

UNIVERSITY OF NAIROBI

**TOWARDS A MODEL FOR MOBILE PHONE TECHNOLOGY ADOPTION
IN REPRODUCTIVE HEALTH IN KENYA - A CASE OF MOBILE FOR
REPRODUCTIVE HEALTH (M4RH)**

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**A research project submitted in partial fulfillment of the requirement for the
award of Master of Business Administration (MBA) degree, School of Business,
University Of Nairobi**

DECLARATION

This management Research Project is my original work and has not been presented for a degree in any other University.

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ABSTRACT

This study set out to create a model of mobile phone technology adoption in Reproductive Health in Kenya, by exploring the factors that influence mobile technology adoption in Reproductive Health Care and the relationships that exist among those factors. The grounded theory' methodology was used to guide the data collection, analysis and eventual theory generation while factoring in the unique circumstances surrounding the Reproductive Health Care and the dynamics of mobile technology adoption in a developing country. By carrying out in depth interviews with a mix of policy makers, Reproductive Health professionals, service providers, users and mobile technology experts, the study established recurring themes of cost, technology complexity, privacy needs, infrastructure management, social and cultural influences on technology adoption. By discovering the complex relationship that exists among these factors, the study established that the ultimate contribution of mobile phone technology adoption is the change in behavior of the general population as a result of receiving the correct information regarding RH. The resulting mobile phone technology adoption model was further informed by the experiences of the Mobile for Reproductive Health (M4RH), the case study.

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LIST OF ABBREVIATIONS

AIDS	Acquired Immuno-Deficiency Syndrome
DOI	Diffusion of Innovations
DRH	Division of Reproductive Health
GSM	Global System for Mobile Communications
HIS	Health Information System
HIV	Human Immunodeficiency Virus
ICT	Information Communication and Technology
ICPD	Program of Action of the International Conference on Population and Development
IT	Information Technology
ITU	International Telecommunications Union
KDHS	Kenya Demographic and Health Survey
MDGs	Millennium Development Goals
M4RH	Mobile for Reproductive Health
MOH	Ministry of Health
NGO	Non Governmental Organization
RHC	Reproductive Health Care
RH	Reproductive Health
STI	Sexually Transmitted Infection
TRA	Theory of Reasoned Action
TAM	Technology Acceptance Model
UTAUT	Unified Theory of Acceptance and Use of Technology
USAID	United States Agency for International Development
UN	United Nations
UNDP	United Nations Development Program
WHO	World Health Organization
WSIS	World Summit on the Information Society

I. CHAPTER ONE: INTRODUCTION

1.1. Background

Mobile technology is a collective term used to describe technology that is portable comprising mobile devices, the mobile telecommunications networks, platforms for development and deployment of enabling technologies, mobile applications, mobile location technologies, and content delivery formats. The most identifiable components of mobile technologies are the artifacts which include; laptop and note book computers, palmtop computers or personal digital assistants (PDAs), mobile phones and 'smart phones', global positioning system (GPS) devices, wireless debit/credit card payment terminals. These artifacts are enabled by various communications technologies such as; wireless fidelity (WiFi), Bluetooth, data networking services for mobile phones such as third generation (3G), global system for mobile communications (GSM), general packet radio service (GPRS), Universal Mobile Telecommunications System (UMTS), Short Message Service (SMS), Wireless Application Protocol (WAP), Global Positioning System (GPS), extensible Markup Language (XML), and Wireless Markup Language (WML).

The adoption of the various mobile technologies has grown in the recent years, including in the field of health. The World Summit on Information Society (WSIS) held in Tunis in 2005 noted that Information and Communication Technologies (ICT) have an immense impact on virtually all aspects of lives (WSIS Forum. 2005). In 2011, the WSIS met in Geneva and one of the line action lines was to review the progress and challenges of e-Health six years after the WSIS Tunis recommendations. The stakeholders in the WSIS acknowledged that the health sector is one key area of life to which the rapid growth of ICTs offers chances to improve efficiency and effectiveness in service delivery. In particular, the sector can benefit from the capacity of ICTs to reduce existing obstacles, especially those of time and distance. Within ICTs, portable technology through the use of mobile devices is by far the fastest growing segment further extending the benefits of ICTs to populations that are locked out of other technologies due to factors such as lack of infrastructure and electricity. (WSIS Forum. 2011)

1.2. ICTsin Healthcare

Healthcare provision forms a substantial sector of any economy and some of the healthcare challenges common to many developing nations include increasing survival statistics, ensuring diseases such as malaria and TB are eradicated, making information universally available on how to prevent the spread of HIV, providing healthcare and health information to people in difficult-to-reach rural areas and to provide education on pre-natal and post-natal care (WHO, 2011). Just as the challenges are common, so are the barriers to addressing them. Challenges such as poor government investments in healthcare; shortage of hospitals and well trained health personnel; scarcity of drugs and equipment; prohibitive cost of healthcare services; poor infrastructure; and lack of accurate information on health related topics are just some of the issues that governments and populations in developing countries have to deal with. In a bid to address these challenges, the role that ICTs can play has been explored and tried in various countries and settings.

According to WHO (2004). the healthcare sector has always relied on technologies to prevent, diagnose, and treat illness and disease. ICTs are only one other category of the vast array of technologies that may be utilized. Daly (2003) observes ICTs can be powerful tools in the hands of those working to improve health if applied in the context of the right policies and resources. Some of the areas that healthcare stakeholders should aim to utilize ICT include the existing information systems that can gain in performance from the adoption of new technologies, growing operation needs in areas such as logistics, finance or pharmaceutical services that ICT systems can help to better manage; a need for data gathering and analysis that can be simplified using ICTs; or a need to disseminate information that can be done more efficiently by using ICTs.

Past studies have highlighted the benefits of using mobile technologies in the health sector. These benefits include using ICTs in gaining to access to information in a timely manner studied; disease diagnosis; improving communication with patients; developing Health Information Systems (HIS); and making the administrative role of healthcare providers more efficient (Bali & Singh, 2007; Chib, A. 2010).

According to Elder & Clarke (2007), there is considerable enthusiasm about the role technology plays in the health sector especially in the backdrop of the impressive rise of mobile technology penetration in the developing countries. Granot, Ivorra. and Rubinsky. (2008) compiled a list of mHealth projects in Africa. The mHealth projects include using mobile phones to monitor measles outbreaks in the Zambia; supporting diagnosis and treatment by health workers in Mozambique; sending health education messages in Benin. Malawi and Uganda; sending SMS reminders to HIV-positive patients about their anti-retroviral therapy schedule in Kenya, Malawi, and South Africa; sending information about HIV patients' health status to community health workers; and in the collection, measurement and monitoring of health data.

1.3. Reproductive Healthcare in Kenya

The responsibility of planning, implementing and monitoring programs to promote the reproductive health in Kenya is charged to the Division of Reproductive Health (DRH) which operates under the Kenya Ministry of Health (MOH). According to DRH's website, its goal is to ensure provision of a comprehensive, integrated system of reproductive health care, through a range of services offered by the government, non-governmental organizations (NGOs), and the private sector (DRH. 2011). The areas of focus in provision of services are: safe motherhood, gender and reproductive rights, adolescent reproductive health, family planning, STIs and HIV/AIDS, community reproductive health and monitoring and evaluation.

According to the National Reproductive Health Research Guidelines (MOH. DRH. 2006), Kenya started to offer modern contraceptives to the population as early as 1957 through Ministry of Health facilities and private sector. However, after the 1962 census, the government recognized a need for family planning for sustained social economic development with the population was expected to double in the following two decades. The government's efforts included the formulation of guidelines such as the National Family Planning Program launched in 1967. The DRH acknowledges that even with the government efforts, the family planning program did not accelerate as expected and that there was rapid population growth as a result of increasing fertility rates and declining mortality rates. In recent years, even though the fertility rate has been declining, it has stalled at an average of 4.9 children per woman. (Kenya Demographics Health Survey 2003, quoted in MOH. DRH. 2006). Approximately

82% of the population lives in rural areas where according to the KDHS 2003 survey the total fertility rate is 5.4 births per woman and the contraceptive prevalence among married women is 32%.

Despite, government efforts, challenges exist in the RHC provision in Kenya. The ministers of health acknowledges that many sexually active youths do not receive the existing services because providers are biased, unfriendly or not adequately trained to handle youths; that not all health facilities in Kenya provide comprehensive RHC; and that the health facilities which are designated as RHC service delivery points are not equitably distributed throughout the country. Other challenges noted are the geographical and cultural diversities, the socio-economic and gender disparities, upsurge in fertility, child mortality with diverse regional disparities, unsafe abortions and women delivering at home without assistance from medically trained personnel. The government also acknowledges that community has either positive or negative influence in the efforts to provide RHC services. For example, RHC is negatively affected by practices such as female genital cutting, early marriages and cultural practices that violate women RH rights that are common in some communities. On the other hand, RHC efforts can be positively influenced by community practices that encourage care and support for children orphaned by HIV/AIDS, and community knowledge of pregnancy related complications. (MOH. DRH. 2006).

1.4. Statement of the problem

Adoption of mobile technologies in the healthcare sector in a developing country is set against a backdrop of challenges such as lack of management support, perceived complexity, high costs of implementation, capacity to handle sensitive health related data and lack of supporting infrastructure (Lu et al.. 2003). In this context, Author and Zhao (2009) noted that despite growing uses of mobile technologies in the health sector in African countries, there is little scientific evidence to warrant generalizations.

Orlikowski & Iacono (2001) identified some of the common approaches used in technology adoption research. One is the theory of reasoned action (TRA) which has been applied in Guinea to explain the factors influencing cellular phones use in

Guinea (Kaba et al. 2006). Another is the diffusion of innovations (DOI) approach developed by Rogers (1995) which has been applied in study of mobile banking applications in South Africa (Brown et al., 2003) and mobile and pager adoption in urban China (Wei, 2006). Also common is the Technology Acceptance Model (TAM) used to explain and predict mobile adoption in Nigeria and Kenya (Meso, Musa, and Mbarika 2005). However, there are studies that show the shortcomings of these models when applied to the healthcare setup. For example, a study based on the examination of six studies in the healthcare domain established that with regard to the constructs proposed by TAM, only perceived usefulness (PU) was a predictor of technology acceptance in healthcare while ease of use (EoU) was found to be insignificant (Spil and Schuring, 2006). Other theories such as TRA and UTUAT have been found to have similar shortcomings since all their preconceived constructs cannot explain technology adoption when applied in a healthcare setup. (Gururajan and Hafeez-Baig, 2007).

In an effort to contextualize the study of technology adoption, Drury (2005) proposes an eHealth model for developing nations which he calls the "5Cs" framework of analysis. The 5Cs that form this framework are: Context, Content, Connectivity, Capacity and Community. This model is based on the proposition that it is only when there is synergy between the eHealth aspects of these components that the full benefits of investing in eHealth can be realized. Drury argues that this model contrasts the other models for eHealth developed in the UK, Canada and the EU since the context there is such that national and local ICT infrastructures are well developed to support all aspects of national and local economies including healthcare.

While appreciating the theories that have so far been advanced on technology adoption, the lack of an all-encompassing model on mobile technology adoption in the healthcare sector of a developing country was noted. Hence, the study sought to be guided by the 5Cs framework in conducting an interpretive research on the adoption of mobile technologies within the RHC subsector in Kenya. Qualitative data was collected and analyzed to identify the influential factors and their causal interrelationships on the adoption process. The results of this inquiry led to the development of a model that can inform the technology adoption decision-making process by stakeholders in RHC, particularly in developing countries.

The main research question addressed in this study is "what are the factors that affect mobile technology adoption in RHC in Kenya and how are these factors related?"

1.5. Research objectives

In order to answer the main question stated above, the study set to achieve the following objectives:

1. To establish the factors that influence mobile phone technology adoption in RHC in Kenya
2. To establish the relationships among the factors that influence mobile technology adoption in RHC in Kenya
3. To develop a model of mobile technology adoption in RHC in Kenya and other developing nations

1.6. Value of the Research

Contribution to Practice

By mapping the relationships between mobile phones, society, and RHC needs in Kenya, the public health stakeholders can gain a better understanding of the issues involved in determining the health impact of mobile technologies with their growing use in Kenya and other developing country. The findings of this study will increase the collective knowledge of the mechanisms by which mobile phones support the achievement of RHC objectives. In addressing the research question stated above, data was collected, analyzed and used in drawing valuable conclusions that can inform the government, medical practitioners and the general public on the direct impact of mobile technology adoption on RHC. More specifically, the following stakeholders will find the findings of this study useful:

- The government, in formulating policies to address the unmet needs for RHC
- The Information System departments within hospitals, in creating databases containing RHC content that can be delivered to the general population through mobile phones
- The Medical fraternity, in creating knowledge bases that can be queried on demand by service providers

- Monitoring and evaluation departments, in collecting data on utilization and the needs of the general public for RHC

Contribution to Theory

By using grounded theory methodology, this study produced a substantive model of mobile technology adoption specific to RHC needs in developing countries. Scholars and future researchers are invited to subject the model to hypothesis testing in a bid to improve the model, eventually resulting in a formal theory.

2. CHAPTER TWO: LITERATURE REVIEW

This section explores the literature available on technology adoption, mobile technologies and reproductive health and identifies the research gap that existed to warrant this study. The section is arranged as follows: first, is a global perspective on mHealth. based on a survey conducted by WHO in its member states, followed by a discussion on technology adoption in healthcare. This is then followed by mobile technology adoption in healthcare: the growth of mobile technologies in developing countries; theories of technology adoption: the RHC scenario in Kenya and then a summary of the literature review. Finally is a conceptual framework of the research, based upon the findings presented in the literature review.

2.1. Global Perspective of mHealth

In a 2009 global survey conducted by World Health Organization's Global Observatory for eHealth, 114 member states completed the survey which focused on four aspects of mHealth - the existence and maturity of mHealth initiatives within member states; types of mHealth initiatives being conducted; status of monitoring and evaluation of the initiatives; and barriers to implementation (WHO, 2011). The key findings of that study showed that a vast majority of the countries (83%) reported at least one mHealth initiative in their country. Within the statistics, 22 countries categorized as low income countries, 77% reported at least one mHealth initiative compared to 89% of the 29 countries categorized as high-income countries. For purposes of the survey, the countries were asked to provide details of whether the initiatives were informal, pilot or established. The results showed that the most frequently reported types of mHealth initiatives globally were health call centres/ health care telephone help lines (59%), emergency toll-free telephone services (55%), emergencies (54%), and mobile telemedicine (49%). The least frequently reported initiatives were health surveys (26%), surveillance (26%), awareness-raising (23%). and decision support systems (19%).

The study further concludes that in low and lower-middle income countries, there has been a growing interest in capitalizing on the ubiquity of mobile technology infrastructure to develop health call centres that can increase accessibility' of health advice and information to patients and the public. This approach has been found to

overcome widespread health system barriers such as health professional shortages, reliance on untrained and/or informal providers, cost of service and transportation, and lack of sources of reliable information.

Of the mHealth initiatives identified from the WHO study, only one was specific to addressing the needs in RHC. This was the Ligne Verte Toll-Free Hotline run by Population Services International (PSI) in the Democratic Republic of the Congo. The initiative targeted exclusively the mobile device users of the partnered Telecommunications Operator (Zain, now Airtel) to provide confidential family planning information, and refer patients to nearby clinics to access contraceptives and other commodities.

2.2. Technology Adoption in Healthcare

Adoption, in relation to technology, is not necessarily easy to peg to one definition mainly because of the variability in technologies and circumstances under which organizations or individuals adopt them. Rogers (1995) defines adoption as "a decision to make full use of an innovation as the best course of action, and conversely, rejection is a decision not to adopt an available innovation". For purposes of this study, technology adoption begins with the intention to use, which is influenced by facilitating conditions leading to the decision to use a given technology.

In a broad perspective, the adoption of ICTs by the healthcare sector has gained the attention of researchers in recent year with numerous articles, journals and books being written, reviewed and published on the topic. Concepts such as "eHealth", "telemedicine" (Johnson, et al. 2004) and "mHealth" (WHO 2005, 2011) have emerged and the body of literature around each is growing. ICTs are adopted to facilitate the delivery of appropriate health services to the populations of the world. Specifically, technology in healthcare contributes to health information sharing, knowledge management, health monitoring, gathering statistics and analysis, and in meeting internationally agreed upon health targets within healthcare sector. In this broad research area, different areas of focus have been highlighted such as the effects of specific technologies on healthcare, data collection and analysis, developing countries, specific diseases and Health Information Systems. (UNDP, 2003)

2.2.1. Mobile Technology Adoption in Healthcare

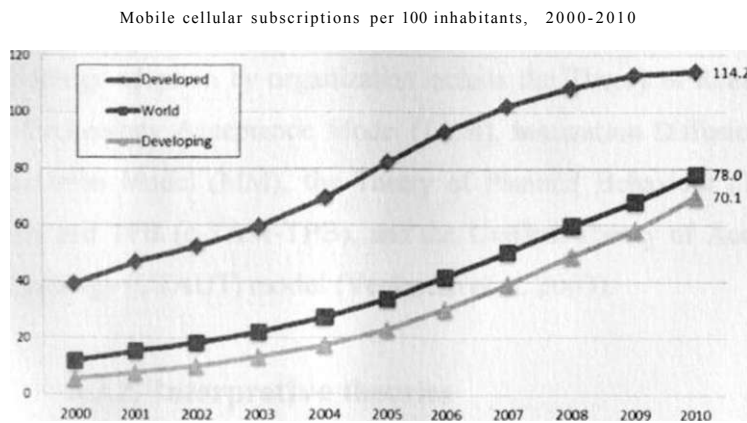
The use of mobile devices in health, also called mHealth has been growing as mobile device penetration rates continue to increase especially in the developing countries prompted by reducing hardware and usage costs (United Nations, 2007). Specific case studies have recorded mHealth projects. Satellife (2005) identifies a project carried out in Mbale and Rakai districts of Uganda in which health workers used cellular networks to transmit data to and from District offices. In South Africa, SMS services have been used in offering prevention services for HIV/AIDS and to follow patients undergoing tuberculosis treatment (Atun. 2005). Others are Bali & Singh (2007) in studying dissemination of critical health information in rural communities in India; and Chetley (2006) in studying the use of Personal Digital Assistants (PDAs) to collect data in Ghana. Another study (Idowu et al. 2003) described the use mobile phones by Nigerian doctors to communicate with each other across different parts of a large hospital.

The 5Cs model proposed by Drury (2005) proposes that developing countries should consider the implementation of eHealth in the context of the existing national ICT infrastructure. The model also closely links efforts towards the achievement of the MDGs and the successful implementation of eHealth. noting that MDG efforts already have government and donor funding. It suggests that improving the paper-based systems can pave way for introduction of contextually appropriate content on affordable ICTs later. Investment should then be made in infrastructure that supports connectivity to knowledge servers to provide basis for improvement in management of information, better coordination of care, capacity building for health workers, delivering health knowledge to communities. Drury predicts that using this model, "it should be possible by 2015 for any health worker in the community or health facility to retrieve and send contextually appropriate health knowledge from or to anywhere".

2.2.2. Mobile technologies penetration in developing countries

There are several reasons why mobile phones have high adoption rate in any sector, including healthcare (Donner, 2006). First, mobile phones use the radio spectrum, breaking the reliance of telephone communication on physical cabling that is expensive to establish in all parts of a country. The only equipment in remote sites is the base stations which work with onsite generators so they can be set away from the electrical grid. Secondly, mobile phones only require basic literacy, and are therefore accessible to a large segment of the population. Thirdly, mobiles phones enjoy some technical advantages such as transfer of data in addition to voice, an advantage that can be used in context of applications for the purposes of health, education, commerce or governance. Finally, growth in the industry has seen innovations such as pre-paid services which have made mobile phones are increasingly affordable to the lower economic strata of the population who would otherwise be blocked from the technology by high costs.

The statistics from the International Telecommunication Union (ITU, 2011) indicate that while global mobile phone subscriptions increased at a decreasing rate the period 2006 -2010, subscriptions in the developing countries experienced a steady increase in the same period. The mobile phone is thus a tool whose contribution to everyday life cannot be ignored and various sectors find themselves with the need to adopt the technology.



TV (leveloped/dfvftoprg country clHvfKations »re b««J on lh» UN M49.
<http://www.flu.mr/ITUD/Kt/drnfjtionVrtftion,/index.html>
SoufC*: ITUWorldTHKonnHjniution /ICT Indicators dat«b*se

Figure 1: Mobile Cellular subscriptions per 100 inhabitants, 2000-2010

Source: <http://www.itu.int/ITU-D/ictystatistics/>

2.3. Technology Adoption Theories

With the widespread use of ICT tools, many models originating from different theoretical disciplines such as psychology, sociology and information systems have been advanced to explain technology adoption. The various models have been created through research conducted using either positivist or interpretive approaches. Using the positivist approach, the researcher starts with an established theory premised on existence of relationships within the phenomena of investigation (deductive process). The researcher then predefines dependent and independent variables and uses either qualitative or quantitative data collected using structured instrumentation to test hypotheses. The results of such a positivist approach research serve to increase predictive understanding of a phenomenon and draw generalizations that apply to the general population after studying a sample population. On the other hand, the interpretive research is based on the foundation assumption of a socially constructed reality. The researcher starts off with the phenomena by observing, measuring and describing it. This is followed by categorizing the data based on attributes of the phenomena and analysis to establish correlations. This process eventually culminates in models or new theories that aim to produce a relativistic understanding of the phenomenon as it influences and is influenced by the social context (Klein & Myers 1999).

2.3.1. Positivist theories

Some of the positivist theories that have been used over the years to explain technology adoption by organization include the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), Innovation Diffusion Theory (IDT), the Motivation Model (MM), the Theory of Planned Behaviour (TPB), the Combined TAM and TPB (c-TAM-TPB), and the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al. 2003).

2.3.2. Interpretive theories

Actor .Network Theory (ANT)

ANT is one example of an interpretive approach whose ideas are based on a careful observation of the real world rather than the review of assumed truths. The unit of investigation using ANT is the 'network' which is considered to be made up of both

humans and non-humans (the actors) and the ultimate goal is to identify what people and things become as a result of their position in a particular network. (Iatour, 1996). ANT suggests that before adoption can occur, technology needs to be aligned to the interests or needs of actors in the network. Such an alignment is achieved in the network since the human actors share common definitions, meaning and utility attached to the non-human actors (technology) resulting in a common interest to adopt and use the technology.

Structuration Theory'

Structuration theory originated from the social sciences and is defined as a social process that involves mutual interaction of human actors and structural features of the organization (Giddens 1994, Rose 1999). The theory provides an understanding of human actions as social interaction within a culture, mediated by artefacts such as tools, language, rules and technologies. The human actions are enabled and constrained by social structures, which are the result of previous human actions. 'Structures' consist of norms, rules and resources that the human actors recursively employ in their everyday interactions. These rules and resources mediate human action and at the same time delimit the same action. Although structuration was not originally formulated to explain technology adoption, it has been used in social analysis of ICT especially given the reality of high level of ICTs entrenchment in contemporary organizations. DeSanctis and Poole et. al.(1994) extended the original structuration theory to come up with the Adaptive Structuration Theory which focused on the interrelated dynamics embedded in the creation and application of the technology that is in use by the organization through the combined processes of human interaction, technology, and organizational social structures. Some examples of studies in the field of IS using structuration are Orlikowski (1992) on analysing IT as a form of structuration and Orlikowski (2000) on studying technologies in organizations.

Grounded Theory

Grounded Theory was first proposed by Glaser and Strauss (1967) as a method for the collection and analysis of qualitative data. The method aims to discover conceptual properties from the qualitative data by following a number of guidelines and procedures.

First, data is collected and subjected to constant comparative analysis, a procedure for identifying conceptual categories and their properties that may be embedded in the data. This is followed by theoretical sampling, a stage that enriches the conceptual categories through coding and integration. These two procedures lead to the development of a hierarchy of integrated categories and lead to the emerging theory.

In later work, the grounded theory methodology is extended further with a description of the criteria that the theory derived using the methodology must satisfy (Strauss & Corbin. 1990). The theory must fit, that is, be relevant to the original data; it must be presented in a way that it can be understood by others, especially those in the same field of study; it should be generalizable through testing by other researchers and finally the analysis should show the significance of the theoretical finding presented in the most relevant form.

2.4.Reproductive Health Care in Kenya

Reproductive Healthcare (RHC) is a key component of the health sector in any country. This importance is highlighted by the fact that it has a direct impact on two of the United Nations (UN) Millennium Development Goals: MDG 4 (reduction of under-five mortality rates by two-thirds) and MDG5 (reduction of maternal mortality rates by three-quarters by year 2015) (UNDP, 2003). The World Health Organization website (WHO. 2011) defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". Within that framework. Reproductive Health therefore, implies that people are able to have a responsible, satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so. Implicit in that definition are the rights of men and women to be informed of and to have access to safe, effective, affordable and acceptable methods of fertility regulation of their choice, and the right of access to appropriate health care services that will enable women to go safely through pregnancy and childbirth and provide couples with the best chance of having a healthy infant. It is thus clear that it is not just the provision of the family planning methods which is central to RHC but dissemination of information, research, documentation, data collection and interpretation of the data are equally important in

a holistic RHC system. It is these needs within the RHC sub sector that drive the need for technology adoption.

In Kenya, significant progress has been made in provision of reproductive health services. This is evidenced by Kenya being a signatory to the Millennium Development Goals approved by the World Summit on Sustainable Development (WSSD) in September 2000 and the Program of Action of the International Conference on Population and Development (ICPD) of 1994. In addition, the government has formulated national health policies, guidelines, standards and strategies expected to positively influence reproductive health. In a chapter titled Poverty "E-readiction' Lanvin and Qiang (2003) use the following representation to show the relationship between use of ICTs and achievement of MDGs.

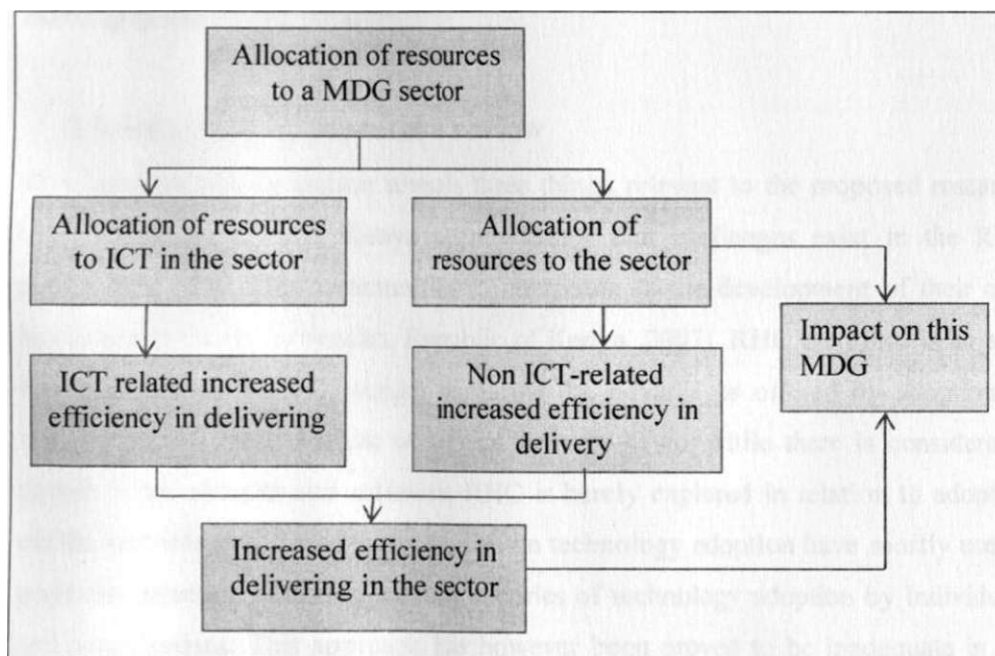


Figure 2: How application of ICTs affects achievement of MDGs.

Source: Lanvivi and Qiang (2003)

Despite the strides made in provision of RHC services, the government acknowledges the challenges that still exist and need to be addressed to achieve the overall goal of improving the well-being and quality of health of the Kenyan population. The National Reproductive Health Policy (Ministry of Health. Republic of Kenya, 2007)

states that among the challenges to attainment of the MDGs is inadequate capacity to manage health programs, especially shortage of skilled health workers, inadequate budgetary provision and poor procurement and supply systems, among other critical management problems. The policy document further identifies key determinants in improving RHC which include strengthening of reproductive health information systems and the monitoring and evaluation function.

The government further asserts that communities and individuals have a responsibility in the development of their own healthcare; thus it would be useful to research and analyze how the adoption of mobile technologies can contribute as new methods to the development, planning, implementation and evaluation of RHC. Potential services that can utilize mobile technologies include dissemination of information, requesting for services, tracking of family planning methods inventory, collecting, analyzing, exchanging and storing data.

2.5. Summary of literature review

This literature review section reveals three things relevant to the proposed research. One. the government of Kenya acknowledges that challenges exist in the RHC provision and calls for communities to contribute in the development of their own healthcare (Ministry of Health, Republic of Kenya, 2007). RHC therefore is an area that stakeholders should consider exploring the advantages offered by adoption of ICTs to help in improvement of service delivery. Two. while there is considerable growth in the eHealth and mHealth. RHC is barely explored in relation to adopting mobile technologies. Thirdly, the studies on technology adoption have mostly used a positivist approach in testing existing theories of technology adoption by individuals and organizations. This approach has however been proved to be inadequate in the healthcare environment (Chismar and Wiley-Patton, 2006; Spil and Schuring , 2006; Gururajan and Hafeez-Baig, 2007) and more specifically in developing nations (Drury, 2005).

Galliers (1992) recommends that IS researchers should not blindly adopt a specific research method but rather be guided by the research questions and the objectives of the research project. Since it has been noted that quantitative research methodologies

do not adequately answer why a phenomenon occurs or how it occurs (Silverman, 2000), this study sought to use qualitative methods which provide the necessary in-depth exploratory tools to achieve a clear picture of the process grounded in the natural environment of the phenomena (Symon & Cassel, 1998). The research question in this study called for interpretive research, using grounded theory methodology to collect and analyze qualitative data to discover the factors that affect mobile technology adoption in RHC in Kenya and the how the factors are interrelated. The resulting model is grounded in the data, and applicable to mobile technology adoption in the health sector of developing countries.

2.6. Conceptual Framework

Curry (2003) points out that the purpose of grounded theory is to provide a framework by which theory can be scientifically and methodically generated. Grounded theory is founded on the assumption that theory is a process, beginning with the collection of raw data which is then qualitatively coded. From the initial coding, major variables emerge, prompting further questions. If the answers to the questions are not found in the data, more data is collected. This is followed by theoretical sampling, a process that sees the data elements integrated into the whole and a network of relationships is established. The casual relationships, similarities and differences then lead the researcher to draw conclusions and formulate theories inductively. The theory that emerges can then be tested against new cases and categories, and compared against those in the literature to try and explain or reinforce it. The theory can thus be refined or abandoned.

The process methodology described in grounded theory is consistent with the generic descriptions of theory building. For example, Christensen and Carlisle (2009) described theory building as the creation of a body of knowledge or understanding and developed a model that explains theory building in two stages. The first stage is the descriptive or inductive stage which involves observation of phenomena combined with description and measurement of the observations. Researchers then classify or categorize these observations, and identify relationships between them resulting in models. The other stage is the deductive stage, where researchers carry out hypothesis testing by exploring whether the same correlations exist in different data sets. This leads to the theory being confirmed or rejected. It is also through hypothesis testing

that the models can be developed further by defining the phenomena more precisely and specifying the circumstances under which correlations hold.

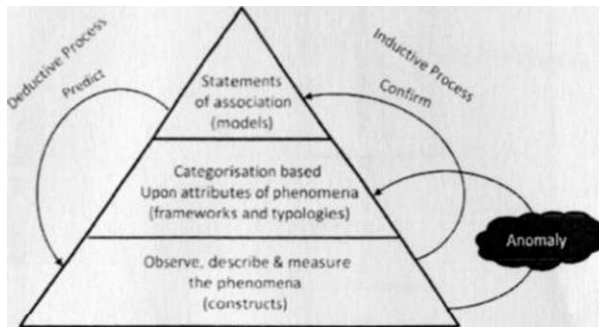


Figure 3: Model of theory building

Source: Christensen and Carlisle (2009)

The conceptual framework for this study was based on the steps involved in grounded theory. Additionally, to make the emerging theory more relevant to the developing countries context, Drury's (2005) 5Cs framework was used as a guideline to formulating semis-structured research questions. The frameworks' 5Cs are:

Context: the context of technology adoption in developing countries is one of poverty; characterized by lack of electricity, roads, telephone lines ICT infrastructure and staff training.

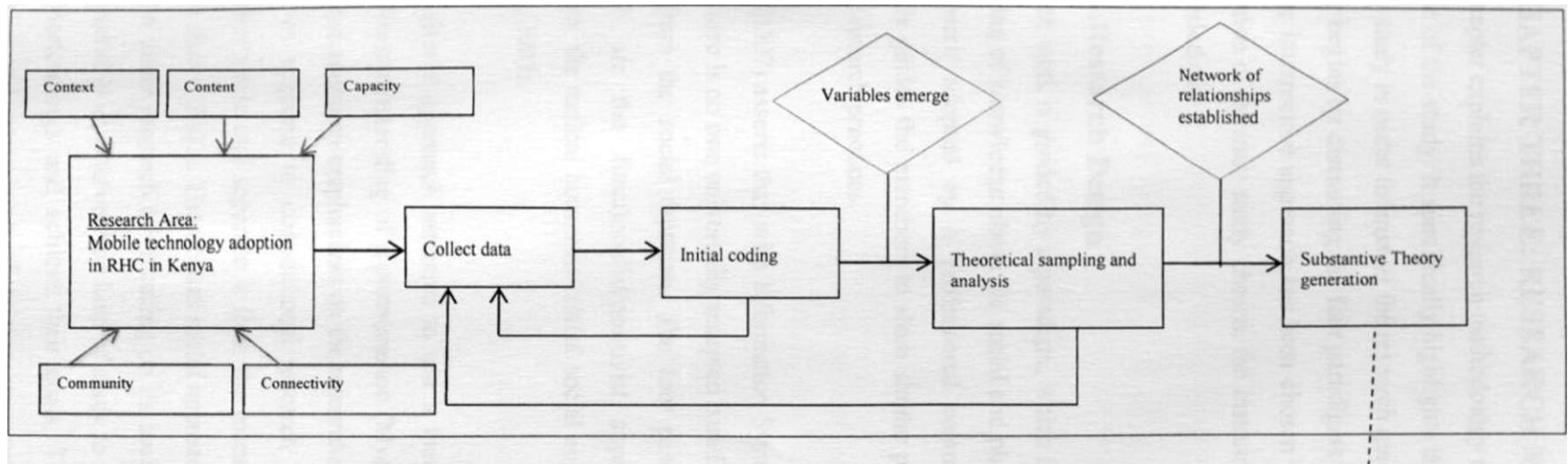
Content: this refers to the health information which Drury noted was usually lacking or dated especially in rural healthcare facilities. ICTs can be used to make the information more accessible to health workers

Connectivity: this refers to the network required to facilitate transfer of information in addition to the ICT devices used for accessing the information.

Capacity: the use of ICTs to strengthen facilities implies that there is need to train health workers to use them in delivering health services at local facilities as well as part of a larger institutionalized information system

Community: this refers to the capacity build in health facilities for the health workers to use and reuse health data collected from service delivery at the community level in order to take action and also notify higher authorities of the findings from the data.

Figure 4: Conceptual framework - using grounded theory methodology to study mobile technology adoption in RHC in Kenya



V
 research
 Hypothesis testing
 V

Formal theory
 generation

3. CHAPTER THREE: RESEARCH METHODOLOGY

This chapter explains the research methodology chosen as the means of achieving the purpose of the study. It specifically highlights the research methods used in carrying out the study in order to answer the research question and achieve its objectives. The chapter begins by discussing the four paradigms of Information Systems research and why the interpretive approach has been chosen for this study. This is followed by a description of the case study chosen, the instrumentation used and how data analysis was carried out.

3.1. Research Design

Research work is guided by a paradigm, which is the fundamental set of assumptions consisting of knowledge about the social and physical world associated with the area of research adopted by a professional community (Burke, 2007). A paradigm therefore guides the members to share similar perceptions and engage in commonly shared research practices.

Burke (2007) asserts that with Information Systems being a relatively young area of study, there is no one universally accepted paradigm, but rather adaptations have been made from the social theorists. The four paradigms used in information system research are the functionalist/positivist approach, the radical/post-modernist approach, the radical humanist/critical social approach and the interpretive approach (Burke, 2007).

The positivist approach attempts to test a theory, with the aim of increasing the predictive understanding of a phenomenon (Myers, 1997 in Burke, 2007). The post-modernist approach emphasizes on the researcher's experience being part of the final results as opposed to conventional research approaches that clearly define the researcher's role and separate it from the research participants (Dorst. 1989: Rose, 1989 in Burke, 2007). The critical social approach centres on the need to improve the situation under research by focusing on its social context. This approach is seen as being useful in an intervention kind of study to help the study participants overcome their shortcomings and achieve their goals. The interpretive approach allows for discussion and questioning of existing assumptions. Clarke (2000) asserts that the interpretive approach addresses the difficulties presented by the research domain such

as intangibility of many of the factors and relationships, the involvement of the researcher within the research domain and the dependence of the research outcome on definition of the research domain; selection and rendition of existing theory; definition of the research question; design of the research framework; selection, definition, operationalization and measurement of variables.

This study adopted an interpretive approach, using a case study and guided by the steps prescribed by grounded theory for data gathering and analysis. The decision on the methodology and design to use was informed by Trauth (2001) who argues that "it's the nature of the research problem that should be the most significant factor on influencing the choice of research methodology".

The case study approach in this work provided the opportunity to ask penetrating questions and to capture the richness of multiple perspectives of a phenomenon which would have been hard to understand in isolation from its environment (Wu, 2007). Yin (1994) defined a cases study as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident". The basic principle of a case study is that it focuses on understanding in "breadth and depth the specific situation/phenomenon to be studied within its context" (Eisenhardt, 1989). Case study research has often been associated with description of phenomena and with theory development, where it is used to provide evidence for hypothesis generation and for exploration of areas where existing knowledge is limited (Cavaye, 1996). The grounded theory approach (Glaser & Strauss, 1967), in which theoretical concepts and propositions emerge as data is gathered and phenomena is investigated, was used to develop a model in this study.

3.1.1. Grounded Theory Methodology

The literature review revealed that although considerable research in mobile technology adoption existed; the models fell short when tested in the health sector and in the scenario of developing countries. According to Charmaz (2006), the strength of grounded theory methodology is that it presents a unified and systematic method to develop concepts, categories, hypotheses and theory. Grounded theory methodology therefore was suited for collecting data within real life context and analyzing it using

the various levels of coding to come up with a model that is grounded in the data. Also, according to Orlikowski (1993), complex organization elements should be incorporated in understanding the data. This element was used in understanding how the complex scenario of the RHC in a developing country influences the adoption of mobile phone technology.

3.2. Population and Sampling (Choice of case study)

Kenya has experienced growth in projects that utilize mobile phone technologies including in the area of health. These range from applications developed for mobile phones to address specific health needs to projects that utilize toll free calls or short message service (SMS) to ease communication among health workers and to reach the clients, especially in rural and remote areas where other modes of communication are slow, expensive or even non-existent.

Some examples of mHealth projects in Kenya include: 'Freedom HIV/AIDS', a project run by Mobile for Good, which involves the use of mobile phone games to spread the messages of HIV/AIDS prevention as well as tackle stigma and discrimination; 'Mhealth for women with fistula', which was run by Engerhealth and other partners and involved the use of mobile phones to pass information and mobile money to assist women with fistula problems access treatment; 'Mobile technology to fight fake drugs', a project run by Pedigree, HP and the Kenya mobile operations in which users can send text message with a special number printed on the purchased drugs to query their authenticity; and 'SMS bulk tool for HIV education', a project run by a consortium of HIV/AIDS NGOs to raise awareness of HIV/AIDS risks and send reminders on taking medication.

In reviewing the mHealth projects available in Kenya, it was found that the area of reproductive health had not extensively utilized mobile phone technologies. The Mobile for Reproductive Health (M4RH) pilot project was therefore picked as the case for this study for the following reasons:

- I. The M4RH. as an initial pilot project exploring the possibility of adopting mobile technologies in Kenya, provided answers to the 'why' and the 'how' of the research objectives

2. The area of mobile technology adoption in RHC in Kenya has not been studied much. This therefore fitted into the criteria of emerging topics where few studies have been carried out.
3. The M4RH is a pilot project which may seek to be extended to other areas of the country based on the findings of the pilot phase. This study therefore sought to develop a model for mobile technology adoption that is grounded in the data collected and analyzed in the complex natural setting of RHC in a developing country. The model developed should therefore be useful for the stakeholders in RHC in Kenya in trying to replicate the M4RH project all over the country

3.2.1. The Mobile for Reproductive Health Pilot Project (M4RH)

The M4RH is a USAID funded investigation of Mobile phone intervention for Reproductive Health that was conducted by Family Health International (FHI 360) in Kenya and Tanzania by collaborating with Marie Stopes and Family Health Options Kenya as implementing partners. The pilot study was formulated with a goal to investigate whether a custom. SMS-based application (mobile4RH) was a feasible and effective way to deliver and evaluate family planning information via mobile phones. The M4RH was developed as an automated text messaging service to provide family planning information and clinic referrals to current and potential users of contraceptives through the mobile phones. The service was free to the users and the content was delivered in both English and Swahili languages. The mode of information delivery relied on menus that use keywords to narrow down queries and ultimately deliver the required information. To create awareness of the service, promotion through various media was utilized including flyers and posters, palm cards placed at the clinics and issued out by service providers. Monitoring visits were conducted at the implementing sites and evaluation carried out by using data collected through the system, electronic feedback request and phone interviews (L'Engle, K., & Vadhat, H., 2010).

3.3. Data Collection and Instrumentation

Since the original proposition for grounded theory by Glaser and Strauss (1967), divergent views have been expressed in subsequent works by the original authors. For

example. Glaser (1992) urges researchers using grounded theory methods not to consider a research question but rather start off with an interest in a field of study. He argues that the research focus becomes clear during open coding, collection of data by theoretical sampling and analysis of the data through the constant comparison method. In contrast, Strauss urges researchers to start with a preliminary theory or hypothesis (Strauss and Corbin, 1990). They argue that the theory should guide the researcher and define the scope of the study. However, the chosen hypothesis or theory should not restrict the researcher but should function solely as a guide leaving flexibility and freedom for an in-depth exploration. Charmaz (2006) regards grounded theory as a guiding framework, consisting of a set of principles and practices which can be fine-tuned to suit the context of the particular research project.

In this study, Grounded Theory was used as a guiding framework rather than a prescriptive research methodology. Following the recommendation of Strauss (Strauss and Corbin, 1990), the 5Cs framework proposed by Drury (2005) for adoption of mobile technologies in developing countries was used as a guide to focus the theory and scope of the study.

The study participants were selected for their expertise in reproductive health or their crucial role in the planning and implementation of the M4RH project. A list of the job positions held by participants in the various M4RH partners is provided in the table below.

Interviewees codes	Position	No. of interviewees
GP.1	Government policy makers - medical doctor in a top leadership position within the Ministry of Public Health and Sanitation	1
TA.1	Reproductive Health Technical Advisors - medical doctor with experience in Reproductive Health both in practice and in an advisory role	1
RA.1, RA.2	Research Associates (M4RH) - Social scientists with experience in conductive Reproductive Health research	2
SP.1, SP.2, SP.3, etc	Service providers (M4RH) - Clinical officers or nurses	7

The participants listed above were drawn from the Division of Reproductive Health (DRH) within the Ministry of Public Health and Sanitation; Family Health International (FHI 360); Marie Stopes Kenya; and Family Health Options Kenya

(FHOK). However, in order to protect the actual identity of the interviewees, they have not been matched with their respective organizations.

3.3.1. Instrumentation

Semi-structured interviews were the primary data collection technique for the various respondents in this study. Lee (1999) provides an understanding of semi-structured interviews which combine features from structured and unstructured interviews. He states that "semi-structured interview has overarching topic, general themes, targeted issues and specific questions, with predetermined sequence of their occurrence". In addition, the interviewer is free to probe the interviewee for more information and unforeseen issues.

The semi-structured interview guides were designed to probe the interviewees experiences in RHC and their views on how mobile phone technology can be used to address the challenges faced in service provision. In order to ensure that the interviews remained focused on the unique scenario of RHC needs in developing countries, the semi structured interview guides were informed by Drury's 5Cs framework. The key issues addressed by the interviews were:

- The participant's understanding of mobile phone technology adoption in RHC
- The needs and problems of RHC in Kenya
- The perceived advantages of using mobile phone technologies in RHC
- The anticipated problems and hindrances to adopting mobile phone technologies in RHC
- Feedback on M4RH program - success factors and suggestions for improvement

The interviews were recorded using a digital recorder, transcribed using Microsoft Word and the transcripts were later imported into ATLAS.ti software for coding and analysis. The semi structured interview guide used for this study can be referenced in Appendix A.

3.4. Data Analysis

Dey (1993) describes three aspects of qualitative data analysis which have been found to fit in with grounded theory methodology. The first aspect is describing, which

refers to providing context using a comprehensive description of the phenomena under study. The second is classification, which refers to allocating analytic categories to data and the last concept is connecting, which is identifying the relationships between categories that form the basis of theory building.

The generic steps of data gathering and analysis using grounded theory methodology have been summarized by Gasson (2004). The first level is Open Coding in which large quantities of raw, qualitative data is focused and labeled. This is followed at level two by Selective coding. In this stage, the data is focused further resulting in category' development. Then at level three is Axial/Thematic coding which involves the search for relationships between the categories of data and their related properties to gain an insight on how structures relate to processes. This step is supported by writing of theoretical memos which are a write-up of ideas about codes and their relationships. These memos reflect emerging ideas concerning relationships between data categories and offer cross-category insights into the process. At all levels, more data may be collected for comparison purposes, until thematic saturation is reached, which is the point at which no new categories or themes are discovered with additional data. Finally at level four, theories or models emerge from saturated themes or categories and may be presented in the form of diagrams or in explanatory prose.

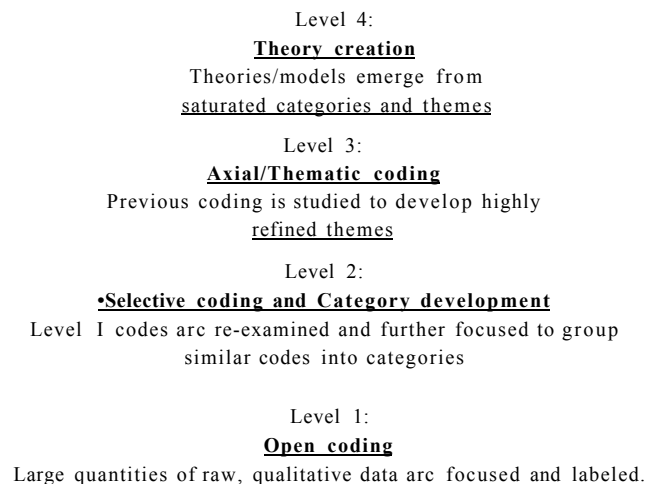


Figure 5: Summary of data analysis steps using grounded theory methodology

Atlas.ti, a computer software package designed for indexing, searching and theorizing non-numerical unstructured data was used for storing and categorizing interview transcripts; computer-aided coding and creating categories; conducting searches relevant to analysis in order to generate reports; and creating hierarchies and models of the basic codes.

3.5. Validity

To ensure the quality of the model, this study was guided by the criteria for judging and ensuring quality in qualitative research recommended by Gasson (2003). First, is the emphasis on the rigour in analysis of data as opposed to sample size. The data in this study was subjected to two separate analyses during the open coding stage, one analysis by the researcher and another by a peer with considerable experience in analyzing qualitative data. This allowed for a comparison of the codes and the emerging categories to ensure that they were grounded in the data rather than being imposed on preconceived ideas. This measure of quality was also enhanced by writing of open and also thematic memos which are the researcher's thoughts as the categories and relationships were built. As such, the emergent theory is transferrable to another context to be tested for validity. The other recommendation is to use cyclic interpretation of data through constant comparison which ensures internal consistency of the research findings. This was employed through comparing one interview to another to build on concepts and also comparison of new data to already identified categories.

4. CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

By following grounded theory methodology, data collection and the initial analysis were conducted concurrently. Each interview was recorded, transcribed and open memos written against the interview transcription as notes of the concepts that were emerging. Individual interviews were compared to each other in a bid to establish the emerging concepts and the relationships among them.

4.1. Open Coding

The first step of data analysis using grounded theory as proposed by Strauss and Corbin (1990) is open coding, a technique of content analysis where the data is read and categorized into concepts which emerge from the data rather than being imposed from preconceived ideas. For example, when the interviewees were asked for their understanding of mobile technology adoption in RHC, one of the respondents stated:

"My understanding is to use mobile technology as a channel through which services can be provided to the clients or the population services in terms of preventive services or curative services and also stimulating the populations or the citizens to enhance their health seeking behavior yeah " [TA. 1]

The underlined words were initially identified as codes of "communication channel", "service provision", "prevention and curative services" and "behavior modification". Another respondent said:

"what I've come to learn people want to set a lot of information on reproductive issues but the problem is they don't know how to get this information they rely mostly on word of mouth from other people and most of the time they get the biased information from the wrong people with a lot of bias and being human beings we talk about the bad experiences, the good experiences people rarely talk about. The issue of mobile technology for RHC for me is good thing because when people access information they become enlightened they know what they are getting into so they make informed choices' 7SP.31

In this second excerpt, the codes "wrong information", "no information" and "lack of knowledge" and "wrong choices" were identified. Through this process of open coding, all the concepts were listed and then grouped and labeled through continuous comparison process. Appendix B. shows the initial concepts identified from the interview, titled with everyday terms picked from the interview guide.

ft Code Fjmrly MarugerlHU M4RH Scriptl]

Families tclrt Miscellaneous i*™

Name	Sen	Author	Created	Modfed
© Address.^ Problems	9	Scoer	10/26/11...	10/26/11...
© Adoption nfluencer s	12	Super	10/26/11...	10/26/11...
© A.d. anrages	11	Super	10/26/11...	10/26/11...
©Chatenoos	1S	Super	10/26/11...	10/26/11...
Oconarefi	6	Sjjer	10/26/11...	10/26/11...
© >sad' amages	S	Super	10/26/11...	10/26/11...
© Experiences	13	Super	10/26/11...	10/26/11...
©Government	5	Super	10/26/11...	10/26/11...
© Health carters role	4	S^cer	10/26/11...	10/26/11...
© *HRH feedback	19	Scoer	10/26/11...	10/26/11...
©MoMe barriers	12	Super	10/26/11...	10/26/11...
©moWe technologies	21	i w	10/26/11...	10/26/11...
© recommendations	6	S « r	10/26/11...	10/26/11...
© RH need* and problems	22	Super	10/26/11...	10/26/11...
©Stakeholders roles	1S	S4*r	10/26/11...	10/26/11...

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Address_Prot>le^.Awareness [*0}
Adetess_Prob«^_CalCentre ;*(})
Address.ProBM.Correct {7-0}
Adetess.RoblM.FreeCal (1-0)
Adtess.ProtWrijTeeFP (2-0)
Adcfress_ProNem_lovrfrice {1-0>
Ack«ess_ProHem_Preose ,1-0>
Address_Problem_Tra«i (4-0)
AdE«eM_Ptot*m_Trart*»> 12-0>
Adoot.RHC.Channel [1-0>
Adopt.RHC.Canmncate (IK)
Adopl.RMCJnfa (6-0);

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15 Fam*es No famllr selected
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Figure 6: An example of Open Coding in Atlas.ti

4.2. Category development through constant comparative method

After the initial open coding, the codes were further analyzed and aggregated into a higher level grouping called categories. For example, "health seeking behavior" and "informed choices" were initially put in a category called "RH behavior modification". Since grounded theory advocates for constant comparison (Strauss and Corbin, 1990; Charmaz, 2006), more data was compared not just against previous data, but also against the already identified codes and categories. In each step of the constant comparison, data memos were written against the categories as suggested by Charmaz (2006) to assist in analyzing the data and act as reminders in later stages of the theory development. Table 1 shows an example of the memo written after identifying the category "RH behavior modification"

Memo: RH behavior modification

Two respondents point out to the fact that there is need to change health seeking behavior and to correct misconceptions that exist regarding RH. The fact that this comes out when asked of their understanding of mobile technology adoption in RH may be a pointer to the fact they acknowledge the mobile phone as a tool to change behavior.

Table 1: Memo - RH Behavior modification

Table 2 shows an example of excerpts from interviewees, the codes identified and subsequent categories they were allocated. The names used for the categories are conceptual, that is, similar concepts explained by the interviewees using different wording are taken as one category and given a conceptual name. Glaser (1992) advises that the researcher should avoid bringing preconceived ideas to the process of data analysis but rather let the theory emerge freely from data.

Interviewee reference	Interviewee excerpts	Codes	categories
TA.I	"...you can <u>reach massive numbers</u> of the population with the <u>right information</u> based on the fact there is a very' <u>massive phone usage</u> at the moment....."	Reaching the masses, Demystifying myths and misconceptions, Information dissemination.	Age Affordability Privacy
TA.I	".....through the use of a mobile a <u>certain segment</u> of the population are known to be <u>tech savvy</u> that is the <u>youth</u> .	Send reminders, Referrals,	Ease of use Relevance of message
TA.I	".....operator can easily <u>update information</u> based on latest events or updates that are coming in aaah either from global evidence or local evidence....."	Lower cost. Transcend boundaries, Offer privacy, convenience, technology phobia, choice of language, correct information, pass on information to others, enlighten the masses	Convenience Language resistance
SP.2	".....it can be sent in <u>many</u> languages....."		
SP.2	".....Its much easier to <u>convey a message</u> when you think one <u>understands</u> what you are telling them....."		
SP.2	".....many people are <u>not interested</u> about this technology thing there is a <u>phobia</u> . Even when you go to this educated /K'ople you 'II find that they don 7 use this SMS thing....."		
SP.3	".....for one if someone is able to get the information that they want from the <u>comfort of the office or their home</u> then it assists in <u>demystifying myths</u> and misconceptions and more so it makes people <u>more enlightened</u> so that they are able to give the <u>correct information</u> because remember word of mouth <u>spreads</u> veryfast it's like bushfire....."		
SP.1	<u>availability of the telecommunication service</u> if I think of the major cities service providers are available but what about the person who is in Machakos what happens if <u>one of the service providers is not available</u> at all so of the two you 'II start thinking which provider is not available, will there be any <u>disruption</u> .		

Table 2: Example of open coding - from raw data to codes and then to categories

4.3.Selective coding

Selective coding requires the selection of focal code which is regarded as the central phenomenon identified from the data through open coding and all the other codes must be related in some way to the focal code (Strauss and Corbin, 1990). Table 3 shows the categories identified before creating the relationships among them. Some of the codes appear under more than one category. For example, "cost" appears under the "internal environment" referring to the cost of delivering services from a service provider's point of view and also appears under the category "external environment" referring to the cost incurred by the general public in utilizing mobile technologies to access RHC services.

At this stage of the analysis, "RH behavior modification" was selected as the focal code and efforts directed towards discovering how the other codes contributed towards or were related to the focal code.

Table 3: Categories after selective coding

<p><u>Internal Environment context</u> RH needs, problems, milestones, service providers, available resources, time allocation, management influence, costs, government stand, policies and guidelines, service provider bias</p>	<p><u>External environment context</u> Availability of mobile phone connectivity, willingness to use mobile technologies, the users' needs, cost of service, unmet needs, age groups, geographic locations, religion and social influence, myths, availability of service, underserved populations, poor health seeking culture</p>
<p><u>Technology characteristics</u> Geographic locations, mobile network coverage, convenience, technology phobia, ease of use, convenience, privacy, language of communication, call centers, awareness creation, confidentiality, Push vs. pull technology</p>	<p><u>Cost implications</u> Donor funding, government's role, user's contribution, cost of training, role of telecommunication companies, CSR, sustainability</p>
<p><u>Intervening factors</u> Cost Mobile phone network availability Ease of use Perceived importance of service Myths and misconceptions Training Advertising/ creating awareness Monitoring/feedback mechanism</p>	<p><u>Expected results</u> Convenience Reach the masses Demystify myths and misconceptions More referrals Good health seeking behavior Data for decision making Policy guidelines</p>

RH Behavior Modification

- Technology acceptance by users -use of mobile phones to seek RH information
- Technology acceptance by service providers - service providers incorporate mobile technologies in R11
- Influence on government policies - use of collected data to make informed RH planning

4.4. Axial/Thematic coding

Axial coding as described by Strauss and Corbin (1990) refers to the search for the relationships that exist among the categories identified. The recommendation from the grounded theory proponents is to follow theoretical sensitivity during this phase (Glaser, 1992; Strauss and Corbin, 1990). Theoretical sensitivity refers to the researcher's knowledge and understanding of the study area under investigation gained from professional or academic background and by studying existing theories. Glaser (1992) urges researchers to "study theory constantly" in the substantive area in order to be aware of the concepts in the field of study and be able to build meaningful relationships among the categories.

Based on existing theories of technology adoption such as UTAUT, the relationships established among the categories adopt the structure of preconditions - actions - intervening factors and results/effects. Having identified RH behavior modification as the focal category, this step then set out to identify how the internal and external environment influence mobile technology in RHC, the role of the intervening factors and the finally how all this ties to the results.

The result of building relationships among the various categories is an emergent model of mobile phone technology adoption in RHC, which are presented in a diagram form in figure 6. Strauss and Corbin (1990) recommend the use of memos and diagrams in the analysis process to act as a visual representation of the relationship between the concepts.

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Figure 7: An Example of Thematic coding in Atla.ti

4.5. The findings

By analyzing the interviewees responses to the questions presented to them, this study was able to answer the research question posed at the beginning, which is "what are the factors that influence adoption of mobile phone technologies in Reproductive Health in Kenya and how are those factors related? By discussing the various questions relating to general experiences in the field of RHC and experiences in working for the M4RH pilot project, the interviewed participants identified the RH needs in Kenya, the advantages of using mobile phone technologies in RH, the role of the various stakeholders including the government, the service providers, the telecommunication players and the general public. In addition they shared on the various challenges experienced in the M4RH pilot project and offered recommendations on how these can be overcome in future bids to utilize mobile phone technologies to reach an even greater proportion of the population with reproductive health information.

The following are the findings of the study:

a) The RH needs and problems in Kenya:

The major RH needs and problems discussed by the participants included lack of enough trained personnel, few health clinics, lack of information, myths and misconceptions among the general population, high maternal and infant mortality rates, unmet family planning needs as well as administrative and logistics challenges. The following excerpts show the underlined descriptive words and phrases that describe the RH needs in Kenya.

".....generally there are issues of access, the need is very high, access is limited, demand is also limited because of lack of information, there are several issues that lead to the issue of limited access, one is lack of information, ignorance about the services they require, where to get the services and who will provide what service. Two are systemic issues, where we have limited human resource, we have limited people with the skills, we have issues of geographic access where facilities are far apart, we have issues of financial access, it can be in the city and the facility is few metres from you but if you don't have the means to go there, the transport or even the payment for the service if its provided in private facilities or community based facility although in the government facilities they are free. Issues of data, that you don't have the right data to plan well, issues of leadership and governance, that is slightly improving but..... and then there are issues of

misconceptions and myths are a challenge, *cultural and religion*, culture and religion generally contribute and because ignorance is a major player in issues of *myths and misconceptions*. *Prioritizing family planning or reproductive health* as such, some people view reproductive health as abortion services only, when you say reproductive health what come to the mind of a layman is abortion but really maternal health is part and parcel of reproductive health....." [GA.1]

".....we still have major problems of high *maternal mortality*. Where our mothers are still dying in their thousands we estimate that I really not sure of the figure but the maternal mortality rate is put at 488 per 100000 live births and the millennium development goal, we are supposed to reduce that one upto 147 by 2015. and those are the only ones we know because a good number of our women *deliver at home* ok that's a major they are delivered at home by traditional birth attendants..... *definitely not by a skilled worker* and that's where the problem is....." [TA. 1]

I think *lack of information* is the greatest problem that we are having, *lack of informed service providers* to give the right information then we have what we call *provider bias*, and then we have what we call people imposing their own values to other people, especially the service providers imposing their own values to other people..... [SP.2]

".....generally when you look at these trends or rather these indicators in Kenya, we are not doing so well, our *contraceptive rate is still low*, our *total fertility rate is high*, we still have a *high maternal mortality rate*, and *high infant rates*. So for me there is still so much that can be done in Kenya, there is still so much that we can do as a country to make sure that both women and children and even men have access to reproductive health. . . ." [RA. 1]

These RH needs were found to be key in influencing the RH stakeholders in making a decision on whether to adopt mobile phone technologies or not. The realization that there is a high demand for RH services with limited resources to reach the many clients leads to the need for innovation on how the information is disseminated and how the data is collected to influence further planning and decision making.

In the substantive model developed in this study, these needs have been categorized as the internal and external environment as shown in Figure 8.

b) The factors that influence mobile phone technologies in RH in Kenya:

The interviewees identified that availability and reliability of mobile phone network is essential, finding the right platform to pass on the information, having the financial

resources to sustain the project and creating enough awareness about the availability of information by using mobile phones.

".....first of all the availability of the mobile phone provider is essential, coverage is very critical so that you have a very wide reach, of course the other thing is availability of resources." [TA. 1]

"...I will probably draw from the experience we have had, probably one of them would be to make sure that you have the right context in which to work, like the right platform, its not just about mobile phones, its about finding the right platform." [RA. 1]

it should be done in terms of advocacy and awareness for the technology So we need a lot of awareness big time campaigns to inform the people. [SP.5]

".....and then also I can say places which are quite remote and they could not be having electricity people may not have a chance to charge their phones so most of the times their phones could be off....." [RA.2]

The factors identified as influencing the adoption of mobile phone technologies in RH in Kenya fall under the preconditions and the intervening factors categories in Figure 8.

c) The advantages of utilizing mobile phone technologies in RH Kenya:

It was generally agreed that mobile phones had the potential to improve RH service delivery especially in passing the right information to the population in order correct the myths and misconceptions about RH that exist. Other advantages identified relate to reducing cost by reducing transporting costs incurred in visiting health facilities, the fact that mobile phones are fast and can reach a wide population, providing accurate and private RH related answers especially to the youth, and collecting data used to make informed decisions by the government.

".....its very fast and its accessible to many especially mobile, we know the clientele and the subscription to mobile is very high." [GA. 1J]

".....you can reach massive numbers of the population with the right information based on the fact there is a very massive phone usage at the moment and the same time it might be an ach'antage because through the use of a mobile a certain segment of the population are known to be tech savvy that is the youth. can easily update information based on latest events or updates that are coming in either from global evidence or local evidence." [TA. 1]

"....for me the advantages, the key advantage is the reach. The fact that you can reach so so many people with that information and also the fact that you can improve on some of your systems. So those are two - the wide reach and the ease of setting information meaning you are able to implement your projects faster...." [RA. 1]

".....so when we use this platform we wanted to educate people living in remote areas who cannot have access information of RH, so we 'll be providing information and empowering them on how to use methods that are easily available to them, we could help them seek services around them we can easily create awareness where they can seek services for RH." [RA.2]

"....that's more like an advantage for mainly the youth. Because someone wants her own phone for her own privacy to be able to ask and access information." [TA.1]

The strong theme identified by exploring the responses regarding advantages of adopting mobile phone is that of changing the population's **RH** information seeking behavior from one of ignorance to a population that makes informed **RH** choices based on the information they receive through mobile phones. This theme is the central one and is the end goal of adopting mobile phone technologies in **RH** as shown in the model in Figure 8.

d) The challenges expected and recommendations to counter them:

The interviewees identified cost of implementing a mobile phone project as being a challenge and offered one option to counter this as getting involvement from telecommunication player to waiver or subsidize the cost of using mobile phones to access **RH** information as part of their corporate social responsibility. Generally, it was felt that the potential of adopting mobile technologies was greater than the challenges. The other ways of overcoming the challenges was through awareness creation and creation of government guideline policies to ensure that there are standard to follow when disseminating information through the mobile phones.

".....well it can be misused just as any other equipment in the sense that someone might send the wrong information yeah and this might cause a lot of anxiety to the client, for example the service provider can send information according to their own belief." [TA. 1]

".....you have to sit down and decide which system, which formats am I going to disseminate or rather increase this reproductive health information. So that could be one of the challenges, not finding the right platform to use, the right mobile platform to use. And then of course there are issues of

resources, ensuring that you have adequate resources to implement your system. And I think the other one could be like technology or rather the technological awareness of the people or rather the receivers of the message." [RA.1]

".....most communities don't know that a phone can be used for another thing other than communication."/SP.4]

".....one disadvantage is we will not be able to reach people we want to reach because of illiteracy, costs of buying mobile phone and also misconceptions because of social reasons and unreliable network coverage....." [RA.2]

e) M4RH feedback

The interviewees agreed that the objectives of M4RH pilot project had demonstrated the potential that exists for adopting mobile phone technologies in RH. The implementing partner involved in planning and implementing the project pointed out that finding the right partners was a strong foundation for the project.

"...../ think putting, finding the right platform to put the messages. We identified a mobile company that works in reproductive health, and once we found that that was then easy to work with, now they have the technology bit, the mobile technology bit and we have the information component, and so working with them we were able to develop the right messages that would be sent out and for me I would say that worked well -finding the right partner to work with." [RA.1]

".....what worked very well specifically the first days people are excited, it's a new thing it's a new channel of passing information on FP, which many people when we interviewed them what they tell us that they like the service because of the confidentiality that comes with it, its cost effective you don't have to use your transport to walk into a clinic, you can easily get a lot of information by just using your fingers you don't need to walk and then some of the youth are very happy because they don't want to be seen picking information on FP from clinics they don't want to be seen by women whom they refer as their mothers. They get information without being stigmatized" [RA.2]

On the other hand, some of the service providers at the various clinics felt that the project needed more awareness creation and follow up at the participating health clinics.

".....Don't talk of FP talk of RIIC, do proper marketing, have a catchy word make it interesting that's it." [SP.4]

".. get the information out there because if more people call you will be able to know where the setbacks are for the m4rh and it will help us know what

problems people are having and they are not reporting to the health facilities." [SP.1]

".They have no information at all even if we do a quick survey right here nobody knows M4rh." [SP.2]

".ok M4RH1 don 't know whether there is an option to look for a catchy word so that it is easier. give it some more funky name. / know at some point you were acting with the users to find out their views but probably I don't know how that interaction bit can be done may be make it more interactive , look at a way on how to get feedback from the people utilizing and then you know if it is possible expand it to give more information so that people don 't find it bias on just one area but its somewhere you can get information and then interact more with the providers whether it is having some results and then improve it on." [SP.5]

The feedback given specific to the M4RH pilot project is important in evaluating how the project performed and this can be used as a learning experience for other mobile phone adoption projects. The feedback also served an important role in determining the relationship among the factors identified as key in making the decision to adopt mobile technologies and the results as represented diagrammatically in Figure.8.

4.6.Theory Generation

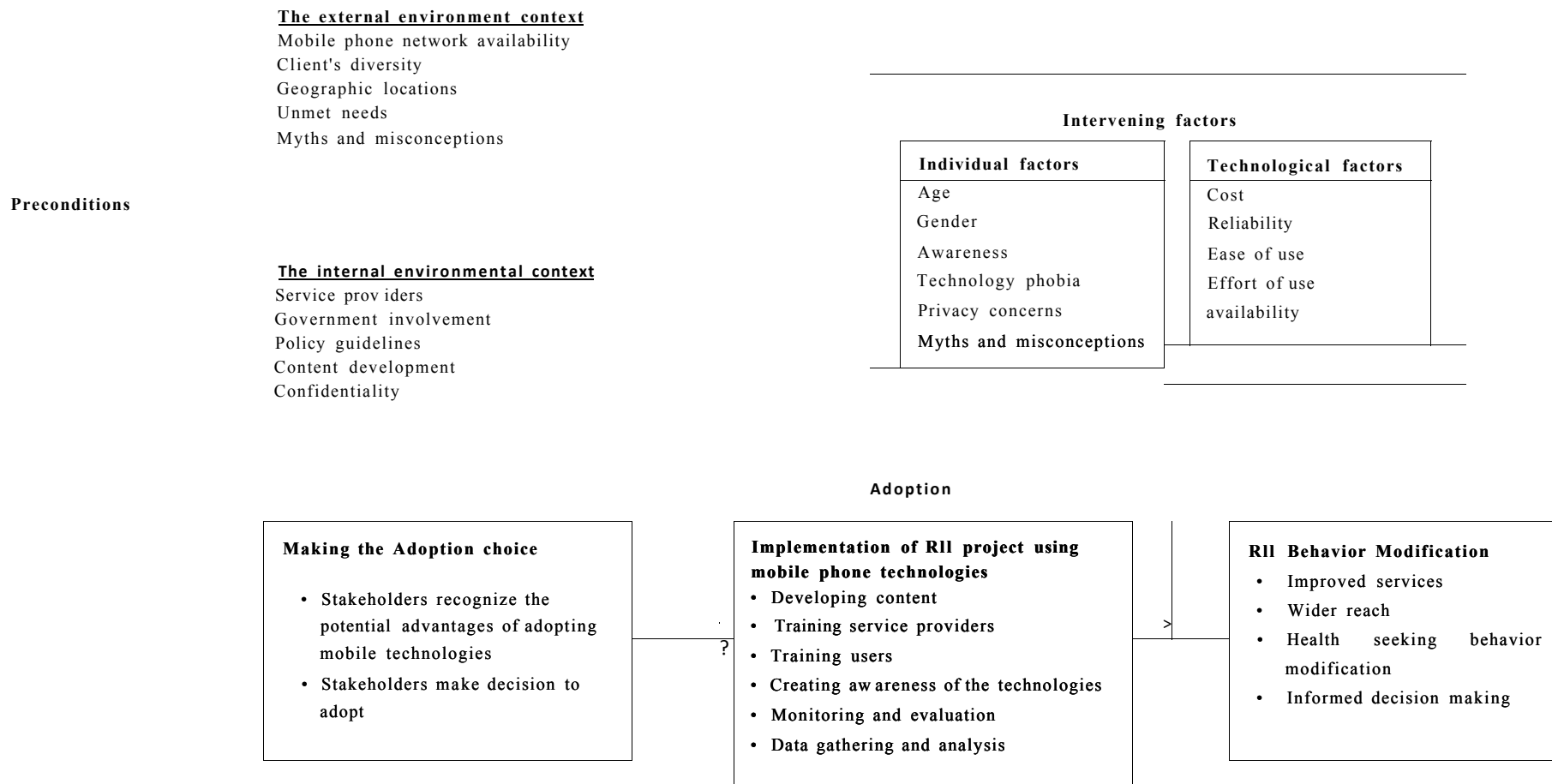
Grounded theory aims to generate theories that are grounded in data. Glaser and Strauss (1967) pointed out that the grounded theory can produce either substantive or formal theory. Substantive theory is one that is developed from a specific area and cannot be generalized outside of the area of inquiry while formal theory is one that offers explanations across a range of situations. Theory development in grounded theory is an iterative process which focuses not just on data analysis but also on conceptualization. Unlike positivist approaches that view the researcher as an objective entity and well removed from the research area, grounded theory acknowledges that there is a relationship between the researcher and the data analysis process, influenced by the researcher's worldview. Glaser and Strauss (1967) however warn that the researcher should be careful not to force preconceived ideas into the process of theory generation but rather let the theory emerge from the data.

This study followed the advice of Goulding (2002) that a novice researcher using grounded theory should enhance theoretical sensitivity by reading ideas and conceptually linking them to the emerging theory. The UTAUT model (Vankatesh.

2003) was particularly referenced at the stage of creating relationships between the various themes that emerged during the axial coding. The 5Cs model by Drury (2005) was also instrumental in category development since the model is specific to developing nations. By studying these models, it increased theoretical sensitivity and enabled more meaningful linkages to be created between the various categories and eventually the model emerged.

Through constant comparison of new data with the initial categories developed during open coding, the study ensured that preconceived ideas were not forced on the data and this iteration continued until data saturation was reached. The results of the iterative process of data analysis are presented in Figure 8. as the model for mobile phone technology adoption in RHC in Kenya. This model captures the conscious decision that the stakeholders in RH need to make regarding adopting mobile phone technologies influenced by recognizing the challenges presented by the internal and external environments on the one hand and the potential offered by the mobile phone technologies on the other hand. The stakeholders also need to be aware of the very crucial role played by the intervening factors of cost, age, gender, technology availability and ease of use on influencing the results of the adoption process. The ultimate result of mobile phone adoption is the behavior modification in the population as a result of the availability of correct RH information.

Figure 8: Substantive model of mobile phone technology adoption in KM developed using grounded theory methodology



4.7. Discussion

This study set out to answer a question of the factors that influence mobile phone technology adoption in RH Kenya are and the relationships that exist among them. To do so, the study set the following objectives:

- To establish the factors that influence mobile phone technology adoption in RHC in Kenya
- To establish the relationships among the factors that influence mobile phone technology adoption in RHC in Kenya
- To develop a model for mobile technology adoption in RHC in Kenya

The following is a discussion of each of the objectives in relation to the findings.

4.7.1. Factors that influence mobile phone technology adoption in RHC in Kenya.

This objective was achieved by analyzing all the data from the various questions posed to the interviewees. In discussing their general RH experiences, the M4RH successes and challenges, the advantages and disadvantages of adopting mobile technologies in RHC, the interviewees gave insights to the complicated web of factors including those unique to developing countries. Through selective coding and categorization, the web of ideas was arranged into internal, external, technological and intervening factors. Through constant comparison of the data collected from the various participants, a point of saturation was reached when no new information was discovered in subsequent scripts.

4.7.2. Relationships among the factors that influence mobile technology adoption in RHC in Kenya

The second objective was to establish the relationship between the factors identified. It was concluded that the intervening factors played an important factor in influencing the decision to adopt and the subsequent process of adoption. In comparing this to other models such as UTAUT (Venkatesh et al. 2003), who identified age, gender, experience and voluntary of use as main constructs of technology adoption, this study concluded that there are more intervening factors in the context of reproductive health in a developing nation that come into play such as cost, technology phobia, literacy, technology availability, confidentiality and the level of awareness created.

The following relationships emerged from the categories:

1. The environment, both internal and external have an effect on the process of mobile phone technology adoption and the outcome
2. The process of mobile phone technology adoption begins with a conscious decision to adopt, informed by the expected benefits and follows the process of adoption
3. The intervening factors determine the level of success of the adoption process
4. The process of mobile technology adoption modify or improve the environment, both internal and external

These relationships are presented in the model in Figure 8.

4.7.3. Substantive model developed for mobile technology adoption in RHC in Kenya

The final objective was to create a model of mobile phone technology adoption grounded in data collected in its natural environment. The model has been presented in figure 6. In addition to showing the influence of the internal and external environment on the decision to adopt mobile technologies in RH, the model also shows that the result of the adoption which is RH behavior modification has an influence on the internal and external environment making the model a cyclic one.

The literature review presented in chapter two revealed that the most of the existing models of technology adoption were derived from studies conducted in developed nations where technology is readily available and thus fail to snugly fit when applied in the context of developing nations. This realization has made other researchers modify the existing technology adoption models, to address the social economic and technological realities of developing nations. Notably, Drury (2005) proposed the 5Cs eHealth model for developing countries. Drury identified the five important pillars - context, connectivity, content, capacity and community. This study was informed to a large part by the 5Cs model in setting the semi structured questionnaire to focus on the major area that have already been identified as being important in the health arena of a developing country. However, Drury did not explore the relationships among the 5Cs. This study adds to the body of existing knowledge by creating a cyclic model

that captures the identified relationships among the factor that influence mobile technology adoption in RH in Kenya.

The other notable work that focuses on the unique technology situation of the developing nations is that of Musa, Meso and Mbarika (2005) which modifies the original TAM by focusing on "understanding of the interactions between socio-economic development needs and factors specific to Sub-Sahara Africa and other developing countries" Musa, Meso and Mbarika (2005). The authors identify what they call the "negative-impact forces or factors with negative interactions and consequences on socio-economic development" such as lack of vision, lawlessness, corruption and failure by governments to provide basic amenities. These forces have an influence on technology innovation, diffusion and adoption. The resulting modified TAM includes the perceived positive and negative impact factors and how they affect the individual's perception of socio-economic environment, together with the other factors from the original TAM to create a model that is informed by the realities in sub Saharan Africa.

The mobile phone technologies adoption model for RH in Kenya developed in this study compares to the modified TAM Musa, Meso and Mbarika (2005) by recognizing that some factors and relationships are unique to a developing country like Kenya. However, by using the grounded theory methodology, the model produced in the study accrued the advantages of the methodology. First, the model is grounded in empirical data collected within the context of RH in Kenya. Secondly, the complexities of the organization were factored in, rather than ignored resulting in a deep understanding of the history and the social conventions that dictate the reasons behind the adoption of mobile technologies in RH. This process has ensured that the model does not suffer from the limitations of positivist approaches which aim to predict human activities without consideration for historical or contextual influence.

The adoption of grounded theory methodology facilitated the achievement of the study's set objectives by collecting data in the context specific to RHC in Kenya and by using the semi structured interviews to ask penetrating questions and seek clarification from the respondents until saturation was reached for each category of factors analyzed.

5. CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary

This study set out to establish the factors that influence mobile phone technology adoption in RH in Kenya and the relationships among those factors. A review of existing literature revealed that while theories existed regarding technology adoption, they fell short in capturing the unique realities of technology diffusion in developing nations where factors such as infrastructure, cost, government planning and illiteracy affect the rate and successes of technology adoption in ways that are not comparable to developed nations. A close review of the mHealth projects revealed that RH was lagging behind in uptake of technology to complement and improve existing methods of data collection and information dissemination. In order to fully understand the needs in RH and discover the potential offered by mobile phone adoption, an interpretive study of the M4RH pilot project was conducted. By following the steps recommended in the grounded theory methodology, data was collected in the context of the health facilities. The data was also reinforced by the opinions of government official in the Division of Reproductive Health and RH experts that had been involved in the planning, implementation and evaluation of the M4RH pilot project. Through analysis of all the data collected and using qualitative analysis software, relationships were created among the various factors that were identified and ultimately a model was created that is grounded in the data and applicable in the Kenya situation.

5.2. Conclusion

The utilization of mobile phone technologies in health has already shown great potential as evidenced by the numerous pilot projects that are have sought to use the mobile phone technologies to support the various facets of health. To achieve great success in utilizing mobile phone technologies in health, it calls for deep understanding on how organizations as well as individuals adopt technology, the factors that contribute to successful adoption and the anticipated problems of adoption and how to mitigate them. With various adoption models already developed, focus has now shifted to testing the applicability of those models in different environments. One area that researchers have developed an interest in is testing technology adoption

models that were generally developed using data collected in the developed nations to see how well they fit in the developing nation's scenarios.

This study has developed a model that is grounded in data collected entirely in Kenya and specifically focused on RH. By analyzing the data, the study concluded that there are constructs that are unique to developing nations that need to be built into a model of mobile phone technology adoption. This study has demonstrated that the external environment for RH in Kenya is complicated by the existence of myths and misconceptions about RH, the diversity in the population, technology phobia, and lack of awareness as to the possibility of using mobile phones to access network. On the other hand, the internal environment has shortage of skilled workers, low funding from the government; higher demand for services than supply and some providers have bias. The model generated by this study recommends that stakeholders in RHC who choose to adopt mobile phone technologies select the right partners; find the right mobile phone platform to use; create awareness regarding the service available and source for adequate funding to ensure continuity of the projects. Furthermore, the intervening factors such technology availability and reliability, cost, ease of use and perceived usefulness need to be considered and catered for when planning, implementing and evaluating mobile phone technology adoption models.

The findings in this study and the substantive model generated are grounded in data collected in the natural setting of RHC service provision and informed by RH experts and implementers of the Mobile for Reproductive Health pilot project. It has therefore captured the realities of the needs and problems of RH in Kenya, the mobile phone technology penetration and established the complex relationships that ultimately affect the success of a mobile phone technology adoption project and if its effect will have a positive influence on the RHC services in Kenya.

5.3. Recommendations

The findings of this study should prove useful to the stakeholders in RH particularly the government as it gives leadership to implementing partners who may be considering rolling out RH projects that utilize mobile phone technologies. The factors identified and the intervening factors such as age, gender, literacy, cost,

technology availability and reliability should be built into any such project for successful results. Also, the projects should be monitored and evaluated to measure whether the adoption has positive impact on the internal and external RH environments.

Stakeholders in RH should not underestimate the potential for utilizing mobile technologies especially in disseminating correct information and collecting data to inform RH decisions. However, the stakeholders need to be aware that the success of the adoption projects is dependent on the planning and implementation with emphasis on the intervening factors that may be unique in the case of a developing nation like Kenya.

5.4. Limitations of the study

There were practical and methodological limitations in this study.

First, the M4RH pilot project was the only project in Kenya that was found to be utilizing mobile phone technologies with specific focus on RH. As such, there was no other case study to compare the findings of this study to. Also, in keeping within the authorized scope of the original study that had been authorized by the Protection of the Human Subjects Committee (PHSC), I could not directly interview the M4RH end users. Therefore, the study had to rely on secondary data of the feedback that had been collected by the M4RH partners regarding the user's perception on using mobile phones to access RH information. Secondly, the M4RH is an ongoing pilot project and therefore its findings have not been formally presented. This study therefore reports on the researcher's independent analysis of the participant's responses.

The other limitation had to do with the grounded theory methodology. The Glaser and Strauss schools of thoughts on grounded theory offered divergent views on how to approach the research in critical areas such as how to formulate the research question and conceptual framework, whether to review existing literature or not and even the steps to follow in coding and analysis. The study therefore required a balance of the application of the two schools of thought in different sections.

5.5.Suggestion for further study

This study concludes that there is great potential for application of technologies for development especially in the developing nations. It has also demonstrated that technological realities in developing nations differ considerably from those in the developed nations and therefore there is need to keep exploring adoption models that fit local realities. This study therefore calls for other scholars and researcher in both RH and IS fields to subject the model developed to hypothesis testing with an aim to developing it further into a formal theory or improving its application in the RH.

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APPENDICES

1.1. Appendix A: Research Interview guide

Introduction:

Good morning/afternoon. My name is Mercy Maina. I am a study at the University of Nairobi. I am current undertaking a Master in Business Administration (MBA) course. As part of course requirements, I am carrying out a study and I have chosen the pertinent area of Reproductive Health Care. My topic of study is "Towards a model of mobile phone technology adoption in Reproductive Healthcare in Kenya - a case of M4RH". To find out more on this topic, kindly assist by answering the following questions. The questions are a guide, please feel free to expound on the issues asked so that I may gain in-depth understanding of the study area.

This oral interview will be recorded for analysis. No personal or medical information will be asked for and all answers are purely for academic purposes.

Section I: Introduction

1. What is your role in your organization?
2. What is your understanding of adoption of mobile technologies in RHC?
3. Are you a user in M4RH?

Section II: Questions for all respondents

4. What are your experiences in RHC?
5. Have you utilized mobile services in RHC?
6. What factors influence the adoption of mobile technologies in RHC in Kenya?
7. What are the advantages of adopting mobile technologies in RHC?
8. In which ways has the RHC sub sector in Kenya utilized mobile technologies?
9. What are the barriers to mobile technology adoption in RHC in Kenya?
10. What are the RH problems that face the population in Kenya?
11. How can mobile technologies be utilized to address the problems mentioned above?
12. What is the government's role in promoting mobile technology adoption in RHC in Kenya?

13. What is the role of health workers in the adoption of mobile technologies in RHC in Kenya?
14. What are the disadvantages of adopting mobile technologies in Kenya?
15. Who are the consumers of RHC in Kenya?
16. How do cultural practices in Kenya affect the adoption of mobile technologies?

Section III: Questions for respondents who hold decision making roles in the RHC subsector/organizations

17. How does the government/employer in private practice contribute towards capacity building regarding use of mobile technologies?
18. How does Kenya's economic status affect the adoption of mobile technologies in RHC?
19. What RHC services can benefit from using mobile technologies?
20. What is the role of the telecommunication players in the adoption of mobile technologies in RHC in Kenya?
21. What methods are used in measuring the effectiveness of adoption of mobile technologies in RHC in Kenya?
22. How does the existing infrastructure (roads, electricity, and telephone network) contribute to adoptions of mobile technologies in RHC in Kenya?
23. What training is required for RHC workers to efficiently use mobile technologies in Kenya?
24. What are the cost implications of adopting mobile technologies in RHC?
25. How does the pricing of mobile services affect mobile technology adoption in RHC

Section IV: Questions for interviewing RHC service providers

26. What is the healthcare provider's capacity in utilizing mobile technologies in their day to day activities of service provision?
27. What are the challenges encountered or anticipated in using mobile technologies in healthcare?
28. From your experience as a healthcare provider, what areas within RHC do anticipate can benefit greatly from using mobile technologies?
29. What role does the language of communication play in adoption of mobile technologies in RHC?

30. From experience of interacting with the community, what factors are likely to promote the use of mobile technologies to access RHC?
31. From experience of interacting with the community, what factors are likely to hinder the use of mobile technologies to access RHC?
32. What information can be gathered from the community using mobile technologies would be valuable in making decisions regarding RHC in Kenya?
33. How has the M4RH project contributed towards improving provision of RHC services?
34. What are the challenges in implementing the M4RH project?
35. How can the M4RH be improved?

Section V: questions for interviewing M4RH users

36. How did you learn of M4RH?
37. How often did you use the service?
38. Was the service helpful to you?
39. Would you use this service if it was charged?
40. How does using the M4RH compare to provision of services without the support of mobile technologies?
41. Would you encourage other people in your community to use for M4RH?
42. Was it easy for you to use the mobile phone to access RH information?

1.2. Appendix B: Initial concepts of mobile phone technology adoption in KHC:

The government

- o Mandated to provide RHC to all
- o Have country wide reach
- o Make RH policy guidelines

The service providers

- o **Inform consumers of existence of mobile services**
- o Stay informed on new developments in RH

Other stakeholders e.g NGOs, donors

- o Funding to reduce cost of using mobile phones for RH
- o Mobilize users/ advertisement

Telecommunication companies

- o Network coverage in hard to reach areas
- Subsidize the service as CSR

Mobile application developers

- o Develop easy to use applications
- o Clear, easy to understand messages

The consumers of RH services

- o Make a choice to seek information
- o Follow up with visits to the health facilities
- o Proactive in seeking RH services

Problems and needs in RH

Unmet FP needs
 High infant and maternal mortality
 Myths and inaccurate information
 Limited number of trained RH service providers
 Lack of RH services tailored for the youth
 Lack of RH services or FP methods
 RH related preventable deaths - unsafe abortions, home deliveries
 High cost of RH services
 Complications added to RH by HIV/AIDS
 Service provider bias
 Cultural and religious influence on view of RH
 Poor health seeking behavior -most services sought are curative not preventive

The potential of mobile phone technology

- **Reaching the masses***
- Demystifying myths and misconceptions about RH
- Information dissemination
- Send reminders to clients
- Referrals to RH facilities
- Lower cost of RH services - eliminate cost of transport to RH facility
- Transcend boundaries -geographical, places that lack good infrastructure
- Offer privacy for some segments of the population that may not ordinarily seek RH services e.g the youth, men, certain religious affiliations
- Convenience

Potential ways of utilizing mobile technologies in RHC

- Information dissemination
 - Pass on general RH information
 - Inform on available FP methods
 - Clarification of existing knowledge and dispelling myths
 - Tele counseling
- Reminders and referrals
 - Pre natal and ante natal reminders
 - Reminders for e.g. cancer screening, follow up clinic visit, take pill
- Data gathering for policy making
 - The popular methods of FP
 - FAQs
 - Common myths and misconceptions
 - Underserved communities and areas

Factors to Influence adaptation of mobile phone technology in RH

- Age of RH service consumer
- Ease of use
- Network coverage
- Usefulness of the information passed through the mobile phone
- Availability of alternative methods of accessing information
- Cost of using the service
- Time consumed using the mobile using mobile technologies

The RH consumers' diversity

Gender Men vs women
 Age Youth vs older clients
 Rural vs urban communities
 Literate vs illiterate clients
 Consumers in different economic strata

Pertinent issues in considering mobile phone technology adoption in RHC

Cost
 Ease of use
 Mobile network coverage
 Need for privacy and confidentiality
 Use call centers
 Need for monitoring and evaluation

How to encourage mobile phone use in RH

- Low or no cost for the service
- Easy to use user interface for mobile applications
- Create awareness of the service/ advertise
- Engage the telecommunication players - network coverage in the country
- Use short but clear message
- Service should not be time consuming for service provider and clients
- Use simple language to communicate

Limitations of mobile phones

- In sms-based system, character limit
- If misused, wrong information can cause massive panic
- Preference for face to face communication

MARH Feedback

Mixed feedback - some service providers indicated it was a good service, others felt it was not known to the target population

Recommendations

- Create more awareness of its existence
- Involve government service providers to reach those who cannot afford to pay
- Follow up with the service providers
- Simplify the process of accessing the information