere. They suggested some reasons that can explain this attachment such as leisure, boredom among others. An important aspect of the phone which many said contributed to this attachment is the SMS function.

I then asked them what else a mobile phone could do apart from the mentioned above, all respondents said that, if one has a smart phone It could use Facebook, viber, and WhatsApp. From here I educated them on the use of mobile phone in order to access health care and I taught them on using mobile phone to google, check anything on the internet concerning their signs and symptoms one could have (symptom checker), about reaching health professional on a phone just in case there is any problem to make life easier and the importance of using mobile phone for access for health care delivery.

When I finally asked them if they think using a mobile phone would promote better health care access in their area, all respondents said yes, because it would help them save money, not miss a doctor's appointment, save time and that they will be more knowledgeable of some cases since they can google what they do not understand and become aware of.

Observation of the Users

One of the main research methodologies in studying small groups in natural settings is observational fieldwork which can either take the form of participant or non-participant observation. Observational fieldwork can be ideal for studying social worlds in other words social worlds is everyday life being brought into being [38]. According to Parke [39] social worlds are groupings of individuals bound together by networks of communication or universes of discourse and who share perspectives on reality.

In this study, participant observation was used for data collection. This method was used to study the Improving Access to Healthcare Services with the Aid of Mobile Health between a Rural Village and a specialized in Uganda. This took place between September 13-26 of October 2018 at Kaokoso Banda. The researcher took notes on participant behavior towards

use of mobile phone and how much people wanted to know about mobile phone usage. In direct observation, I was engaged in detailed, descriptive notetaking about the specific, concrete events that I observed.

These women who were using mobile phone to access health care were observed in the hospital, some of these women were educated women and had good paying jobs, while others had jobs though not paying well, according to how they appeared, they were in a situation where by some had long lasting illness that needed to be observed and checked most of the time.

All these women that were observed owned their own mobile phone. And all of them owned a phone capable of connecting to the Internet. All these women who had phones that could connect to the Internet and they had ever used the Internet on their phones, that was observed that most of them used to be on Facebook while waiting for their doctor.

I observed that women used their mobile phones to help themselves manage their own chronic disease treatment. They were asking the cashier when they would return for checkup and set reminders and alarms, using mobile phone. Some were requesting to be reminded over the phone or send a text message to remind them to take their medication or to attend their monthly clinic appointment.

Data collection

Recording is an important issue that must be considered during the planning stage of the research [40]. Recording take place in a manner most suited to the research topic and with which the researcher is most familiar. I used two methods of recording; summarizing information on a phone and using audio recorder on another phone to capture conversations.

However, writing down information is the most common recording method but is limited especially when the information to be recorded is slow. Furthermore, taking notes may drive away in cases of observations the attention of the researcher from the scene to the paper causing them to remove part of the activities of the group. It is advised that a researcher should write down key words or phrases as a guide and should complete them after observation.

During the field work in Kasokoso, audio recording made the data gathering process much easier because writing down was impossible in some of the settings. For instance, the focus

group discussion involves so many people talking almost at the same interval which makes it difficult to write the feedback, hence recording is most appropriate. Without a table or desk to write on, audio recording was the most absolute way of getting accurate information.

Tape and audio recording make the process easier, more efficient and provide more accurate and valid recordings. It is important to emphasize that permission was sought before audio tape recording was done. At the beginning of the very first meeting session, respondents were given an overview of the research and given an explanation as to why recording was an important part of the study.

The Non-User Group

Qualitative Interviews

In depth interviews were chosen for this study. They are among the most common qualitative methods. Reason being that are very effective in giving a human face to research problems. Furthermore, conducting and participating in interviews can be a rewarding experience for both participants and interviewers. They offer opportunity to express themselves in a way ordinary life rarely affords them.

According to Kvale [41], During in-depth interviews, the person being interviewed is considered the expert and the interviewer is considered the student. The researcher is motivated by the desire to learn everything the participant can share about the study topic. Researchers engage with participants by posing questions in a neutral manner, listening attentively to participants' responses, and asking follow-up questions and analyses based on those responses.

These interviews are usually done face-to-face and involve one interviewer and one participant. When safety is an issue for the interviewer, in these situations, however, care must be taken not to intimidate the participant. Phone conversations and interviews with more than one participant also qualify as in-depth interviews, but in this study, I focus on both individual and more than one face to face participant interview.

In this study, face to face interviews were conducted with 10 respondents. Each Interview lasted between 15-20 minutes and these were conducted within the hospital settings. All the interviews were conducted in a given place in the hospital. And face to face awareness teaching and interviews took place at a local council place with 20 women.

Focus Group Discussions

The awareness meeting can be described as a focus group. Focus group discussions are discussions made of a group of people led by a moderator designed to obtain information about a chosen topic [42]. It is a key method for qualitative data collection because it is good for exploring a wide range of issue.

The method based on group discussions have elements of both participant observation and individual interviews [43]. It has recently increased in acceptance and recognition as a valuable method for qualitative data collection. The reason being it is a good method for exploring a wide range of issues [44]. Since humans are social beings, they have long been gathering together and discussing important issues in groups. It is this element of human behavior that researchers used, refined and made into a method of research.

Focus group discussions are very important for pilot studies to detect ideas that could further be investigated using other methods. This technique of interviewing participants in a group enables a researcher to attain information on trends and variances, reasons and causes through the views of respondents [44].

I conducted one focus group discussion on if mobile phone would improve access of health care delivery. The focus group comprised of the 20 participants and a moderator. The moderator who was chosen by the government Nurse was fluent in both English and Lukioli. She helped with translation of difficult concepts and issues during the sessions. The participants were chosen randomly from the community. The discussions were held in the local council where the participants live. The participants were females ages of 15-45 who are the active users of cell phones. A recording was used to capture the proceeds of the discussions and these were later transcribed into text.

The main reason of the focus group discussion is not to build agreement, but to find out what each member of the group thinks about the topic under discussion, and to obtain from each member his or her opinions and descriptions of the behavior of interest [45].

After the focus group discussions, participants responded to questions. The content of the question includes questions about basic demographic characteristics, if they could use mobile phone to access health care, access to and use of mobile phones, problems in the participant 's life, and perceptions of and attitudes towards mobile health.

The User group

I consulted the specialist doctor of Ear Nose and Throat because she had been a doctor to my son, and I had an idea that she is having mobile health services, and she allowed me to have my study in her clinic. She then introduced me to these 10 women that I had requested. The user group took place at a specialized hospital called besesuda ear nose and throat consultant bombo road in the center of Kampala. I interviewed 10 women in the clinic. I talked to these women as individuals since they all had different scheduled appointments at the clinic. Interviews used to be 20 to 30 minutes. The women were between 25 to 60 years old. The interviews were held in an informal tone without an interview guide. I used the local language to most of women and to a few in English who could not understand Luganda. I asked them:

- How long have you had a mobile phone?
- How often do you use your mobile phone for health care, or to contact health practitioners?
- Do you get messages on your mobile phones about, health related issues?
- How often do you receive messages?
- Are the messages helpful in your everyday life?
- In what way are they helpful?
- What are the messages mainly about?
- What are the problems do you face when it comes to mobile phones?
- Do you get answers to your questions whenever you call or text your health worker?
- How can you rate the mobile health services with the old traditional way of seeing a doctor or specialist?
- Can you tell other people about mode of access to health care delivery?

ANALYSIS

I will make sense of the data collected by applying the ethnographic research tradition which is a valuable starting point for consideration of the philosophical basis of interpretive case studies, since it has been widely drawn on by organizational research concerned with patterns of interpreting of symbolic action that create and maintain a sense of organization [46].

According to Golden, and Locke [47] Ethnographers develop texts by entering the field setting and converting the stream of field experiences into their written form, initially through fieldnotes and later through manuscripts, therefore I will make sense of data collected by analysis using an iterative process. Details from active involvement in the field will be transformed, translated, or represented in a written document.

I will use the constant analysis which is well suited to interpretive study design because this design is specifically used to study those human phenomena for which I assume that fundamental social processes explain something of human behavior and experience, and interpretive methods that depend on constant comparative analysis processes to develop ways of understanding human phenomena within the context in which they are experienced [48].

I will use a stakeholder analysis of both human and nonhuman interests and describe how the attempted translation of these interests into the black box of fact was not achieved due to weaknesses in the network of associations between stakeholders. This paper described in this paragraph is interesting illustrations of the application of actor network theory in research, although their laudable emphasis on explaining the technology seemed to be at the expense of explaining the social interactions in some cases.

About learning from the data, grounded theory provides a way of doing this, however to some extent, the coding is a subjective process. Therefore, I will choose the concepts to focus on. I will write impressions after each interview, whereby I will make more organized notes on issues after a field visit. That will help me think about what I have learnt in my field data [49].

Network analysis and field work have been criticized for giving interesting demonstrations of local contingencies without being able to consider the social structures which influence the course of local history [28]. However, Robson [19] argues that preventing data overload, includes enabling the researcher, for the duration of the project, to record, store and retrieve empirical data, field notes, emerging ideas, analytical memos and references whether using

word processors. Data overload with the limitations on the amount of data that can be dealt with too much to receive, process and remember. He suggests that, a deficiency of the human as analyst which can be done by information communication technology like the computer.

Chapter IV

RESULTS

Part One

The literature study of E-health in Uganda

The historical development and current situation

Healthcare in Uganda provides both possibilities and challenges for development of mobile health

The literature searches identified the historical development and current situation of e-health and use of mobile phones in Uganda. They are presented below. The material intends to describe some of the main historical developments of Uganda's health care sector, and how it may be possible to implement electronic m-Health.

In 1998, the Ministry of Health restructured Uganda's health care architecture by decentralizing it and creating a platform with four different levels. This system functions as a referral where the secondary hospitals would provide support and supervision to rural health facility units [14]. Ugandan government published the country's eHealth policy in 2013, which explained how technology could be used in Uganda's healthcare system to proceed capacity of health service delivery with support from the private sector.

Uganda's health system in level I of health care, is connected to rural areas. Most rural or remote areas are served by a village health team, these are somehow educated people with a certificate or a diploma in nursing and midwifery and the I contact for someone living in a rural area would be a community medicine distributor or a member of a village health team which is around approximately 831 across the country.

Level II consists of an outpatient clinic that has a midwife, is run by an enrolled nurse and serves several thousand people in a parish; there are around 2,941 clinics in Uganda and this should be able to treat common diseases like malaria

Health center level III is a larger region which are likely 1,289 that consists roughly of 18 staff and are likely to have 100 patients a day. Led by a senior clinical officer, who run a general outpatient clinic and a maternity ward with a functioning laboratory. It should have a senior medical officer and another doctor and a theatre for carrying out emergency operations.

The next Health Center is level IV. This operates as a sub district wide hospital which should have several specialized clinics and wards, which is around 197 institutions in Uganda. At the district level of estimated 144 levels in the country, these hospitals serve a wider region with a greater number of staff and specializations.

Healthcare system in Uganda works on a referral basis, if a level cannot handle a case, it refers the next level. Services in government (public) facilities are supposed to be free, but in many cases health workers get money from patients desperate for services. Most time departments don't have the essential drugs, this means that the patients are the ones to buy the drugs from pharmacies.

Thus the last level, which is the uppermost level of the health facility, is the Regional Referring Hospitals, which are larger institutions with comprehensive treatment of acute cases and there are only 14 of them nationwide, the entire country has two national referral hospitals.

With the background of Uganda's health system structure gives the basis for understanding how existing and potential mobile Health initiatives can be integrated within the upcoming measures of e-health. As part of the discussion on Uganda's infrastructure of health service delivery, it is important to consider the government's current strategic plan for its health care system.

The government of Uganda attempts to incorporate information communication technologies system into the health sector through several policies; The National Information Communication Technology Policy. Through the Ministry of Health, the government

embraces Information Communication technology as a tool for enhancing the quality of health care service delivery [8].

The Ministry of Health has launched a three-year Uganda shillings 4bn pilot project, entitled Information Communication Technology 4MPOWER, in the Isingiro district in the south west of the country. The aim is to see whether it is possible to tap into the rapidly growing field of "telemedicine" using mobile phones and other communication technology to support clinical services and improve referrals and health programs [50].

In Uganda, mobile phones are an effective communication tool and have been used to develop various services for the population. Mobile Money is one example of such an application. It is developed as a bank account, where you can save money, send remittances and pay services and bills through your Subscriber Identity Module (SIM) - Card. During the past years, more mobile phone applications have been developed and have been extended and used as a tool by institutions for registration and documentation.

One example is the project mTrac that was initiated by the Ministry of Health in cooperation with United Nations International Children's Emergency Fund (UNICEF) in Uganda. mTrac is the largest m-Health initiative in Uganda, with over 2,000 health facilities using mobile phones to submit weekly disease surveillance and medicine stock updates. By filling in a form and texting the combinations of the result of the form, data is transferred to a server at the ministry of health Research Center where it is stored and dealt with according to the results. These are a few examples of many successful innovations in Uganda using mobile phone technology [51].

The widespread availability of mobile communication, along with its ease of use and relatively low cost makes it a promising medium to improve health related communications in resource poor settings. Mobile phone subscriptions have increased over six-fold globally to nearly 90 per 100 people during the period 2000–2011. The most substantial increases in cell phone access have occurred in sub-Saharan Africa, where cell phone connectivity increased from approximately 5 to 70% and subscribership increased from 16 to 380 million users from 2000 to 2008. In Uganda, access increased nearly 80-fold to 38 subscribers per 100 inhabitants over the period 2000 to 2011.

Studies in resource rich areas have demonstrated efficacy of SMS text messaging to motivate an array of positive health behaviors including increased sunscreen use, smoking cessation, returning to care for sexually transmitted infection treatment, improved glucose control in

diabetics, and weight loss in obese patients. While early studies of cell phone use to improve HIV-related communication in resource limited settings have shown benefits in reducing missed clinic visits and improving medication adherence [52], more such studies are needed.

Applications of cell phone service in disease prevention efforts have focused on health promotion in general, for instance the study focusing on HIV medication. More qualitative and descriptive work has been published on the use of cell phones for prevention of HIV and other sexually transmitted infections. These include programs to improve communication between patients and clinics, to improve medication adherence and to facilitate contact or partner tracing.

Reports on cell phone initiatives in Uganda include detail on Text To Change (TTC), a mobile phone initiative launched in 2008 to increase access to HIV testing. Although this program has not been evaluated in a controlled trial, program evaluation data indicate that of 15 000 users of Zain, which is one of three mobile providers in Mbarara, Uganda, invited to participate in an SMS HIV prevention program, 16% agreed, and subsequently registered to receive daily text messages [8, 14].

In Uganda, mobile technology could offer a great benefit since health care is one of its fundamental needs. Health challenges include both the diseases themselves and supporting facilities in terms of human resource and physical infrastructure. For example, HIV/AIDS, Malaria, Cholera, typhoid, and yellow fever are reported to kill many people in Africa each year. According to the 2006 World Health Organization 70% of all those infected with HIV/AIDS are in Sub-Saharan Africa. Shortage of health personnel is another key problem in Africa that the use of m-Health technology could address. Most doctors are in urban areas and very few of these are specialists. With mobile technology it is possible for both health providers and patients to establish a people's access to care [8].

The history of mobile phones and mobile phones in health care in Uganda

The use of mobile phones in Uganda has increased quickly from 1% in 2000 to 48% in 2012 [53]. Mobile phones are perceived as successful tools of communication and they have been used to develop services for the community. An example of such an application is Mobile Money. It was developed as a bank account, where people use to save money, send remittances and pay services and bills.

In Uganda in the past years more mobile phone applications have been developed and has been extended and used as a tool by institutions for registration and documentation. One example is the project mTrac that was initiated by the Ministry of Health in cooperation with United Nations International Children's Emergency Fund (UNICEF). mTrac is the largest mHealth initiative in Uganda, with over 2,000 health facilities using mobile phones to submit weekly disease surveillance and medicine stock updates. By filling in a form and texting the combinations of the result 6 of the form, data is transferred to a server at the ministry of health Research Center where it is stored and dealt with according to the results. These are a few examples of many successful mHealth innovations in Uganda [54].

Another good example of mobile phone application in Uganda was developed with respect to disseminating health education material [55]. This was done in 2009 that focused on a Text to Change Project in the Aura district of Uganda. This was done as a mobile Health campaign using SMS as a platform to spread and evaluate HIV/AIDS knowledge, and to promote HIV/AIDS testing at clinics in rural Uganda. This Text to Change HIV/AIDS education campaign was intended to increase knowledge about HIV/AIDS, awareness about the regional clinic and testing centers, and HIV testing behaviors. Similarly the Uganda National Drug Authority developed an SMS-based platform (U-reporting) that is used to generate the national procurement and supply management plan [56].

Some of ways of how of Text to Change programs used: -

- Interactive and incentive-based quizzes to educate, engage and empower people on wellbeing related issues
- Programs that use mobile phones for Health Management Information System purposes
- Data collection surveys via app and SMS
- Personalized medicine reminder programs

- Price information systems for farmers

Makerere University students in Computer and Information Technology in Uganda invented a hand-held pregnancy scan-like machine called WinSenga. The machine, which consists of a funnel-like pinnard horn like the one used by midwives, can be used to scan a pregnant woman's womb or detect problems such as ectopic pregnancy or abnormal fetal heart beats by connecting it to a smart phone that is pressed against the abdomen of the pregnant woman, that is then displays the condition of the baby in the womb.

Results Part Two

1. The Observational Study and interviews of the Non-Users

A total of 20 women participated in the awareness group on improving access to health care with use of mobile phone. The respondents primarily consist of young adults. 96 percent of the respondents are between 18 and 30 years and 4 percent are between 31 and 45 years. One person was below 18 years and one person between 46 and 60 years. The minimum educational level obtained or enrolled in by the respondents is tertiary. And all were housewives who were not allowed to work.

All the respondents owned at least one mobile phone. Most of them had recently acquired their mobile phones within the last five years. When I asked them the use of Mobile phones, it seemed to be treated as a personal device. Concerning mobile phone use practices when I asked them, the only use their mobile phones calling, sending messages and mobile money transfers to their family and friends. Some respondents shared that "use of mobile phone is an easy way to communicate with friends and family, and the mobile phone makes life more convenient". They also used mobile phone for calculator, the alarm clock, picture messaging, and voice mail.

The awareness meeting

I will structure the results according to the hypotheses stated after the research questions.

Hypothesis 2: The awareness meeting will inform non-users of the possibilities in using a mobile phone for health purposes

The awareness meeting was conducted over a period of two months (September-October 2018).

In this meeting I planned to ask the participants about themselves and their encounter of healthcare and then focused on what they used mobile phones for, specifically in relation to healthcare delivery. For instance, questions for women in the awareness meeting were:

- Is it possible to give me examples of when do you use your phone?
- Are there times when you do not have airtime?
- Do you know any other use of your mobile phone?
- Tell me about your experiences of using the Internet.
- Do you need help using your mobile phone?
- Do you know that a mobile phone could be used for health-related purpose?

All the 20 women owned their mobile phone but none of them owned a phone capable of connecting to the Internet, as opposed to basic phones with limited functions. None of the patients owned a touchscreen smartphone.

All women explained that they merely could not afford to regularly buy airtime for making calls, and yet they were not working, often they could be saving from some little money that is given by their husbands for food which at times helps with their problems, but they only buy airtime to call their relatives.

'Yes, it [airtime] is very important and I need it but it's just that I don't have money this was the answer from all the women.'

All women reported that a phone can be used for social media, but they could not because they did not have a smart phone to access that. All women reported that they did not make use of the Internet, but they knew it is existence and use. For most of them, web literacy levels were either non-existent or very rudimentary.

All women suggested that if given a chance to use a mobile phone to access health care in their area would improve their health and that of their family.

But all the meeting, these women were suggesting that unless I provided them with smart phones and maybe once in two weeks airtime on their phones, they could search on the internet all issues about their health. Another suggestion was that I could start up an internet computer cafe in order to go and search, otherwise it will still be hard for them to use internet.

They also said that maybe they would have gone with the ideas of calling and sending messages but still the difficulty of airtime makes it worse since all were housewives and their husbands had refused them to work.

These women described how they were becoming more informed and aware of using mobile phones to actively seek relevant information.

All these women said *they use my phone to research about any disease, the kind of food are you supposed to eat, what you're supposed to do and how to prevent it and stay healthy all the time.*

They spoke about how she shared information with others who were pregnant on what to eat, prenatal visits among others, and they said if they could form a group on Facebook, it would be important because we would be learning new ideas with different women [on the phone]. They also suggested that maybe they could share with other people who are unable to go to Internet, plus saving time of moving from place to another.

They all said, that since I told them about the information online is in English, they would be unsure of where to search for the information they required. They talked about their inability to read or understand websites written in English. They prefer LUO because it's their mother tongue and there are other words that they will not understand if it is in English.

They loved the idea of Phone call and text message reminders in healthcare. They said some of us forget the immunizations dates for children, return for checkup or forget when to go back for injectables since many of them were doing it out of their husbands' awareness.

Hypothesis 3: Non-users will help provide informed knowledge about what kinds of health problems that can be met by using a mobile phone as well as challenges

They said that one can go to a hospital to see a doctor and come back without seeing him/ her, this is because several health personnel are needed at a variety of phases of treatment method programs.

They said Mobile phones for access to health care will be used to inform, support and empower community women because community women with mobile phones can be used to deliver health messages like, reminding them to go back for prenatal care, family planning, immunization of children and reminding them for those with HIV/AIDS to go back and get medicine and checkup among others, provide emergency medical assistance, decision support and referral to providers and services.

The women mentioned that during their hospital visits, they could barely be able only to see a doctor which made their expenses so high since they had to go back early since they serve those that came early. With mobile phones they could reduce the travel time and allow them to access doctors with services since it will be scheduled. They all said that, we think this will be a good idea. It will save time and money. Especially since the referred hospitals are far, you need to spend once knowing that one will be able see a doctor, which will result in both money and time be saved if we can call.

These women also mentioned that according to what they have learnt, mobile phones could be used to aid in chronic disease management. Whereby the hospital together with the nurse will oversee the patient's health by checking on them and that is sensors could be deployed like it was taught in the houses of those terminally ill people.

They said if you have a problem like some signs and symptoms that had stayed long, we will call our doctor set up an appointment.

They said mobile phones can be used as symptom checkers. Whereby they will access some sites used by doctors or health worker. They said it will help them research and find out possible causes of their symptoms. They said, if they get knowledge of finding out the possible cause of their health problem, they can seriously hurry for consultation.

They said that mobile phone could help by constant reminding them to take their medications, monitor any side effects of treatment, such advances will be increasingly beneficial for patient safety.

They said that they learnt if one has a smartphone could gather recordings of a one's heartbeat and sending this information over to a doctor for further assessment.

They said mobile phone could be used as a patient-monitoring device. Used by health care workers in treating malaria and for better follow-up, medication adherence, and collection of information.

They also reported that, according to what they learnt from our group discussion, they learnt that if one has a smartphone, it can be used to record heart sounds for tracking heart rate and heart rate variability. Moreover, the smartphone is being used for echocardiography.

They also said that one can use a mobile phone for weight loss and fitness. by providing a way for people to keep track of how many calories they consume and burn for better control of their weight loss goals.

The Challenges of Using Mobile Phones for Health Purposes According to Non-Users

Women said that the cost of mobile phones especially smart phones that support numerous health applications and tools they said that is quite high for an average Ugandan to afford especially for those non-working housewives. This is an important finding. It depicts some of the challenges within the installed base.

Constant power cuts and inaccessibility to electricity in remote area also hinders the use of mobile health as mobile phones need to be charged in order to work. This is also an element in the installed base.

Most women in this community are illiterate and may not be able to read and comprehend the text messages sent to their mobile phone.

These women said that most of the information available on the internet is in English or in languages that hard for them to read and understand. Important part of the installed base.

The location where I collected data was far from where I stayed which consumed a lot time and transport to the place.

Participants' literacy and language, it took much time for this local council women to translate for these women in their local language.

The number of women kept on increasing since I decided to give them something to eat after a every meeting.

I was told a lot of problems that were not under my study like having a meeting with their husbands educating them that women should not stay at home but work. This is an installed cultural or social part of the conditions for use. These women asked a lot of questions on topics outside my topic.

There is lack of awareness of what many mobile applications and devices can do, or as a majority of these women said they lack money to buy smart phones which could be more of use just the way I educated them on what mobile phone could do to improve the access to health care.

2. The interviews with the users

The interviews were conducted to respond to hypothesis 4:

Hypothesis 4: Users will experience several areas of improvement as well as challenges

Improvements from Using a Mobile Phone

They said these doctors usually send them text message about scheduling or rescheduling of appointments, reminding them on buying the drugs or asking if they bought and taking it.

They said it makes the management among their doctors and these women using mobile phones excellent. It promotes good communication between them and greater access.

They said mobile phone has improved the most basic important side of the healthcare service, by interacting with their doctors, they said that mobile healthcare has helped in remote caring and monitoring. Especially those with high blood pressure will just call and tell the doctor the changes they are feeling.

They said that mobile phone messaging has improved observation to antiretroviral therapy with those living with HIV, it helps in monitoring how they are doing if they are taking the medication, sending them hopeful messages hence reduce stress or depression.

Many women said that before they used to receive many medicine instructions on paper from the hospital that was hard for them to remember or even read. However, with the coming of mobile phone technology, it has helped them by freely calling or sending messages if they feel like they are missing the information they received while in the hospital.

They said mobile phone technology has increased their health information access, they usually go online to check for some signs and symptoms that they develop, and sometimes they usually check for side effects of the medicine that is being given to them before taking.

These women discussed setting reminders and alarms, using the phone's clock and asking friends or family members to phone or send a text message to remind them to take their medication or to attend their monthly clinic appointment.

Some women reported initial motivation towards receiving the calls because they believed that their own reminder system already worked for them three women described how the phone call motivated them to continue with their treatment.

Various women that were interviewed had an experience of gathering information on their disease through their mobile phone by communicating with other fellow women that have the same kind of disease, like getting to know each other on social media such as WhatsApp and Facebook which helps them to discuss on issues concerning their disease hence helping them to deal with it.

Several women said that since they started using the mobile phone, it has provided control of close monitoring which was at once only accessible to those privileged enough to afford constant care. This was mainly with women who had long term diseases.

The poor information communication technology infrastructure status in Uganda is unable to adequately support the potential benefits of information communication technology like mobile phone in the health sector and the community.

I observed the cost of accessing the internet, and as well as buying airtime even to send messages was a problem to the house wives, maintaining the equipment and buying new ones is also a challenge.

Challenges for the users

They argued that most of the information available on the internet is in English or in languages not accessible to the wider segments of the population.

There is electricity instability and these causes on and off disturbance of using the electronic gadgets.

Among those who had access to mobile phones and used them, the usage was limited to voice calls. Some women mentioned that they call health workers for appointments. And still some other women said they used mobile phone to call the responsible person in the health facilities to find out whether the facility is open or closed.

During my observation, these women only wanted direct calls because they were busy with work and don't have interest in reading and replying the messages.

Chapter V

DISCUSSION

The discussion is addressing the 5th hypothesis of the thesis.

Hypothesis 5 The investigation will provide new knowledge of conditions and challenges that should be addressed in order to further implement services.

There are many factors that must be in place for the information infrastructure like mobile health systems to be successful [16]. The community and the health care giver's collaboration is at the midpoint of most e-health and before new technology can become fully confirmed within health care systems delivery, one must understand, describe and design many arguments that surround this network[57]. Challenges that one must be confronted with as these mobile health systems deliveries develop into place increase.

According to World health organization, Uganda is believed to provide just a single physician service available for each 25,725 person [58]. This implies that most of the general population may not easily access the much-needed basic health care. Additionally, it can be truly interesting concept of integrating mobile health which could improve for the entire people's appointment so that they do not have to miss any doctor's consultation. This proves very well with what the women said *if one can go to hospital to see a doctor and come back without seeing him/ her, this is because several health personnel are needed at a variety of phases of treatment method programs.*

My findings agree with the technology-augmented Capability Approach [59] In the settings of poor and remote rural villages with the demanding healthcare access, mobile phones are the objective solution to improve service access. Phones are technical objects that enable change in care seeking and care providing practices, leading to increased capability[60] for instance, people can find health information that they can use to improve health. In this study mobile phones showed importance to many of the participants , the privilege to use their creativity, which in turn could lead to an increased capability of gaining or providing effective access to healthcare [61] although, social factors also influence the usability of mobile phones for healthcare, and this can shape communication patterns[60].

In my study, these women were unable to harness the use of mobile phones because they had few ideas of using mobile phone to access health care and those who were using were unable to equip that much the use of mobile phones because of lack of digital awareness. However, a few of these women who had confidential use of mobile phones were extra active in using digital channels for gaining health information.

In my study data suggest that infrastructure factors such as poor electricity, limited internet use, lack of stable mobile health usage stagnate or influence the use of mobile phones. In the context of this study, a key influencing infrastructural issue cost challenges; Not all medical units are computerized, and this makes it hard to implement telemedicine plans as proposed in Uganda's information communication technology policy. This makes some different infrastructures, like Installed base cultivation and gateways compressed [10]. This is because networks can only be changed in a process where smaller parts, sub-networks, are replaced by new ones while at the same time the new sub-network works together with the larger network.

In my study data showed that most women preferred phone calls and message reminders because they tend to forget. According to Guy R [62], Phone call and text message reminders in healthcare have been shown to increase the likelihood of attending clinic appointments [62]. Especially in the Ugandan setting, digital communication can create social relationships [63], between that of the health worker and the patient in low-resourced villages [64]. This relationship could contribute to improved understanding and harmony with the treatment [65].

Less educated and poverty stricken communities have been shown to have less access to health information on the Web, than those with more wealth and with a higher education level [66]. Lack of skills to search online and the untrustworthy health information on the Web also reduces access [66]. In my study, these women had a stumbling block of smart phones and low computer literacy and lacked web searching strategies. Additionally, Neter [67], said that people who use their phones to find health information on the Web require a level of (self-taught) web literacy [67]. Lack of experience with reading website content can lead to irrelevant information [68]. However, some studies show that mistrust of websites is common [69]. I did not find this in my study, this could be because respondents in my study did not have enough experience of websites to develop any mistrust.

According to Hanseth and Lyytinen [10] as cited by Camilla Bjørnstad, Bente Christensen, and Gunnar Ellingsen [70] in their Medication, integrations and practice research, information infrastructures imply that new technology is never built from scratch, it always builds on and

extends the installed base. In that way, it is possible to keep the original user base relatively intact while new users are attracted to the installed base by adding new functionality to it as stated. My case emphasizes that the present procedures perform a fundamental aspect in the decision held in the design. One cannot decide willingly but must rely upon the present framework and its advantages while designing the new mobile health system.

However, in my case it is marred with persistent on and off electricity, low or loss of internet connectivity and the presence of incompetent health staff that burden its acceptance.

Regardless of the present challenges, maintainable mobile health programmes could be implemented in Uganda. This is because Uganda has implemented 3G and 4G broadband internet services to raise internet penetration [71]. On the other hand, the capability of 3G and 4G services cannot reach the most rural areas as the people are too poor to self-support it. 3G and 4G was first launched by Smile Communication network in Uganda back in 2012. Which later followed by MTN with its own 4G network about April 2013, then followed by Orange network and later Africell network in July 2013 [72].

Orlikowski [73] argued that individuals cognitive elements are the mental frames of indication about the technology, work among others. When challenged with a new technology and its functioning one try to comprehend it in terms of the present technological framework. Generally enclashing these frames to contain distinct aspects of the technology. If the technology is different enough, nonetheless, these present framework might be unsuitable, and individuals will need to importantly change their frames in order to understand completely the new technology[73].

According to Uganda's 2013 national e-Health policy, most e-Health applications and products have been run in silos and are not interoperable or compatible, preventing sharing of information and services. Several technology innovations have remained as pilots for life as they are not interoperable because of divergent platforms. As in other developing countries, such e-Health initiatives are donor funded and often remain a proof-of-concept wherein technology is demonstrated within a limited context [74].

According to Monteiro E, Hanseth 1996, there should be attention to development strategies suitable for information infrastructures. These strategies do not deal with scaling but address issues such as the role of government intervention and industrial consortia [75]. Additionally, The information infrastructure is highly compatible as both governments and healthcare providers direct a considerable amount of resources towards achieving fully integrated

healthcare information infrastructures, where interconnected and interoperable Electronic Patient Record systems are central [13]. However, such implementation can be slowed down by the Uganda Revenue Authority (URA), could confiscate project equipment and delay releasing them [8].

Infrastructures are ecologies or complex adaptive systems, they consist of numerous systems, each with unique origins and goals, which are made to interoperate by means of standards, socket layers, social practices, norms, and individual behaviors that smooth out the connections among them. This adaptive process is continuous, as individual elements change and new ones are introduced [16].

Aanestad, M. and Jensen state that all technology along with mobile health should be connected or ingrained as an extension of other forms of technology to ensure effective adoption of information infrastructure that cannot be changed instantly but should be implemented in a gradual fashion and proceed through changing sub-networks [13]. additionally, mobile health offers the promising for programs to add features like text messaging for appointment reminders, booster content to reinforce education that are easy and simple for organizations, institutions and clinics to adopt [14].

It is mainly assumed that demand for service and stakeholders need something pre-existing and it can be recognized in advance. This contradicts the notion of innovation, how can stakeholders have prior need of something that does not exist? This is supported by my findings, because mobile phones for healthcare is being implemented for the first time [10]. For a country like Uganda, daily use of a mobile phones is not new, however, its convinced that people may not be aware of this information communication technology and that makes it hard for people to ask for such or contribute in the design of what they are not conversant of.

According to Hirschheim [76] obtaining the spread justified might be a task. If the group is too big (large) could cause coordination impediment and disturbance, while if a group is too small could be biased to the users [76]. Additionally integrating user centered design activities throughout the circuiting of interactive computer based system could achieve usability as a user centered design is a multi-disciplinary activity [70]. However this could be a hard way since mobile health application is new to the people.

Bansler [77] emphasized that the end users should take part in the design and implementation of information communication technology based systems, because the possess accurate

experience of the organization and the work processes. In that they can consider the technical aspect, the social and human aspect of the system development [77].

Challenges of the existing information infrastructure and the external conditions

Lack of knowledge and skills about telehealth, and the absence of government policy and guidelines for the use of mobile health at hospitals, have been mentioned as major challenges to its adoption in Uganda [33]. Therefore, studies recommend designing a suitable and appropriate telemedicine framework that would lead towards adoption of sustainable telemedicine programmes in developing countries like Uganda [13]. This complies well with the goal for my case.

The participation of the government, via the Ministry of Health, is a fundamental aspect for success of mHealth projects. Failure may happen when there is a lack of integration into the healthcare system and, particularly, when there are unclear roles and responsibilities at the various hierarchical levels (government to managers to health workers) involved in implementation and operation. For example, mHealth outcomes are highly dependent on clinical training, practice and experience of health workers. If they are non-existent or provided by the government actors, the project is unlikely to achieve its expected goals.

The major challenge for implementation of mobile Health projects is the coverage and accessibility of the technologies. mHealth is highly dependent on infrastructure availability in the area where the project is being deployed, hence a reliable network, internet and electricity access are prerequisites. Access to mobile phones in Africa is extensive, but not necessarily reliable. Moreover, the technical or expert knowledge for maintenance and development of platforms (software and hardware) may be limited or not available locally, and when available, the lack of expertise may slowdown implementation as technical training will normally be required

The capacity of mHealth projects is defined by the capacity of the technology itself. There are for instance, only a limited number of characters that can be sent using text message, thus limiting the application of these projects to specific types of interventions. Thus, the use other technologies to replicate or imitate the same mHealth project may not result in similar outcomes. Other technology-related problems are poor data quality and transfer , network

loses, phone maintenance costs, risk of theft and loss , poor handling and use, a lack of software flexibility and adaptability, and risk of human errors in the program [78].

Although information communication technology like mobile health, is showing the capacity to be greatly important for the health sector of a developing country like Uganda, its success is sometimes impaired by challenges and contradictions. This includes the workable condition and costs of equipment, level of awareness and skills of the potential users, technology compatibility and policy provisions amongst others [8].

Lack of knowledge, awareness, perceived poor quality of services, lack of confidentiality and especially perceived poor attitude of health workers are barriers to access to health on the demand side. Thus, any attempts to improve access would need to address the barriers on both demand and supply sides. Uganda has made institutional steps toward ensuring that quality health services are available to all people. However, to consistently improve and maintain quality, the need for introducing mobile health to providers in clinical management skills and regular supportive supervision cannot be underestimated [5].

Village health workers and health team members are not to using mobile health service in this way will have to receive serious and consistent training to make this work. Telemedicine relies not only on mobile phones, but on databases, local area networks and internet connection. The health centers don't even have a regular power supply to keep their vaccine fridges cold. And putting the systems in place is one thing but getting people to use them is another.

The use of information communication technology for health in also faces cost and infrastructural challenges. Not all medical units are computerized, and this makes it hard to implement telemedicine plans as proposed in Uganda's information communication technology policy. This makes some different infrastructure, like Installed base cultivation and gateways compressed [10].

According to Hanseth [79] information infrastructure is that new technology is never built from scratch, it always builds on and extends the installed base. Pironti states that all of the people, processes, procedures, tools, facilities, and technology supports the creation, use, transport, storage, and destruction of information [80].

Lastly in Uganda most of the information on the internet is in English. The capability writes and read sometimes makes the entire process difficult. There is need to implement convenient education, adequate communication and awareness to the people in the language they understand, and, in a way, they are recognizable with.it is very important that the health practitioner speak or upload information that people are well constant with.

Chapter VI

CONCLUSION

In this thesis, I have investigated 5 hypotheses in order to respond to the research questions. To conclude, I will provide short summaries according to the research questions.

1. What are the conditions for the development of mobile health in Uganda?
 - a) What characterizes the information infrastructure?
 - b) How do non-users consider use of mobile phones for health purposes in a rural village in Uganda?
 - c) What do users' value about use?
2. How do the installed information infrastructure and non-users' and users' accounts align to provide current opportunities for use of mobile health?

Hypotheses

1. Healthcare in Uganda provides both possibilities and challenges for development of mobile health.
2. The awareness meeting will inform non-users of the possibilities in using a mobile phone for health purposes.
3. Non-users will help provide informed knowledge about what kinds of health problems that can be met by using a mobile phone, as well as limitations.
4. Users will experience several areas of improvement as well as challenges.
5. The investigation will provide new knowledge of conditions and challenges that should be addressed in order to further implement services.

The Possibilities of Improving Access to Healthcare Services with the Aid of Mobile Health in Uganda

1. What are the conditions for the development of mobile health in Uganda?

The installed infrastructural conditions and the non-users' attitudes and conditions

Mobile phone technology has outstanding possibilities for positive impact on access to healthcare in Uganda. Mobile infrastructure has stumbling block on land-based telecommunication infrastructure in much of the region of Uganda, and mobile penetration is now high, even in low-income remote areas. In rural areas, where people consistency is lowest, access to healthcare personnel is often limited and mobile Health offers potential solutions for maximizing access to healthcare impact and efficiency.

Locality of mobile Health where it is most promised, has been shown to date are in medication adherence and healthcare worker communication. The evidence, however, is not yet enough to warrant large-scale investment and policy change. The use of mobile Health in spreading health education unremarkably has been much less successful mostly due to lack of enough penetration to the most vulnerable groups of people.

Other issues of access are not so evident in other applications of mobile Health such as medication adherence. Internet-based applications in Uganda within the range of eHealth remain generally unattainable in much of Uganda due to lack of infrastructure as well as matters with familiarity and usability.

Costs and infrastructure remain the primary barriers to the adoption and implementation of mobile Health in Uganda, the speedy development of market-driven telecom infrastructure in the region could overcome this difficulty soon. Similarly, challenges emerging from lack of cultural familiarity with wireless technology are vanishing with the introduction of cell phone access even in the most remote areas of Uganda. Additionally, the rise of 3G access and smart phones could facilitate more complex mobile Health and eHealth applications even in the village areas where traditional access to the Internet has been cost restraining.

The degree to which the health sector of any country is computerized and the range of use of other information communication technology like mobile phone is telling the length to which mobile phone benefits can be appreciated in health care. An evaluation of this predict that Uganda needs to do more to benefit from the benefits of information communication

technology like mobile phone among others for health. Mobile phones could offer many opportunities, efforts have to be made in order to systematically harness the underlying potentials and opportunities. These are much needed to be used to improve access to health care delivery and several medical challenges and diseases.

The only possible way is to keep the original user base relatively intact while new users are attracted to the installed base by adding new functionality to it. As stated, my case emphasized that the present procedure performs a fundamental aspect in the decision held in the design. One cannot decide willingly but must rely upon the present framework and its advantages while designing the new mobile health system. However, in my case it is marred with persistent on and off electricity, low or loss of internet connectivity and the presence of incompetent health staff that burden its acceptance.

Regardless of the present challenges, maintainable mobile health programmes could be implemented in Uganda. This is because Uganda has implemented 3G and 4G broadband internet services to raise internet penetration [71]. On the other hand, the capability of 3G and 4G services cannot reach the most rural areas as the people are too poor to self-support it. Additionally, Telemedicine not only relies on mobile phones, but on databases, local area networks and internet connection.

Most of the health centers in Uganda don't even have a regular power supply to keep their vaccine fridges cold. And putting the systems in place is one thing. According to Uganda's 2013 national e-Health policy most e-Health applications and products have been run in silos and are not compatible, preventing sharing of information and services. Several technology innovations have remained as pilot study for life as they are not interoperable because of divergent platforms. As in other developing countries, such e-Health initiatives are donor funded and often remain a proof-of-concept wherein technology is demonstrated within a limited context [74].

Most of non-users expressed interest in receiving medication adherence reminders. Since most of them Forget when to go back for their children's vaccination, this barrier can be minimized with the use of reminders. They said since medication reminders can be sent via mobile phones. These women showed interest of appointment reminders. Reviews indicate appointment reminders via SMS improve attendance in primary care clinics, family planning clinics [81]. A study from rural Haryana, reported using mobile phones to obtain appointments for outpatient visits [82].

What do users' value about use?

Since the respondents in my study were women with access to mobile phones. In the Ugandan context, women are mainly responsible for the health and hygiene in their family. Women are involved in cooking, cleaning and caring for children and elderly in their households, the existing experience with caregiving within families may have resulted in women preferring much frequent adherence reminders in my study. Since these women were also less likely to be employed making their schedules more flexible and conducive to ensuring better medication adherence.

My findings that women communicated directly with their doctor in the management of an acute illness may indicate that they had lesser knowledge about health issues and needed assistance. My findings indicate that mobile phones may serve to enable women to actively participate not only in their own healthcare and but also that of their families.

My study sought to answer the question of whether mobile phones would improve access to health care delivery in the villages of Uganda, my findings have generally showed that use of mobile phone for health care would improve access to health care delivery and may even direct future endeavor's in this area.

Mobile phone interventions such as reminders and information disseminating applications showed much interest in my study. Voice call was the preferred mode of communication in my study and needs to be considered considering the popularity of SMSs globally. Although factors like English literacy, education, employment status of the user would only serve to improve the efficacy of mobile health. Healthcare communication directed at women via mobile phones, could empower them with the necessary knowledge to promote not only their own health but also the health of their families.

2. How do the installed information infrastructure align with non-users and users accounts to provide current opportunities use of mobile health?

The installed base is an essential part of an information infrastructure, which is always built on or extended from its existing base. The installed base can be understood as a heterogeneous network of technical, organizational, legal, financial, and human components and also as the accrued continuous practices and technologies that are

institutionalized in the organization [83]. Therefore, the entire infrastructure cannot be immediately changed; however, new components can be integrated with the old.

According to Hanseth the overall evolution of infrastructures is both enabled and constrained by the installed base, that is the existing configuration of mobile phone, whatever is added needs to be integrated and made compatible with the existing base. This sets up demands for backwards compatibility and imposes constraints on what can be designed at any time. Accordingly, mobile phone evolution is path dependent and shaped by neighboring infrastructures, existing information technology capabilities.

The installed base is an important factor of an information infrastructure, which is consistently created on or emerge from its existing base.

My case shows that making gradual, user transformation through small groups of users and building organizational networks are one way by which to overcome the barriers related with existing technical and institutional structures, the influencing installed base. It states that new organizational structures supported by new technical components should seek to benefit from an existing but adequate installed base. This may then trigger gradual changes in parts of the existing organizational structure and make possible to build links between the old and new information infrastructures. With the assessment of my study indicates that Uganda needs to do more to benefit from Information Communication Technology like mobile phones for health. While mobile phone for health offer a variety of opportunities, efforts must be made in order to systematically harness the underlying potentials and opportunities.

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Appendix 1 - The interview guide for the user group

Questionnaire for the mobile phone user group.

How long have you had a mobile phone?

How often do you use your mobile phone for health care or to contact health practitioner?

Do you get messages on your mobile phones about, health related issues?

How often do you receive messages?

Are the messages helpful in your everyday life? In what way are they helpful?

What are the messages mainly about? What are the problems do you face when it comes to mobile phones?

Do you get answers to your questions whenever you call or text your health worker?

How can you rate the mobile health services with the old traditional way of seeing a doctor or specialist?

Can you tell other people about mode of access to health care delivery?

Appendix 2 – The awareness group

Questionnaire for the awareness meeting group.

What is the use of Mobile phones?

What are mobile phone use practices do you know?

what else a mobile phone could do apart from the mentioned above?

Do you think using a mobile phone would promote better health care access in their area?