UNIVERSITY OF NAIROBI

SCHOOL OF COMPUTING AND INFORMATICS

A FRAMEWORK FOR MOBILE HEALTH ADOPTION IN DEVELOPING COUNTRIES- CASE STUDY KENYA

BY

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DECLARATION

STUDENT

I, the undersigned, declare that this project is my original work and that it has not been presented in any other university or institution for academic credit.

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This research project has been submitted for examination with my approval as university supervisor.

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ABSTRACT

Healthcare in the developing world encounters many challenges due to the level of poverty and the exponential growth of population in these countries. This is in contrast to the growth of wireless technology which has experienced a robust growth in mobile phone technology across the globe in the past two decades. This growth has brought in a new era where information is transmitted miles away in a click of a second. In this regard various groups and organizations have harnessed this technology to do more than the conventional communication purpose e.g. mobile money transfers.

The purpose of this research was to bring out another dimension of mobile phone technology and explores how this gadget can be used to promote health in developing countries where healthcare is usually poor and under-developed due to multiple factors such as poor infrastructure and insufficient medical personnel. The research was conducted in Kenya and the data used was collected from the general public. It was then refined and subjected to statistical analysis to draw more comprehensive conclusions.

Many researches have been carried out on m-health but most of them focus on the professionalsô point of view. This research approached the problem from the users / public perspective and tried to bring out the issues that are fundamental in rolling out a successful m-health solution to the public. The research not only focused on the technological aspect, but also on the behavioral aspect of the m-health technology by extending the UTAUT model.

The final model was able to account to at least 64% variance on the usersô intention to adopt and use M-health which was noteworthy improvement compared with other researches such as (Said S. Al-Gahtani, 2007) which were carried out on user acceptance on new technology.

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DEFINITION OF IMPORTANT TERMS

- M-health : This is the general term referring to Mobile Health.
- Vision 2030 : This the development blueprint that Kenya has adopted to achieve Middle income status country by the year 2030.
- MDG : Millennium Development goals.
- E-health : This is the provision of healthcare using electronic means
- KNBS : Kenya National Bureau of Statistics
- TAM :Technology Acceptance Model
- TPB :Theory of Planned Behavior
- TRA :Theory of Reasoned Action
- UTAUT :Unified Theory of Acceptance and Use of Technology.
- MoH :Ministry of Health
- Mpesa : Mobile Money Transfer that is offered by Safaricom

CHAPTER ONE

1.1: Introduction

In many developing countries, healthcare provision remains a big challenge to many governments as they struggle to balance their priorities over the resources that are available. They are mostly faced with the dilemma of providing quality healthcare and their development agenda. In many cases a compromise to quality healthcare is done to cater for the development needs of the country. Among the challenges include in-adequate medical personnel, Lack of health facilities and infrastructure to cater for the rapid growth of populations.

According to Kenya Health Workers report, It's clear that the ratio of health workers in Kenya to the population density is far way below the acceptable international standards. Due to these factors technology is deemed to be the alternative in bridging the gaps by providing solutions that can ensure some of these challenges are addressed accordingly. Universal access to quality and affordable healthcare by all is a goal at both national and global level as envisioned in millennium development goals of the United Nations 2015 ambition.

Over the last three decades there have been an exponential growth in mobile technology and their applications across the world. According to a survey by the International Telecommunication Union ITU, there are over five billion people who have subscribed to the mobile phone services across the globe. It also noted that over 70% of these subscribers reside in low income countries. In this regard Kenya has not been left behind and according to the official data from the Communication Commission of Kenya (CCK) reveal currently we have over twenty eight millions mobile subscribers by the year 2012 and the projections were for the figures to rise rapidly by the year 2015.

This rapid growth in mobile information technology has dramatically transformed the world during the past several decades. Access to mobile and internet is increasingly required for faster communication. This has also been accelerated by the phenomenon growth in the internet technology, which has seen the cost of connectivity rapidly declining over the years. The capabilities that were brought about by fiber optic cable is an example of this development.

Among the notable inventions that has acclaimed accolade across the world is the mobile money transfer services that has revolutionized the financial sector in the Kenya. After this digital transformation, many stakeholders have joined hands in an attempt to come up with applications and solutions that are suited to various areas of the economy among them health. It is worth noting that many governments across the world are committed to gradual improvements of their citizens healthcare by continuously increasing the budgetary allocations that goes to the health sector each year. In this study, we will evaluate the applicability of the mobile technologies in advancing healthcare in developing countries and Kenya would be considered as a case study. Kenya is not alone in the pursuit of M-health solutions as the survey conducted by the world health organization in 2011 (WHO 2011c) revealed that over 83 % of member states reported implementation of at least four or more M-health solutions.

1.2: Defining M-health in the context of E-health

According to Dr. Adesina Iluyemi PhD Candidate ï University of Portsmouth UK, ñHealth involves using wireless technologies such as Bluetooth, GSM/ GPRS/3G, Wi-Fi, WiMAX, and so on to transmit and enable various e-Health data contents and services. Usually these are accessed by the health worker through devices such as mobile phones, smart phones, PDAs, laptops and tablet PCs.ò

According to Dr. Patricia Mechael ï Health and Telemedicine advisor to the Millennium Villages at the Earth Institute; ñWith e-Health and m-Health, an ecosystem approach is recommended. Many of the basic applications and devices exist and are in use, but now we need to make them talk to each other in a way that yields strategic benefits.ò

1.3: Research Question and Purpose of the project:

This research would seek to bring out the importance of embracing m-health in developing countries and the factors that spur its growth.

Mobile penetration in the developing countries continues to grow at un-precedent rate. It is estimated that in developing countries, the mobile network infrastructure overshadows the road network as many countries have embraced the technology (WHO 2011). This has brought about the need to harness and exploit this powerful tool in innovating new products and aiding service delivery across many sectors of the economy in the

developing countries. In this research a comprehensive study of the extent in which Kenya has embraced the mobile technology in healthcare system will be carried out with an aim of establishing the prevailing challenges and thereby propose a model that can spur growth in the sector.

Many m-Health models have been fronted in the market in the developed world to help grow the sector but many of these solutions may not be applicable to the developing world. This research would seek to propose a model that can be useful in advancing healthcare through the mobile phone in the developing world. The main objective of this study is to conduct an empirical field research to investigate the factors that affect mobile health adoption in Kenya.

1.4: Necessity of M-health in developing countries.

According to the world bank report 2004, Healthcare in developing countries are often inadequate because they are neither accessible nor affordable and when they are accessible, they are often dysfunctional, low quality and unresponsive to the needs of the clients / public.

The table below outlines the dire situation of the primary healthcare in developing countries:

Table 1.0: Healthcare situations in some few selected Developing countries

Countries	Infant Mortality rate per 1000 (2006)	Maternal Mortality rate per 100000 (2005)	Years of life lost due to communicable diseases % (2002)	Births attended by skilled Health Personnel (%)	Hospital Beds per (10000)	Total health workers per 10000
India	57	450	58	47(2006)	9 (2003)	14(2003)
Mexico	22	63	27	83(2005)	11(2002)	28(2001)
Pakistan	78	320	70	54(2006)	12(2005)	12(2003)
Bangladesh	52	570	60	20(2006)	3(2001)	5(2001)
USA	5	8	10	100(2004)	32(2005)	125(1999)
UK	7	11	9	99(1998)	39(2004)	75(2001)

According to the Millennium development goals 2008 UN report on progress towards meeting the millennium development goals MDGs indicates continuing dire conditions in healthcare situations in developing countries e.g.

a. A child born in a developing country is over 33 times more likely to die within the first five years of life than a child born in a developed country even though the leading cause of deaths (Malaria , Diarrhea, and Measles) are preventable through basic services and vaccinations

b. According to the report, every minute at least one woman dies from complications related to pregnancy or child birth and for every woman who dies in childbirth approximately 20 more suffer injury, infection, or disease. Nearly 10 million a year.

c. The report also stated that approximately 2.5 million people were infected with HIV in the year 2007.

d. Communicable and avoidable diseases such as tuberculosis (TB) and malaria continue to claim lives due to preventable factors such as lack of access to proper drugs and medical treatment. Due to these factors the UN projects that meeting the MDG target of halving the TB prevalence rate by 2015 is unlikely.

One of the obstacles that hinder quality healthcare in developing countries is the shortage of healthcare workers. According to WHO among the 57 countries mostly in the developing world, there is a critical shortfall of health workers representing a deficit of 2.4 million healthcare workers worldwide. The problem is also aggravated by the brain drain whereby healthcare workers from developing countries migrate to the developed world in search of greener pastures. This constraint adds pressure to the governments of the developing world who also has to contend with the burden of containing the spread of communicable disease associated with extreme poverty.

Mobile phone communication has brought about a digital revolution across the globe and more so in the developing countries. Tens of millions that could not access landline communication network can now afford a mobile handset which has become a household tool. This growth of mobile phone technologies offers an opportunity to harness the technology in improving healthcare delivery in the developing world. It offers an opportunity to bridge the gap that has existed between the public and

healthcare providers. In conjunction with the mobile operators, government and developers, the m-Health industry promises a great area of investments.

1.5: Research outcomes and their significance to key audiences

The research will aim at establishing facts about the m-Health penetration in the country as well as the factors that favor or hinder the growth of this technology in the country. This data will be essential to all the stakeholders that are in involved in healthcare provisions namely; the government, Developers of mobile phone applications, Hospitals and service providers since each one of them has a role to play. The outcome of this research will help shape policy formulation that can be used to enhance and improve the quality of healthcare to the public by the use mobile phone technology. The results achieved can also be used for further research in the same topic.

1.6: Research questions/objectives/hypotheses

The main objectives of this study are to unearth the factors that can spur growth of m-health technology in Kenya as well as to highlight those factors that hinder its growth. We will also seek to determine the extent in which m-health has penetrated in the Kenyan population. Finally a framework entailing all the factors that can spur the uptake of m-health technology will be developed and validated using various statistical measures.

The objectives are summarized as below:

- To bring out factors that can spur growth of M-health in Kenya
- To bring out the factors that hinder the uptake of M-health in Kenya
- To come up with a Framework that can spur the growth of M-health in Kenya

1.7: Assumptions and limitations of the research

While conducting this research it was assumed that; the sampled population will be enough to represent the whole population, that the participants in the survey will give accurate and honest responses, that the methods used in the data collection and interpretation will be as accurate as possible, that all the stakeholders would be interested in the project and finally it was assumed that the resultant framework would achieve the intended purpose.

The researcher will try to get credible information as possible to authenticate the work done.

Chapter Summary:

In this chapter the problem has been stated and the objectives of the study have been clearly outlined. A brief review of the current status on healthcare situations and the mobile technology in the country have been compared and contrasted to bring out the problem domain and the relationships between the two. Further the chapter reviewed other statistics that have been studied elsewhere in the world to bring out the wider perspective of m-health and try to relate the findings with our problem. It is also in this chapter that the researcher has tried to define the concept of m-health for the purpose of better understanding of the following chapters.

The second chapter will cover some in detail some previous studies that have been done on m-health and all the technological issues that involve the adoption of a new technology. It is in this chapter that a conceptual framework of the study has been derived for further analysis. The third chapter describes the methodology and the tools that have been used for data collection and analysis. The forth chapter describes in detail the research findings, analysis and the process of validating the proposed framework while chapter five summarizes and concludes the research findings in a comprehensive manner and suggest some recommendations.

CHAPTER TWO: LITERATURE REVIEW

2.0: Introduction

In this chapter, the relevant literature that forms the bases of this research will be reviewed. It starts with exploring the opportunities and the potential of m-Health initiatives in the developing world. This is followed by examining some m-Health initiatives that have been developed and implemented in some few selected developing countries. It is then followed by reviewing the various existing technology models in-order to identify the most appropriate model that can be adopted in the proposed Kenyan model. Lastly the chapter concludes by proposing a framework that can be adopted to implement m-Health in Kenya.

2.1: Potential for m-Health in developing countries

According to World Health Organization report, (WHO 2011), there has been an exponential growth of mobile phone penetration in developing countries Kenya being among them. Many residents of these countries who could not afford a fixed line telephone line are now proud owners of a mobile handset. According to the report, the gadget is now being considered a household tool for communication and data transfers. These gadgets are cheap and are therefore affordable to the common man and besides that most of them are internet enabled through GPRS/EDGE and 3G. This added feature makes it easier for the people to access the internet at their own convenient.

This growing ubiquity of mobile phone penetration provides an opportunity to improve healthcare standards to the poor population in the developing world in a large scale manner e.g. Health workers can provide real time health information and even diagnosis to the rural folks through their mobile handsets or monitor disease outbreak in the rural areas. Among the benefits that mobile phones provides is their mobility, ability to store power for long duration of hours, easy to learn how to use and the confidentiality that one has over his phone. Similar mobile phone innovations have been implemented in other sectors of the economy e.g. in Kenya, the financial sector went under major revolution with the onset of M-pesa introduction in the market.

2.2: Mobile Telecommunication and Health Environment in Kenya.

Table 2.1: Mobile phone subscription in Kenya

Table 1: Mobile Subscriptions

Subscription Type	Dec-12	Sep-12	Quarterly Variation (%)	Dec-11	Quarterly Variation (%)
Prepaid Subscriptions	30,429,351	30,135,142	1.0	26,744,335	13.8
Post-Paid Subscriptions	302,403	297,640	1.6	236,436	27.9
Total Mobile Subscriptions	**30,731,754**	**30,432,782**	1.0	**26,980,771**	13.9

Source: CCK, Operators' Returns

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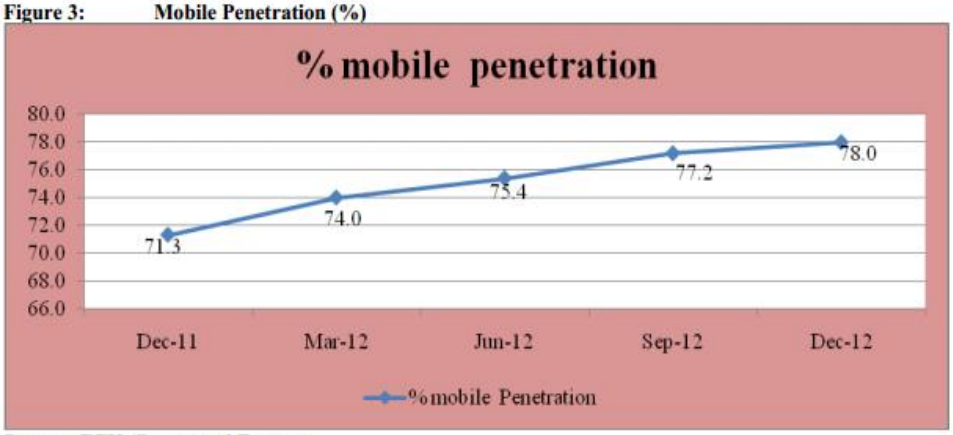
Table 2.2: Mobile phone penetration in Kenya.

Figure 3: Mobile Penetration (%)



Source: CCK, Operators' Returns

Majority of mobile phone users in Kenya own low-end mobile phones handsets which are basically used for texting and calling purposes as they can't be used to support high level multimedia applications and therefore the texting messages is the most ideal way of incorporating healthcare into the system.

Table 2.3: The distribution of healthcare workers in Kenya.

	Most urban	Least urban	Mixed
Dentist	50	4.6	45.2
Environment	26	14.7	59
Nurses	34.8	9.8	55.4
Pharmacists	61.4	5.1	35.51
Physicians	59.4	5.1	35.5

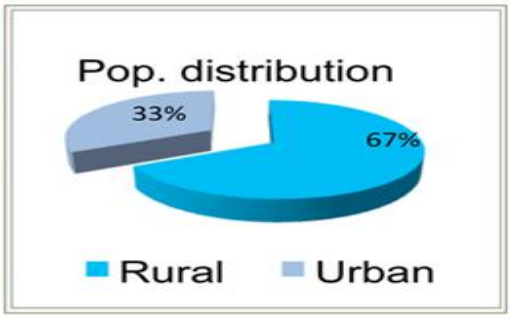


Table 2.4: Vision 2030 targets (MTP 2008-2015)

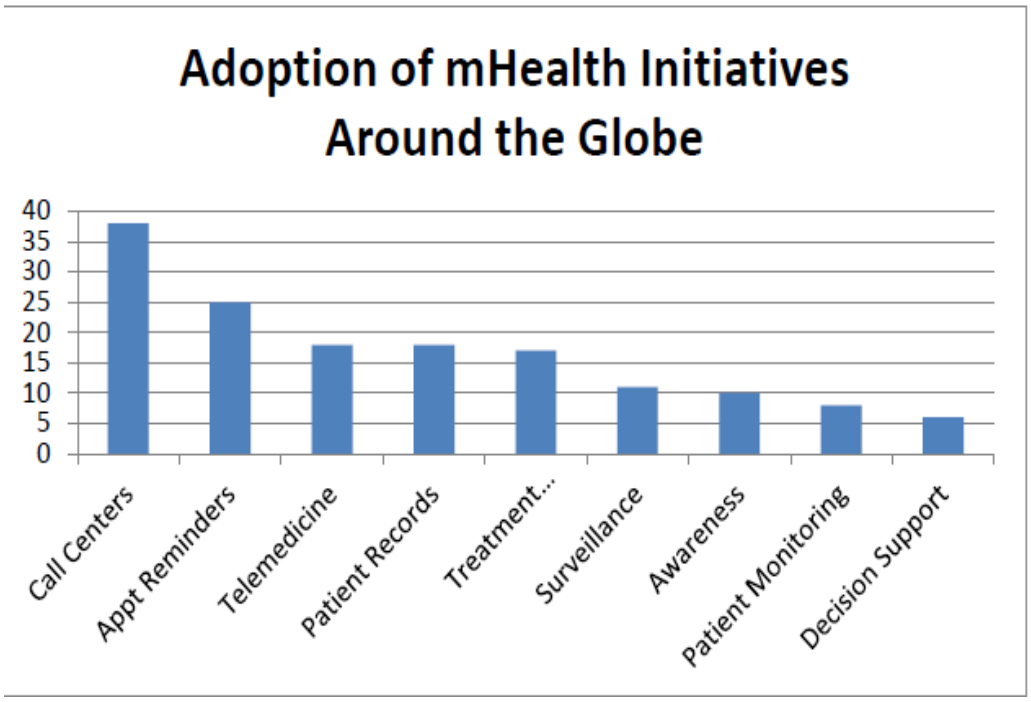
	Baseline	Achieved	Target 2012
Infant mortality per 1000 live births-	79 (2005)	52 (2008-9)	25
Under five mortality per 1000 live births	120 (2005)	74	33
Maternal mortality ratio per 100,000 live births	410 (2006)	488 (2008-9)	147
Under 1 Fully Immunized	73 (2006)	77	95
Delivery by skilled worker	42 (2006)	43	90
HIV Prevalence	5.1 (2006)	6.2	<4
TB prevalence	888 (2005)	283	444
Malaria mortality	5 (2005)		3
Life expectancy	47 (2006)	60 (2009)	60

With the figures indicated in the tables above, it is evident that mobile technology holds the future of technology innovations and if well harnessed, it can dramatically help improve the healthcare provision in the country especially in the rural areas where it is scarce or not available altogether.

2.3 Previous Studies on m-health Adoption across the globe.

According to a study done by the world health organization WHO in 2011, there have an explosion of m-Health initiatives across the globe and a survey conducted in 114 countries revealed that many countries have established m-Health initiatives but there is a difference in adoption levels with the most used m-Health service being that of m-Health call centers which respond to patients queries and the least used m-Health initiative being that of Decision Support Systems. The table below indicates the order in which the various m-Health initiatives have been adopted across the globe. [WHO 2011]. Over all only 23 % of the countries interviewed recorded an initiative of adopting m-Health solutions.

Table 2.5: Adoption of M-health initiatives around the Globe



The report indicated that the highest m-Health adoption rate was recorded in the developed world while Africa recorded the lowest adoption rate.

2.4 M-health Solutions that have been implemented in selected developing countries.

2.4.0 Intelligent Mobile Health Monitoring System (IMHMS)

A joint research was done in the Bangladesh University of Engineering & Technology, University of Illinois and Marquette University. The aim of the researchers was to use what they termed as pervasive computing whereby they intended to incorporate mobile technology in healthcare provisions in the developing world. Their research involved the use of sensors miniature circuits and wireless technology in the delivery of the service. The sensor nodes used are integrated into personal or body area networks for mobile health monitoring and are capable of sensing, processing and communicating one or more vital signs to a central server where the data is analyzed and processed. The IMHMS thus far developed would provide medical feedback to the patients through mobile devices based on the biomedical and environmental data collected by the deployed sensors.

This model was primarily driven by the recent advances in sensor technologies, low power integrated circuits and the advances in the wireless technology. The system uses a sophisticated system to setup the Wearable Body Area Network (WBSN). It employed the use of low cost body sensors and the use of Bluetooth or zigBee adapters for communication purpose. Security in the IMHMS was provided by the use of RFID (Radio Frequency Identification) which is an automatic identification method relying on the storing and remotely retrieving data using transponders.

It is worth noting that the largest population lives in the rural areas where poverty levels are too high and their primary concern in regard to healthcare is all about the availability and easy accessibility to the facilities. The condition is made worse by the fact that the medical personnel in these countries are scarce not to mention the poor health infrastructure in these countries. Therefore the model adopted in the above case is costly and requires some level of expertise to operate and may therefore not be adequate to address the main concern of the common man who lives in the far parts of the country and only armed with a cheap cell phone that may not necessarily connect to the internet. Furthermore education levels in the rural areas are also wanting as many local people may not understand any other language other than their mother tongue.

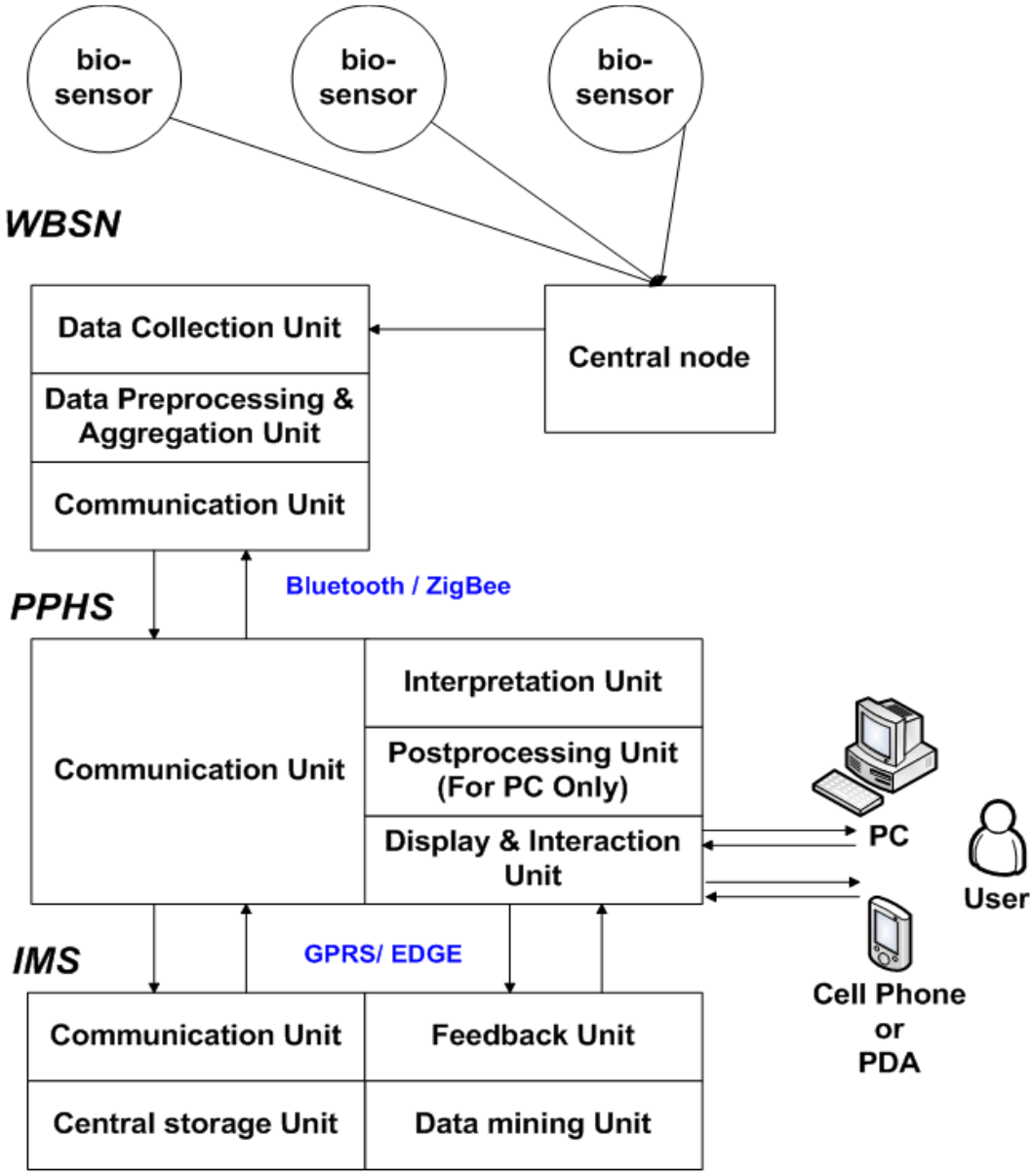


Fig 2.0: The architecture of IMHMS

2.4.1 MmES: A Mobile Medical Expert System for Health Institutions in Ghana

By definition; an expert system is a software / application that simulates the performance of a human expertise in a specific field. The earliest expert system to be developed in the medical field was called MYCIN and was developed by the USA in the early 70ôs.

The health facilities in Ghana were being overstretched by the high number of patients storming in everyday for minor or major treatments as well as check-ups and child delivery. In addition to that, the doctors in both public and private hospitals were also under pressure to perform accurate diagnosis and prescription for very many patients through medical consultancy. A quick solution was required and a research was done by Nana Yaw Asabere (Computer Science Lecturer at Ghana Polytechnique) to explore the use of expert systems in solving the problem. The research was undertaken at Korle Bu Teaching Hospital which is the 3rd largest hospital in Africa and the National referral hospital center in Ghana.

He proposed a mobile medical system (mMES) that uses mobile phones and computing technology that can diagnose and advice on certain diseases when diagnosed on a patient. This was aimed at easing the pressure on the medical doctors working in the public hospitals across Ghana as it was observed that many patients even with minor enquiries or health matters would still stream to the hospitals with those who had serious and complicated situations and they all had to seek medical attention. According to the CEO of the Korle BU Teaching Hospital Prof. Nii Out Nartey, presently the hospital receives an average of 1500 patients a day out of which 150 are admitted. He claimed that the public no longer sees the hospital as a referral hospital rather than they sees it as a general hospital. The increase in population has not helped the situation either.

The main objective of this study was to evaluate and propose a model of an expert system that can be deployed and be used in Ghana to ease the congestion in their medical facilities and therefore enhance their health delivery. The expert system model that was proposed could only be used for diagnosis and advising the patients on the prescription that they require to take. Other areas of healthcare like telemedicine were not part of the project. It is observed that for such an application

to run seamlessly in a mobile handset, the device ought to have a high configuration to run the algorithms successfully e.g. Android. It was also observed that despite this technology being rolled out, the public did not perceive it useful to them and continued the trend of visiting the hospital even for minor diagnosis.

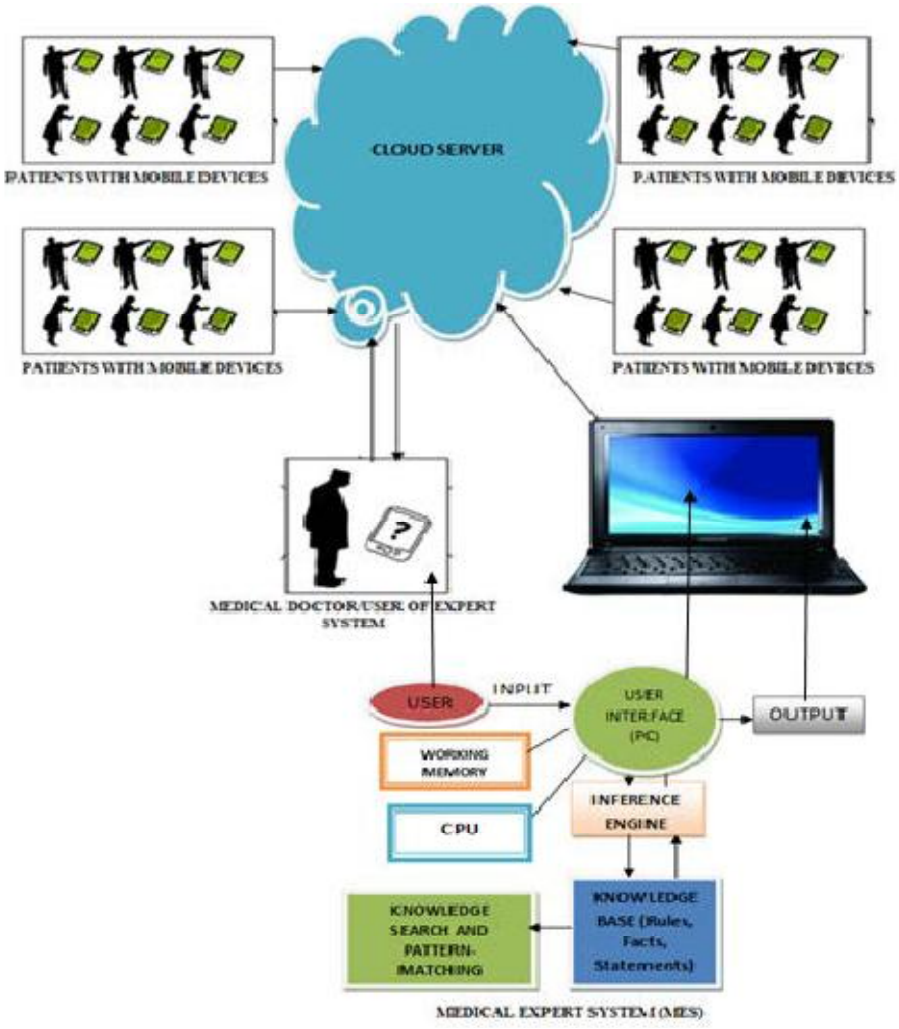


Fig 2.1: Architecture of the Expert System

2.4.2 Text to Change – Uganda.

This was a project in Uganda that was funded by the Dutch ministry of foreign affairs and Merc (a US pharmaceutical firm) through a local NGO Aids Information Center [UN M4D]. The NGO partnered with a local mobile operator (CELTEL) to roll out the Text to Change initiative that focused on providing HIV/AIDS awareness through an SMSbased quiz to 15000 mobile phone subscribers for a period of three months. This program was run between February 2008 and April 2008. The aim was to increase the public knowledge and help improve the change of behaviors about AIDS related issues.

The program contained a multi-choice quiz which was administered to the 15000 subscribers in the rural region of Mbarra. The participants were expected to answer the questions as honestly as possible and once a wrong answer is given, an sms from the operator with the right answer would be sent to the participant. To encourage participation, a free airtime was offered to users which they could also exchange inform of cash. At the end of the quiz an sms would be sent to the participants requesting them to go for the free HIV testing and counseling.

The model that was applied here was purely on preventive basis as the administers intention is to try to bring out the awareness of the HIV/AIDS to the rural community and help stop the spread of the diseases. The incentive also worked to their advantage as they were able to get respondents who are willingly to participate hence motivation was a necessary factor for the adoption of the technology.

2.4.3 Project Masiluleke – South Africa

This is a project pioneered by multiple stakeholders in South Africa and it is designed to help in the fight against AIDS epidemic in the country which according to the UN report 2005 indicated that one quarter of the population is estimated to be infected with the disease but only 3% knows about it. Under the guidance of a multidisciplinary team, the project provides intervention to the entire HIV/AIDS care by promoting testing, treatment adherence and ultimately improved access to testing through an innovative home HIV test kit supported by mobile counseling. The project sends at least one million messages per day throughout South Africa that encourage people to be tested and seek treatment for HIV/AIDS. The project capitalizes on the

mobile technology to offer a solution to the HIV/AIDS even to the most remote part of the country. Messages are written and sent in local languages. Once the patients have called, the representatives of the hotline provide information about the testing and the available locations where the patients can get tested. The ease of use of this service was noted as a key to its success. The model can be modified and replicated to other areas of health e.g. diabetes etc.

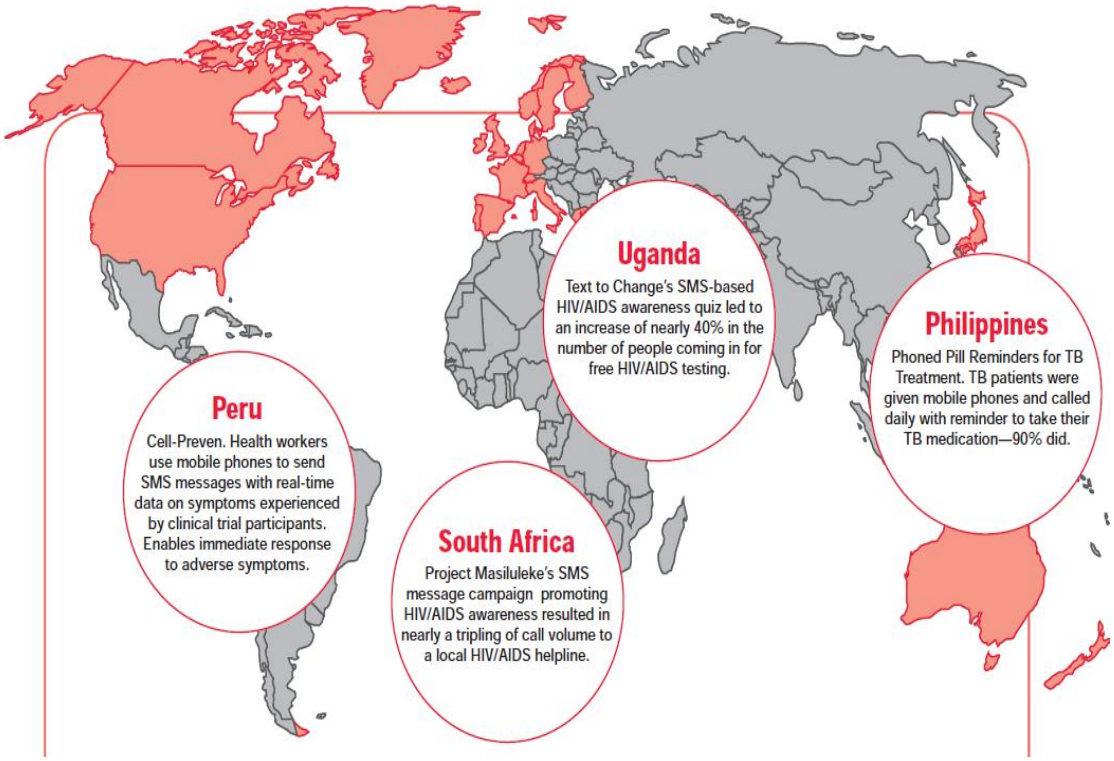


Fig 2.2: M-Health initiatives across the globe.

2.5.0 Theoretical models that have been studied in connection to technology adoption.

M-health in itself is a technology driven approach that aims at solving health related problems in the community and therefore it is important to subject it to the theoretical technological models that have been studied before concerning technological innovations and adoption. Some of the models are discussed below.

2.5.1 Technology Acceptance Model:

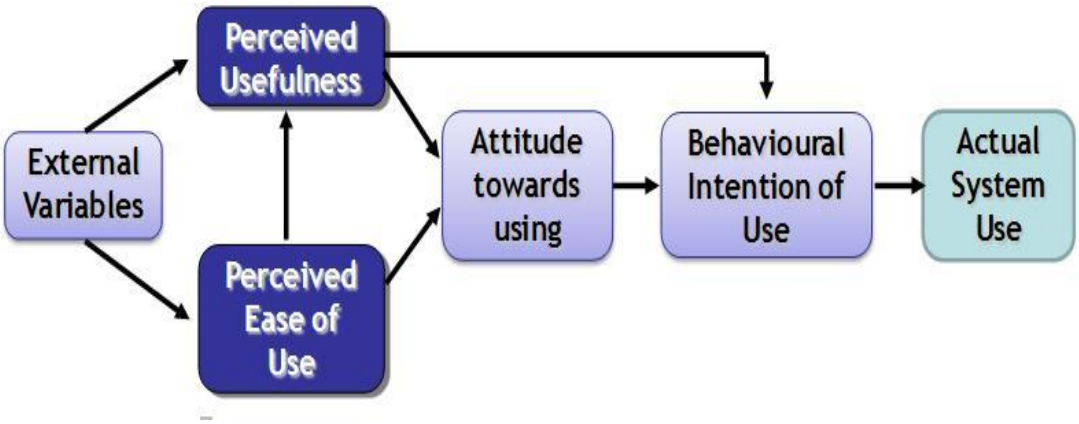


Fig 2.3: Technology Acceptance Model (TAM)

It is a technological theory that models how users comes to accept and use technology. [Davis et al]. The theory suggests that when users are presented with a new technology, there are a number of factors influence their decision about how and when they will use it e.g.

Perceived usefulness (PU) ï Fred Davis defined this as the degree to which a person believes that using a particular system would enhance his or her job performance.

Perceived ease - of- use (PEOU) - Davis defined this as the degree to which a person believes that using a particular system would be free from effort [Davis 1989]

2.5.2 Theory of Reasoned Action

This theory was developed by Martin Fishbein and Icek Ajzen (1975,1980) which they derived from previous research that started out as the theory of attitude, which led to the study of attitude and behavior. This theory is a model for the prediction of behavioral intention, spanning predictions of attitude and predictions of behavior. The separation of behavioral intention from behavior allows for explanation of limiting factors on attitudinal influence (Ajzen,1980). The components of TRA are three general constructs i.e. Behavioral Intention (BI), Attitude (A) and Subjective Norm (SN). TRA suggests that a personôs behavioral intention depends on the personôs attitude about the behavior and subjective norms (BI=A+SN). If the person intends to do a behavior then it is likely that the person will do it. (Fishbein & Ajzen, 1975)

Miller (2005) defined each of the components of the theory as follows.

- Attitude : The sum of beliefs about a particular behavior weighted by the evaluations these beliefs.
- Subjective norms: It looks at the influence of people in oneôs social environment on his behavioral intentions; the beliefs of people ,weighted by the importance one attributes to each of their opinions, will influence ones behavioral intention.
- Behavioral intention : It is a function of both attitudes towards a behavior and subjective norms towards that behavior which has been found to predict the actual behavior.

The theory of Reasoned Action can be expressed as follows,

BI=(AB)W1 + (SN)W2

Where :

BI = behavioral intention

AB=Ones attitude towards performing a behavior

W = empirically derived weights

SN= oneôs subjective norm related to performing the behavior

(Source : Hale 2002)

2.5.3 Theory of Planned Behavior.

This theory was proposed by Icek Jzen in 1985 through his article ñFrom intentions to actions: a theory of planned behaviorò. It was an improvement of the Theory of Reasoned Action that was proposed by Martin Fishbei and it was intended to improve on the latterôs predictive power by including perceived behavioral control. The theory states that attitude towards a behavior, subjective norms, and perceived behavioral control, together shape an individualôs behavioral intentions and behaviors.

In simple form, the theory of planned behavior can be expressed mathematically as shown below.

BI=(W1)AB[(b)+(e)]+W2)SN[(n)+(m)]+(W3)PBC[(c)+(p)]

Where:

BI = Behavioral intention

AB = Attitude towards behavior

(b) = The strength of each belief

(e) = the evaluation of the outcome or attribute

SN = Subjective norms

(n) = the strength of each normative belief

(m) = the motivation to comply with the referent

PBC = Perceived behavioral control

(c) = the strength of each control belief

(p) = the perceived power of the control factor

W1 = Empirically derived weight /coefficient

2.5.4 Diffusion of technology model

This is a theory that seeks to explain how, why and at what rate new ideas and technology spread through cultures. (Everett Rogers). The theory contains four concepts that influence the spread of a new idea as named below.

- Innovation ï According to Rodgers, innovation is an idea, practice or object that is perceived as new by an individual or other until time of adoption.
- Communication channels- It is defined as the means by which messages get from one individual to another.
- Time ï According to Rodgers, the innovation decision period is the length of time required to pass through the innovation decision process while the Rate of Adoption is the speed with which an innovation is adopted by members of a social system.
- Social system ï This is defined as a set of interrelated units that engaged in joint problem solving to accomplish a common goal.

Diffusion of innovations manifest itself in different ways in various cultures and fields and is highly subject to the type of adopters and innovation ï decision process (Rogers 1962)

According to Rodgers, the process requires human capital and it must be widely accepted and adopted in-order to sustain itself. He also noted that it reaches a point when the adoption is at optimum and the rate of adoption goes down. (Rodgers 1962, p.150)

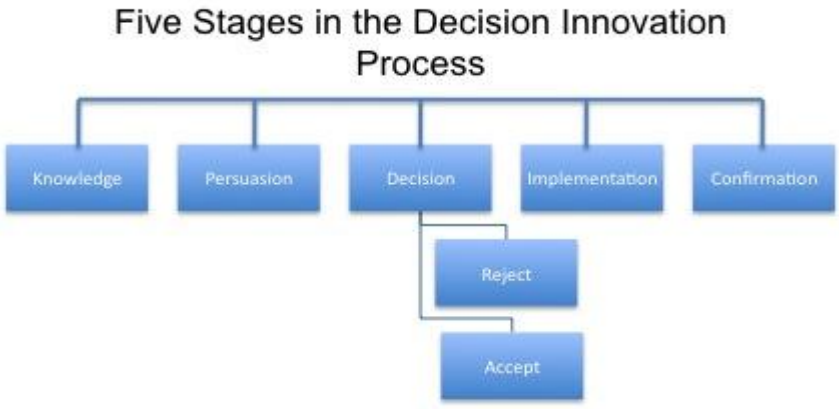


Figure 2.4: Diffusion of Technology

2.5.5 Uniform theory of acceptance and use of technology

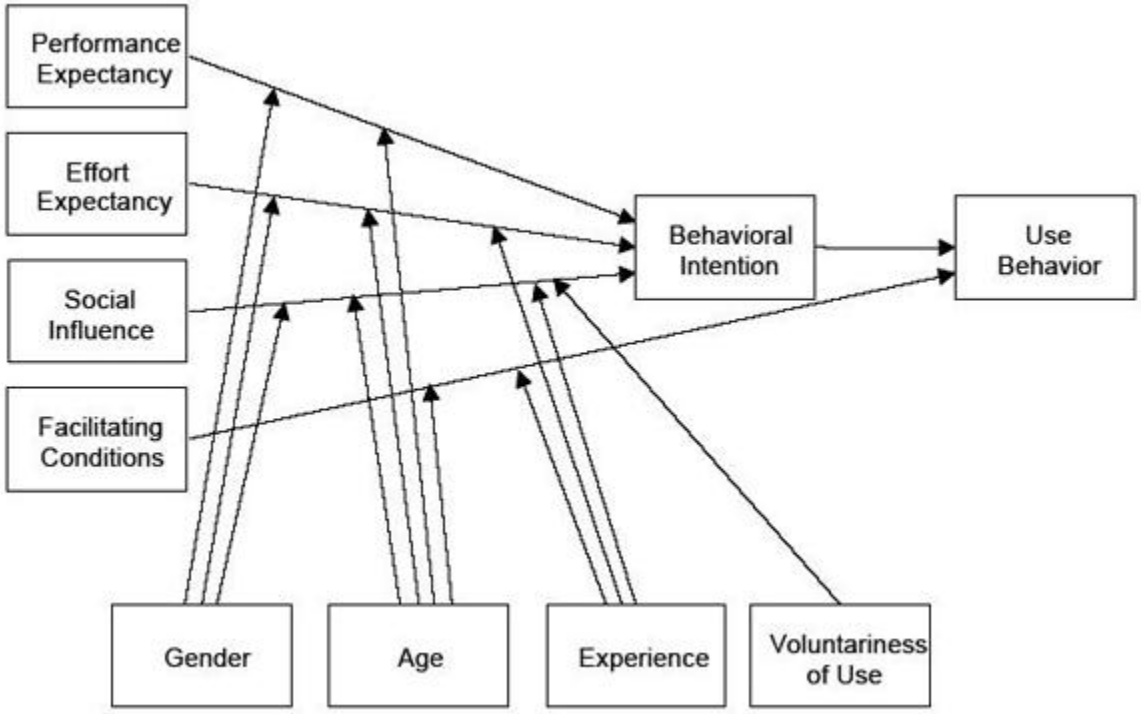


Fig 2.5: Uniform theory of acceptance and use of technology

This is a technology acceptance model that was formulated by Venkatesh and others in the journal ñUser acceptance of information technology : Towards a unified viewò. This theory aims to explain user intentions to use a particular technology and the subsequent behavior that follows. It holds four constructs as stated below;

- Performance expectancy ï This is the degree to which a person believes that using a technology will help him or her attain gains in the job performance.
- Effort expectancy ï This is explained as the degree of ease associated with the use of technology.
- Social influence - This is explained as the degree to which an individual perceives that important others believe he or she should use the new technology / system.
- Facilitating conditions ï This is the degree to which an individual believes that an organization and technical infrastructure exists to support the use of the system or technology.

2.5.6 Protection Motivation Theory

This theory was founded by Rodgers in 1975 in an attempt to understand fear appeals and how people cope with them. It proposes that people protect themselves based on four factors namely;

- The perceived severity of a threatening event.
- The perceived probability of occurrence.
- The efficacy of the recommended preventive behavior.
- The perceived self efficacy

Both the perceived severity and the probability of occurrence constitute the threat appraisal process. They focuses on the source of the threat and factors that increase or decrease the likely hood of a problematic behavior . Severity refers to the degree of harm from the unhealthy behavior while vulneberity is the probability that one experience harm.

Coping Appraisal process:

It consists of the following;

Response Efficacy: This is the effectiveness of the recommended behavior in removing or preventing possible harms.

Self Efficacy: This is the belief that one can successfully enact the recommended behavior.

Response cost: This is the cost that is associated with implementing the recommended behavior.

Overall PMT is generally regarded as a better theory for explaining health behavior. [Prentice-Dunn et al.1986]. TRA is considered as a general theory of health behavior and therefore both of them are going to be used in this study for the purpose of comparisons with other research work and coming up with the new model.

2.5.7 Comparison of the theoretical models

Both TAM & TRA have strong behavioral elements and assumes that when someone forms an intention to act, that they will be free to do so without any limitation. This is not true in the real world (Fred D. Davis)

A close look at the above models also reveals that the constructs are almost similar and only differs in the context of applicability e.g. Perceived Usefulness in TAM is similar to Response Efficacy in PMT, reflecting the degree to which using mobile health services can reduce the potential threats to health; Self-Efficacy and Response Cost in PMT can be respectively regarded as perceived internal and external behavioral control (PBC) in TPB or Facilitating Conditions in UTAUT. Further, Perceived Usefulness and Perceived Ease of Use in TAM reflect TPB attitude.

TAM has been widely criticized despite its frequent use leading the original proposers to redefine it several times e.g. TAM2 , TAM3. (venkatesh & Davis 2000). This due to its questionable heuristic value, limited explanatory and predictive power, triviality and lack of practical value. (Chuttur, 2009). Thus, to formulate a unified theory that will help in achieving the objectives of this study, we need to deal with the conceptual overlaps in different theories.

2.5.8 Research Framework:

It has been found that most of the research work that has been previously carried out using the technology acceptance models focused on the professionals technology acceptance rather than on the patients technology acceptance e.g. most of the research found out that perceived ease of use has no significant impact on behavioral intention, because professional are expected to have high level of competence and adaptability to new technologies. This notion may not hold true when examining the patients technology acceptance hence requiring further empirical study.

Studies on health technology adoption behavior are relatively scarce and this research will try to address this. In addition most of the previous studies on consumer health adoption behavior view the issue from the technology acceptance theories e.g. (Shahriar Akter) investigates how users perceptions of mobile health service quality influence their intentions to adopt the services from the information systems success mode(Willam H. Delone)

Many research conducted before on consumer adoption of technology do not shed light on how users decision making process is arrived at when the technology is for healthcare rather than for other objectives.

(Nutbeam) observed that health behavior is defined as ñany activity undertaken by an individual, regardless of actual or perceived health status for the purpose of promoting, protecting or maintaining health, whether or not such behavior is objectively effective towards that end.ò. Regarding the adoption of health services as an activity to promote, protect or maintain health, health technology acceptance behavior should be considered as health behavior (Debra L. Scammon)

Among the theories that are used to explain health acceptance technology as a health behavior includes Protection Motivation Theory which argues that individualsô evaluations on the severity and the vulnerability of the potential threats (i.e., threat appraisals) and the extent to which they can cope with the threats by conducting certain health behavior (i.e., coping appraisals) will determine their intentions to perform the health behavior [Rogers 1983]. Here, the health technology acceptance behavior is regarded as a behavior to cope with the potential threats to health.

Therefore, in this research to better understand the health technology acceptance behavior, it has been proposed that the issue should be seen from the technology acceptance perspective as well as from the health behavior perspective.

TAM and TPB are regarded as the most influential technology acceptance behavior models while PMT is generally regarded as a better theory for explaining health behavior.(Ronald W. Rodgers) TRA is considered as a general theory of health behavior. These theories will be used in this study for comparisons and coming up with the proposed framework.

- Perceived usefulness or response efficacy can be seen as performance expectancy.
- Effort expectancy will be captured as perceived ease of use.
- Subjective norm will be represented by social influence.
- Self-efficacy and response cost will be represented by facilitating conditions.

We also adapt the term, threat appraisals, in PMT to capture perceived vulnerability and perceived severity (Ronald W. Rodgers). Through this reconceptualization in the unified

model of health technology acceptance, five factors are taken as the determinants of health technology acceptance: performance expectancy, effort expectancy, social influence, facilitating conditions, and threat appraisals

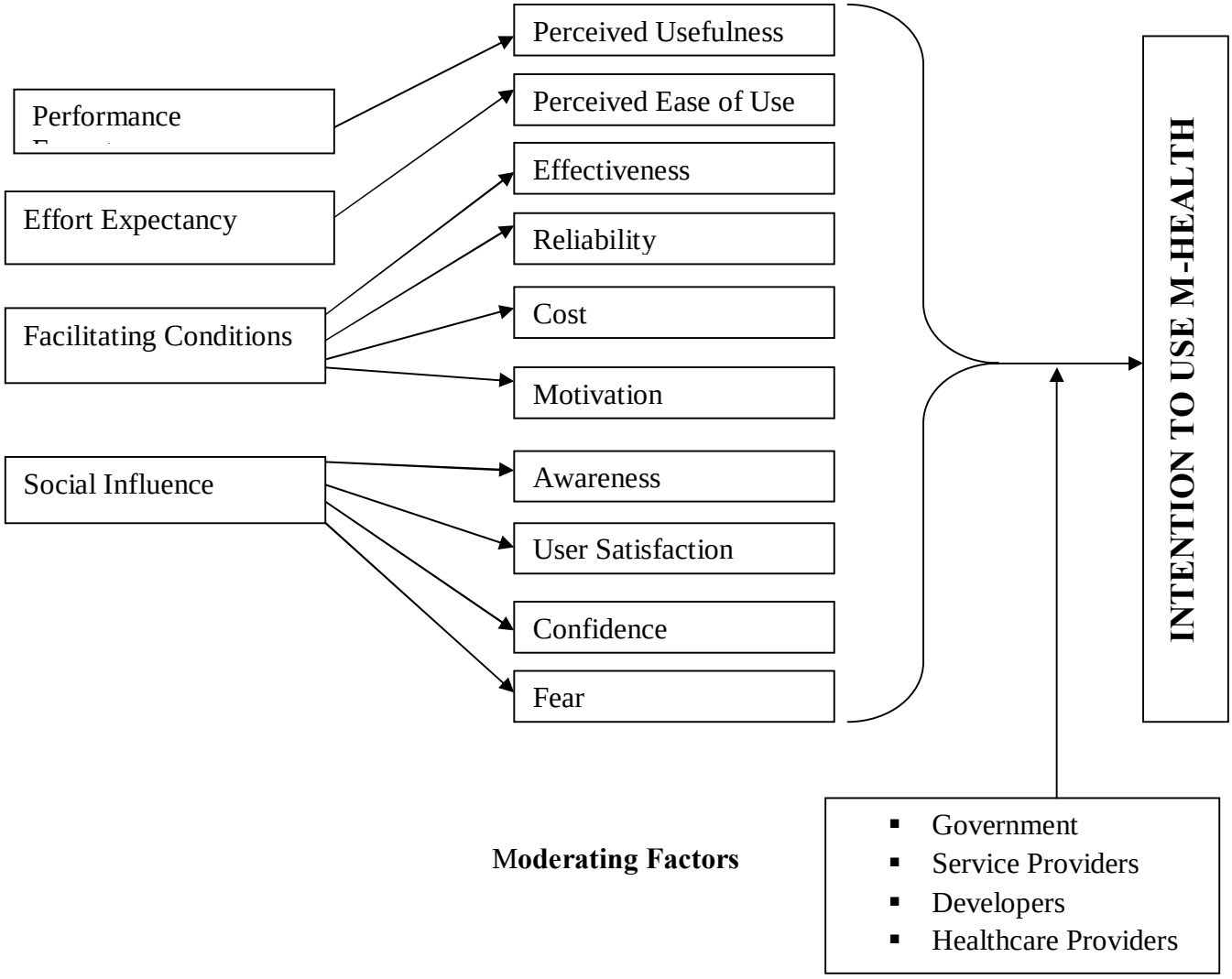


Figure 2.6 : Conceptual Framework for Mobile Health Adoption in Developing Countries

2.5.9 Definition of Constructs

Constructs	Variables	Definition	Reference
Performance Expectancy	Perceived Usefulness (PU)	This is the degree to which a person believes that using a particular technology will enhance his / her job performance.	Fred & Davis 1989
Effort Expectancy	Perceived Ease of use (PEOU)	This is the degree to which an individual believes that using a particular system will be free from effort.	Fred & Davis 1989
Social Influence	User satisfaction	This is the Perceived opinion of the user about any computer or electronic applications that they use.	Doll and Torkzadehôs 1988
	Awareness	This is peoples knowledge of the availability of m-Health technology and the services that are being offered	Choudrie and Dwivedi (2005)
Facilitating Conditions	Cost	This is the cognitive trade-off between the perceived benefit application and the monetary cost of using them.	Dodds et al 1991
	Effectiveness	This refers to the degree in which objectives are achieved and the extent in which the problem was solved.	Business Daily
	Motivation / fun	This is the pleasure that oozes out of an individual out of ease of using technology	Venkatesh and Brown 2005
	Intention to Use	This refers to the desire of an individual to use m-Health technologies now and in the future.	Davis et. al (1989)
Threat Appraisal	Confidence	**Confidence** is generally described as a state of being certain either that a hypothesis or prediction is correct or that a chosen course of action is the best or most effective	Oxford Dictionary and world English
	Fear	This is an unpleasant emotion caused by the threat of danger, pain, or harm	Oxford Dictionary and world English

2.6.0 Conceptualization of the Constructs:

Conceptualization is the process by which researchers define what they are going to study in their research work as precisely as possible. It is important to distinguish between the dependent and the dependent variables in your research. (Donald R. Cooper, 2011)

According to Cooper and Schindler (2011), ñThere is nothing very tricky about the notion of independence and dependence, but there is something tricky about the fact that the relationship between the dependence and independence is a figment of the researchers imagination until demonstrated convincingly. The researcher hypothesize the relationship of dependence and independence. They invent them and try by reality testing to see whether the relationship will work out as intended. In this research the following variables will be tested in trying to answer the objectives of the study.

2.6.1 Intention to Use

This reflects the desire to use m-Health services by the public now and in the future. Davis et al. (1989). It is the degree of willingness by the public to adopt and use m-Health technologies as an alternative method of seeking healthcare services other than the conventional one with the medical personnel. In this research we will be demonstrating the factors that directly or indirectly affect this variable.

It has been hypothesized as A1

2.6.2 Perceived Usefulness:

As defined by Fred and Davis, this is the degree to which a person believes that using a particular technology would enhance his / her job performance. It is important to asses this belief for the purpose of this study because it forms a bigger opinion about the whole idea especially to the medical practitioners.

This was hypothesized as A2.

2.6.3 User Satisfaction:

User satisfaction is a key measure to any technological success. (DeLone and Mclean 2002). Doll and Torkzadehôs defined user satisfaction as the opinion of the user about a specific computer application which can also be extended to any other technological advancement.

For m-Health to be successfully implemented in the developing countries, User satisfaction is perceived to have a substantial weight in the end result.

This has been hypothesized as A3.

2.6.4 Reliability:

It consists of three elements, namely:

- Confidentiality
- Integrity
- Availability

Confidentiality is a set of rules that limits access to information, integrity is the assurance that the information is accurate and availability is a guarantee that information will be readily available by authorized persons. In the context of m-Health, it is perceived that reliability of this technology is key component in its acceptability and diffusion to the public.

It has been hypothesized as A4

2.6.5 Cost

This is the consumersô cognitive trade-off between the perceived benefits of the applications and the monetary value they have to part with. Dodds et.al. 1991.

It is perceived that the cost of any technology have a direct impact on its usage by the consumers e.g. there is evidence that the popularity of short messaging services (SMS) in china is due to the low pricing of the SMS relative to other types of mobile internet applications. (Chan et.al. 2008)

In this research, cost has been hypothesized as A5

2.6.6 Motivation:

Motivation is defined as the fun or pleasure derived from using a technology and it has been shown to play an important role in determining technology acceptance and use. (Brown and Venkatesh 2005). Such motivation (benchmarked as perceived enjoyment)

has been found to influence technology acceptance and use directly e.g. (van der Heijden 2004; Thong et al. 2001).

Therefore motivation also plays a role in predicting consumersô behavioral intention to use a technology, and it is Hypothesized as A6

2.6.7 Effectiveness:

Effectiveness is defined as the extent in which targeted problems are solved. It is the capability of producing the desired results. In health related matters, the solutions to the customers problems is of utmost important as a small mishap can lead to catastrophic results since the lives of the consumer could be at risk. In this regard, m-Health technology must strive to achieve a high degree of effectiveness in-order to win trust among the customers. (Business Dictionary)

It has been hypothesized as A7

2.6.8 Awareness

According to Choudrie and Dwivedi (2005), this is the peoples knowledge of the availability of m-Health technology and the services that are being offered. This will play a big role in the diffusion and acceptance of m-Health technologies in the communities as it is observed that people are likely to try and finally adopt a particular service if the service is publicly advertised.

Therefore Awareness has been hypothesized as A8

2.6.9 Confidence

Confidence is generally described as a state of being certain either that a hypothesis or prediction is correct or that a chosen course of action is the best or most effective.

In this research it will be hypothesized as A9

2.7.0 Fear

This is an unpleasant emotion caused by the threat of danger, pain, or harm. When one deems his or her life to be in danger due to body ailments, their tendency to use all means possible to get out such a situation is very high and therefore use of m-health in such a scenario is not restricted and is hypothesized as 10.

2.7.1 Dependent variable:

In this research, the Intention to Use m-Health will be the dependent variable.

2.7.2 Independent variables includes:

- Intention to Use
- Perceived Usefulness
- User satisfaction
- Reliability
- Cost
- Motivation
- Effectiveness
- Awareness
- Confidence
- Fear

CHAPTER THREE: METHODOLOGY

3.0 Introduction to the research design:

Research design is the arrangement for collection and analysis of data in a manner that aims to combine relevance to the research with economy in procedure. (Kothari 2004). It is a step aimed at designing the research study in a way that the important data can be gathered and analyzed to arrive at a solution (Sekaran 2003). On receipt of the completed questionnaires, the collected data was checked for errors in responses, omissions, exaggerations and biases.

All analyses were done using Statistical Package for Social Scientist (SPSS). For easy management and longevity of the data, it was captured in Ms-Excel 2007 windows. All data was entered and verified after effective coding. Data was then scrutinized in relation to the objective of the study, otherwise with a potential abundance data; vast numbers of irrelevance summaries would be produced. Checking of Inconsistencies, anomalies, missing values, outliers (say data cleaning) was done in SPSS syntax.

Univariate statistics was used to check the missing data and make sure that the all the questions are properly filled and also monitor the pattern of the responses. To ensure that the data is normally distributed, kurtosis and measure of skeweness were used while the adequacy of the sampling technique was checked by the use of Kaiser-Meyer-Olking test. Reliability of the data used was tested using the Cronbachôs Alpha coefficient while the goodness of fit was measured by conducting construct validity. This was confirmed by the use of factor loadings of each question.

Finally the framework to be validated was subjected to wald chi square analysis and the variables that did not met the required threshold were dropped from the model.

3.1.0 Study Purpose:

The main aim of the study was to test a hypothesis that would explain the relationship between different factors that contribute to the growth of M-Health technologies in Kenya. It will also try to explain the variance between one or two dependent variables in connection with the independent variable.

3.1.1 Study Type:

This research was interested in delineating the important variables that are associated with the problem and not delineating the cause of the problem. It also tried to establish the relationships through certain types of correlation or regression analysis hence it is a correlation study.

3.1.2 Study Setting:

This study was carried out in a natural setting where the participants will be approached as they carry on their daily routines. There shall be minimal pre-planned interviews as the case may require but we will try to make it as natural as possible.

3.1.3 Unit of Analysis:

In this study, a mobile phone holder was treated as a unit. Each response was treated like an individual data source. Nairobi was designated as the testing area due to the diversity its population. Data was collected from all types people i.e. students, working class, businessmen/women, upper & low income earners in-order to get the big picture of the situation.

3.1.4 Sapling Design:

According to Kothari 2004, a sample design is a plan for obtaining a sample from a given population. It is the technique or procedures to be adopted in selecting items for the sample. In this research the data was collected from the whole population and thereafter segmented into five different categories according to their Age, Gender, Level of education, Income status and Occupation. This was to enable the researcher to draw a more comprehensive analysis on the subject question. The following points were considered when doing the sampling.

a. The nature of the study
b. The objective of the study
c. The size of the population to be studied
d. The time available and cost of obtaining the samples
e. The accessibility of the study element.

In-order to ensure a high degree of representation of the sample size, probability sampling was used. In this method the elements are selected randomly and the probability of an element being selected is equal.

3.1.5 Developing Research Instruments for data collection and Procedures

The data that was used in this study came from the questionnaires administered to the public. The questionnaire was structured in a way that each question addressed specific objective of the study. Preliminary personal interviews was conducted within the university to get a general picture on which questions are to be included in the questionnaire and how they are to be structured.

3.1.6 Advantages of Using Questionnaires for Data Collection

- It is cost efficient and time saving hence it can be administered to a large population which makes it possible to have sufficient data for testing and validating the hypothesis.
- It requires less skills to administer compared to personal interviews
- Unlike personal interviews, questionnaires are free from bias from the interviewer Kothari (2004)

3.1.7 Disadvantages of using questionnaires

- Some questionnaires can be returned without being properly filled
- It can take long before getting feedback from the respondents as they takes their own time to fill up the questionnaire.
- It is difficult to measure the honesty and accuracy of the answers that are provided in the questionnaire.

To enhance the response rate, the following strategy will be followed when designing the questionnaire.

i) An introduction of the research question will be provided in section one

ii) Easy to answer questions will be posed at the first section to encourage participation and arouse their curiosity.

iii) Sensitive questions will be introduced at a later stage when the respondents are already in the mood of filing the questionnaire.

3.1.8 Data Analysis:

Once data is collected, it was fed into the computer for refinement and using various qualitative and quantitative techniques, it was analyzed for interpretation. At this stage it was easy to study patterns of the various responses and use them to make conclusions on whether the hypothesis being tested has been proven or not. Methods such as mean, mode, regression analysis were employed in the data analysis stage.

3.1.9 Likert Scale in measuring attitude.

Likert scale was developed by Rensis Likert in 1932 and it requires an individual to make a decision on their level of agreement. The number assigned to each response becomes the value of that response and the total score is obtained by adding the values for each response. Attitude is an important element when trying to understand and predict peoples reaction to an object or change of technology and how behavior can be influenced .(Fishbein, 1975) In this research the scale was used in measuring the attitudinal aspects of the study and questions were posed for the respondents to gauge themselves on the degree to which they agree or disagree to the statements described in the questionnaire.

3.2.0 Time Horizon of the study:

The research was deemed to be a one shot or cross-sectional study as it aims at collecting data once over a period of not more than one month in-order to answer the research questions.

3.2.1 Sample size:

This refers to the size of the population that is going to be used in the research. For generalisibility, sample size and sample design are important. (Sekaran, 2003)

According to Kothari 2004, factors such as proposed classes, nature of the study, sampling techniques, nature of the universe , accuracy standards should be put into consideration for the purpose determining the sample. In this regard, he proposed two methods for determining the sample size.

a. Use of Bayesian statistics to weigh the cost of additional information against the expected value of the information added.
b. Specifying the precision of estimation desired and using it to determine the sample size required to insure it.

In this research, the first method was used.

The following formula will be applied to determine the sample size.

$$n = \frac{z^2 .pq. N}{e2 .(N-1)+z2 .p.q}$$

where:

N = size of the population

n= sample size

e= margin of error / precision

z =standard variant at a given confidence level

p = the proportion of the population estimated to have characteristics being measured

q = 1-p

In this research, the population of Nairobi was used as a representative of the whole country due to its dynamic in terms of culture, tribe, social status e.tc. According to the census survey done by Kenya National Bureau of Statistics (KNBS) 2009, Nairobi is estimated to have a population of about 4 million people. This represents 9.524% of the population.

In-order to determine the standard variant, usually precision refers to 95% confidence level of the true value that particular effect. By using tables of normal probabilities, the z value for the 95%confidence level is 1.96.

The precision of our research is estimated to be + or ï 5% and therefore;

z = 1.96, e=0.05

Hence

P = 0.09524

N= 4000, 0000

q=1-p=(1-0.09524)= 0.90476

z=1.96 , e-=0.05

therefore estimated sample size is

$$\frac{1.96^2 \text{ X } 0.09524 \text{ X } 0.90476 \text{ X } 4000,000}{}$$

0.05^2 X(4000000-1) + 1.96^2 X 0.09524 X 0.90476

132.2 = approximately 132 people.

3.3.0 Data Management

3.3.1 Data editing and coding

Analysis was descriptive in nature (Corder and Foreman, 2009), descriptive statistics is aimed at identifying the pattern of the data and consistency of the responses in each of the results from the survey. The following tests were conducted to authenticate the data collected and provide room for further statistical analysis.

3.3.2 Missing data Analysis

Responses from questionnaires were filtered and only completely filled questionnaires were used in analysis. Missing value analysis produced the following output.

Table 3.1 :Univariate Statistics

	N	Mean	Std. Deviation	Missing		No. of Extremes[b]	
				Count	Percent	Low	High
q1i	129	4.33	.700	0	.0	0	0
q1ii	129	4.34	.690	0	.0	0	0
q1iii	129	3.79	.747	0	.0	0	0
q1iv	129	3.92	.787	0	.0	0	0
q2i	129	4.07	.575	0	.0	.	.
q2ii	129	4.47	.501	0	.0	0	0
q2iii	129	4.27	.569	0	.0	0	0
q3i	129	2.45	1.352	0	.0	0	0
q3ii	129	4.41	.607	0	.0	0	0
q3iii	129	3.66	.956	0	.0	0	0
q4i	129	4.53	.501	0	.0	0	0
q4ii	129	4.33	.473	0	.0	0	0
q4iii	129	1.33	.470	0	.0	0	0
q5i	129	4.40	.492	0	.0	0	0
q5ii	129	4.26	.713	0	.0	0	0
q5iii	129	4.32	.718	0	.0	0	0
q5iv	129	3.72	.760	0	.0	0	0
q6i	129	4.08	.735	0	.0	0	0
q6ii	129	4.04	.592	0	.0	.	.
q6iii	129	4.50	.502	0	.0	0	0
q7i	129	4.28	.586	0	.0	0	0
q7ii	129	2.64	1.362	0	.0	0	0
q7iii	129	4.30	.607	0	.0	0	0
q7iv	129	3.57	.974	0	.0	0	0
q8i	129	4.58	.495	0	.0	0	0
q8ii	129	4.35	.478	0	.0	0	0
q8iii	129	1.38	.487	0	.0	0	0
q9i	129	4.46	.500	0	.0	0	0
q9ii	129	4.28	.586	0	.0	0	0
q9iii	129	3.61	.963	0	.0	0	0
q10i	129	4.61	.489	0	.0	0	0
q10ii	129	4.34	.476	0	.0	0	0
q11	129	1.73	.446	0	.0	0	0
q12	129	2.82	1.011	0	.0	0	0
q13	129	2.32	.800	0	.0	0	0
q14	129	2.98	1.265	0	.0	0	0
q15	129	.38	.487	0	.0	0	0

	N	Mean	Std. Deviation	Missing		No. of Extremes[b]	
				Count	Percent	Low	High
q1i	129	4.33	.700	0	.0	0	0
q1ii	129	4.34	.690	0	.0	0	0
q1iii	129	3.79	.747	0	.0	0	0
q1iv	129	3.92	.787	0	.0	0	0
q2i	129	4.07	.575	0	.0	.	.
q2ii	129	4.47	.501	0	.0	0	0
q2iii	129	4.27	.569	0	.0	0	0
q3i	129	2.45	1.352	0	.0	0	0
q3ii	129	4.41	.607	0	.0	0	0
q3iii	129	3.66	.956	0	.0	0	0
q4i	129	4.53	.501	0	.0	0	0
q4ii	129	4.33	.473	0	.0	0	0
q4iii	129	1.33	.470	0	.0	0	0
q5i	129	4.40	.492	0	.0	0	0
q5ii	129	4.26	.713	0	.0	0	0
q5iii	129	4.32	.718	0	.0	0	0
q5iv	129	3.72	.760	0	.0	0	0
q6i	129	4.08	.735	0	.0	0	0
q6ii	129	4.04	.592	0	.0	.	.
q6iii	129	4.50	.502	0	.0	0	0
q7i	129	4.28	.586	0	.0	0	0
q7ii	129	2.64	1.362	0	.0	0	0
q7iii	129	4.30	.607	0	.0	0	0
q7iv	129	3.57	.974	0	.0	0	0
q8i	129	4.58	.495	0	.0	0	0
q8ii	129	4.35	.478	0	.0	0	0
q8iii	129	1.38	.487	0	.0	0	0
q9i	129	4.46	.500	0	.0	0	0
q9ii	129	4.28	.586	0	.0	0	0
q9iii	129	3.61	.963	0	.0	0	0
q10i	129	4.61	.489	0	.0	0	0
q10ii	129	4.34	.476	0	.0	0	0
q11	129	1.73	.446	0	.0	0	0
q12	129	2.82	1.011	0	.0	0	0
q13	129	2.32	.800	0	.0	0	0
q14	129	2.98	1.265	0	.0	0	0
q15	129	.38	.487	0	.0	0	0

3.3.3 Multivariate Normality Analysis

To check for normality, skewness and kurtosis values were employed. Skewness value of 1 indicates moderate skewness while kurtosis values of 1-10 indicate moderate normality. From the results below none of skewness were above 1 and none of kurtosis value was above 10. Therefore the data could be assumed to be almost normally distributed.

Table 3.2: Multivariate Normality Analysis

		Statistic	Std. Error
I believe using m-health will improve my health status	Mean	4.33	.062
	Skewness	-.566	.213
	Kurtosis	-.810	.423
I perceive m-health as a complimentary in my health matters	Mean	4.34	.061
	Skewness	-.568	.213
	Kurtosis	-.772	.423
I intend to continue using m-health now and in the future	Mean	3.79	.066
	Skewness	.362	.213
	Kurtosis	-1.125	.423
I will strongly recommend someone to use m-health	Mean	3.92	.069
	Skewness	.138	.213
	Kurtosis	-1.367	.423
I am able to mobile phone to access health information easily	Mean	4.07	.051
	Skewness	.004	.213
	Kurtosis	.047	.423
I am able to use mobile health to access health care wherever I want	Mean	4.47	.044
	Skewness	.142	.213
	Kurtosis	-2.011	.423
In general I donôt encounter any problem whenever I want to use mobile phone to access health information	Mean	4.27	.050
	Skewness	-.058	.213
	Kurtosis	-.467	.423
I am able to get health information through my mobile phone whenever I need	Mean	2.45	.119
	Skewness	.407	.213
	Kurtosis	-1.289	.423
I have confidence in the information that I gets from through the mobile phone	Mean	4.41	.053
	Skewness	-.501	.213
	Kurtosis	-.620	.423
I perceives the information that I gets	Mean	3.66	.084

through mobile health to be private and confidential	Skewness	-.247	.213
	Kurtosis	-.842	.423
I intend to use mobile phone to access healthcare if it is not expensive	Mean	4.53	.044
	Skewness	-.110	.213
	Kurtosis	-2.019	.423
I intend to use mobile phone to access healthcare irrespective of the cost	Mean	4.33	.042
	Skewness	.715	.213
	Kurtosis	-1.512	.423
I will not use mobile phone for accessing health care matters if the cost is high	Mean	1.33	.041
	Skewness	.753	.213
	Kurtosis	-1.455	.423
I use mobile phone for accessing health information because it is cheap	Mean	4.40	.043
	Skewness	.400	.213
	Kurtosis	-1.869	.423
I use mobile phone for accessing health information because it am offered support whenever I am stranded	Mean	4.26	.063
	Skewness	-.434	.213
	Kurtosis	-.943	.423
I use mobile phone to access health information because it is fast	Mean	4.32	.063
	Skewness	-.559	.213
	Kurtosis	-.889	.423
I am motivated to use mobile health through the internet because it is easily accessible	Mean	3.72	.067
	Skewness	.519	.213
	Kurtosis	-1.092	.423
I use mobile phone to access mobile health because it is accurate	Mean	4.08	.065
	Skewness	-.123	.213
	Kurtosis	-1.129	.423
I use mobile phone to access health information because I trust the information	Mean	4.04	.052
	Skewness	-.008	.213
	Kurtosis	-.090	.423
I would strongly recommend someone to use mobile phone in accessing healthcare information	Mean	4.50	.044
	Skewness	-.016	.213
	Kurtosis	-2.031	.423
I intend to use mobile phone to access health information since I am well informed about it	Mean	4.28	.052
	Skewness	-.142	.213
	Kurtosis	-.523	.423
I donât intend to use mobile phone to access	Mean	2.64	.120

healthcare even though I am well informed about it	Skewness	.201	.213
	Kurtosis	-1.404	.423
I would like to be well informed about the use of mobile phone in accessing health information	Mean	4.30	.053
	Skewness	-.262	.213
	Kurtosis	-.606	.423
People who are important to me thinks I should M-health in solving my health issues	Mean	3.57	.086
	Skewness	-.082	.213
	Kurtosis	-.966	.423
When I use m-health, I am able to get all the information that I need	Mean	4.58	.044
	Skewness	-.334	.213
	Kurtosis	-1.919	.423
Using m-health to access healthcare information is enjoyable to me	Mean	4.35	.042
	Skewness	.642	.213
	Kurtosis	-1.613	.423
Getting health information that I need through the phone is easy to me	Mean	1.38	.043
	Skewness	.501	.213
	Kurtosis	-1.777	.423
I have confidence in the information that I get through m-health information	Mean	4.46	.044
	Skewness	.173	.213
	Kurtosis	-2.001	.423
I would recommend someone to use m-health since it is helpful	Mean	4.28	.052
	Skewness	-.142	.213
	Kurtosis	-.523	.423
I am always at-ease when using mobile phone to access healthcare information	Mean	3.61	.085
	Skewness	-.112	.213
	Kurtosis	-.929	.423
I would resort into using m-health incase my life is in danger	Mean	4.61	.043
	Skewness	-.467	.213
	Kurtosis	-1.810	.423
I wonât use mobile health unless my health deteriorates	Mean	4.34	.042
	Skewness	.678	.213
	Kurtosis	-1.564	.423
	Skewness	-.003	.213
	Kurtosis	-1.116	.423

3.3.4 Sampling Adequacy

The next table was used to test assumptions of sampling adequacy; essentially, the Kaiser-Meyer-Olking (KMO) statistic should be greater than 0.600 and the Bartlett's test should be significant (e.g. $p < .05$). KMO is used for assessing sampling adequacy and evaluates the correlations and partial correlations to determine if the data are likely to coalesce on factors (i.e. some items highly correlated, some not). The Bartlett's test evaluates whether or not our correlation matrix is an identity matrix (1 on the diagonal & 0 on the off-diagonal). The off-diagonal values of our correlation matrix are NOT zeros, therefore the matrix is NOT an identity matrix.

Table 3.3 : KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.			.724
Bartlett's Test of Sphericity		Approx. Chi-Square	35.718
		Df	916
		Sig.	.002

3.3.5 Reliability Test

Reliability can be defined as the degree to which measurements are free from error and therefore, yield consistent results (Mitchell, 1996). In other words, reliability concerns the extent to which an experiment, test, or any measuring procedure yields the same results on repeated trials (Carmines and Zeller, 2009). The reliability (internal consistency) of the collected data in this study was assessed by calculating the Cronbachôs Alpha coefficient. Although several measures of reliability can be ascertained in order to establish the internal consistency of an instrument, this method is considered to be the most general form of reliability estimation (Nunnally, 2008). In this method reliability is operationalized as internal consistency, which is the degree of interï correlations among the items that constitute a scale.

An alpha value of 0.60 and 0.70 or above is considered to be the criteria for demonstrating internal consistency of new scales and established scales respectively. Table 4.1 shows each main constructôs related Cronbach Alpha and accordingly internal

consistencies of main constructs of the model were considered acceptable since the Cronbachôs Alpha related to each of them exceeded 0.70, confirming satisfactory reliability.

Table 3.4 : Reliability Test

Item	N of Items	Cronbach's Alpha
Perceived Usefulness	4	.827
Perceived Ease of use	3	.744
Reliability	3	.840
Cost	3	.864
Motivation	4	.727
Effectiveness	3	.927
Awareness / Peer Influence	4	.844
User Satisfaction	3	.880
Confidence	3	.894
Fear	2	.791

3.3.6 Validity

Validity is defined as the extent to which data collection method or methods accurately measure what they were intended to measure (Saunders and Thornhill, 2003). In other words, validity concerns whether the measured concept represents the intended concept (Swanborn, 2007). The two elements, convergent validity and discriminant validity, are components of a larger scientific measurement concept known as construct validity (Straub et al., 2004). These two validities capture some of the aspects of the goodness of fit of the measurement model (Gefen and Straub, 2005).

Convergent validity is shown when each measurement item correlates strongly with its assumed theoretical construct. To assess convergent validity, every measurement item loading should be examined. A measurement item loads highly if its loading coefficient is above 0.60 and does not load highly if the coefficient is below 0.40 (Hair et al., 2008). Table 4.2 shows each main measurement itemôs loading and accordingly convergent validity of main constructs of the model were considered acceptable since the loadings exceeded 0.80, confirming satisfactory convergent validity.

Table 3.5 : Factor Loadings

Construct	Indicator	Loading
Perceived Usefulness	PU1	0.973200
	PU2	0.991700
	PU3	0.985600
	PU4	0.826000
Perceived Ease of use	PE1	0.892600
	PE2	0.872800
	PE3	0.848700
Reliability	R1	0.909500
	R2	0.966300
	R3	0.962000
Cost	C1	0.937500
	C2	0.835500
	C3	0.824100
Motivation	M1	0.887400
	M2	0.872500
	M3	0.885500
	M4	0.849000
Effectiveness	E1	0.800200
	E2	0.850900
	E3	0.911400
Awareness / Peer Influence	A1	0.907500
	A2	0.918400
	A3	0.890700
	A4	0.866200
User Satisfaction	US1	0.826000
	US2	0.872800
	US3	0.909500
Confidence	Co1	0.892600
	C02	0.848700
	C03	0.824100
Fear	F1	0.887400
	F2	0.885500

3.3.7 Wald Chi Square was used to determine the Framework to be tested.

In the table below Variables in the equation and their regression coefficients and odds ratios are given. Wald Chi-Square statistic, which tests the unique contribution of each predictor, in the context of the other predictors while holding them constant, was also given hence eliminating any overlap between the predictors. It was noted that all the predictor variables meet the conventional 0.05 standard for statistical significance except fear and Motivation

3.4 Results Findings and analysis:

3.4.1 Demographic Data of the respondents

Table 4.1 presents the gender of the respondents who participated in the study. Majority of the respondent (63%) were females whereas 37% of the respondent were males, this is an indication that both genders were involved in this study and thus the finding of the study did not suffer from gender bias**.**

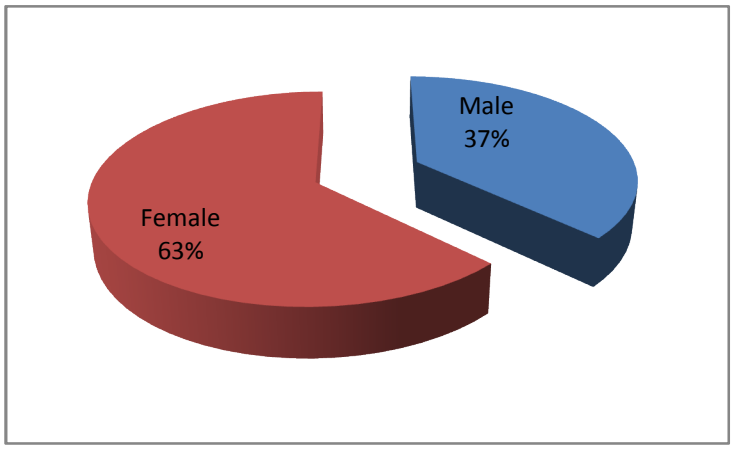
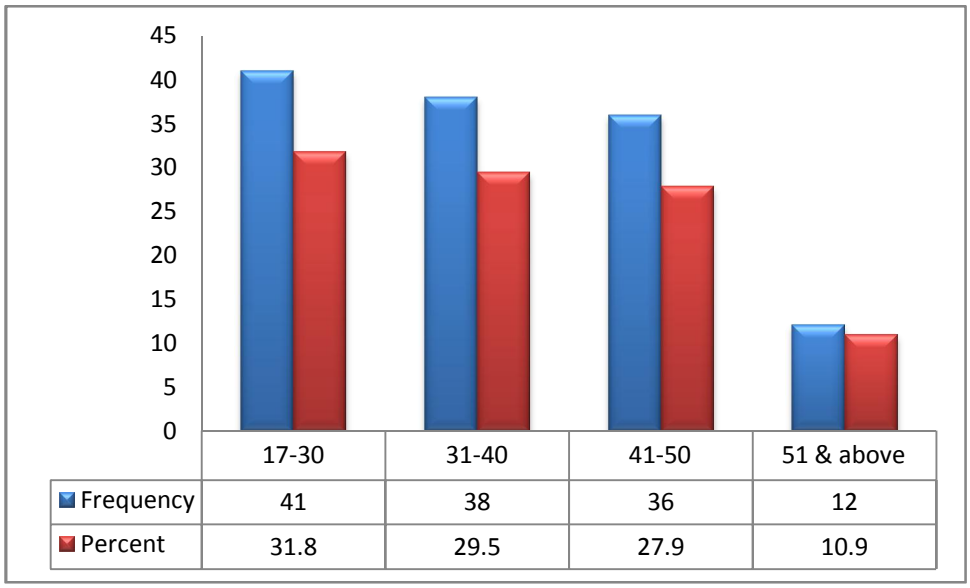


Figure 3.1 : Gender of the Respondents

Majority of the respondents (31.8%) were aged 17 to 30 years while the minorities (10.9%) were 51 years and above. These results shows that the study sample was sensitive to the age of the respondents capturing opinions across all the age groups.



	17-30	31-40	41-50	51 & above
Frequency	41	38	36	12
Percent	31.8	29.5	27.9	10.9

Figure 3.2: Age of the Respondents

Most of the study respondents (53%) were in formal employment while 26% were students and the remainder 21% were in business.

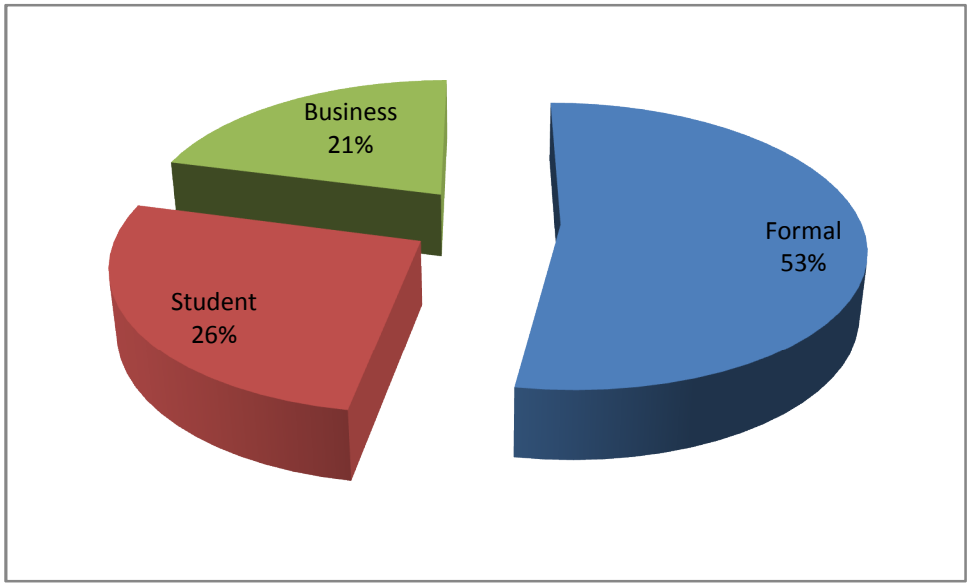


Figure 3.3: Occupation of the Respondents

Respondents were asked to state the amount of money they made every month and majority (31%) were earning above forty thousand a month while the minority (9%) earned less than ten thousands a month.

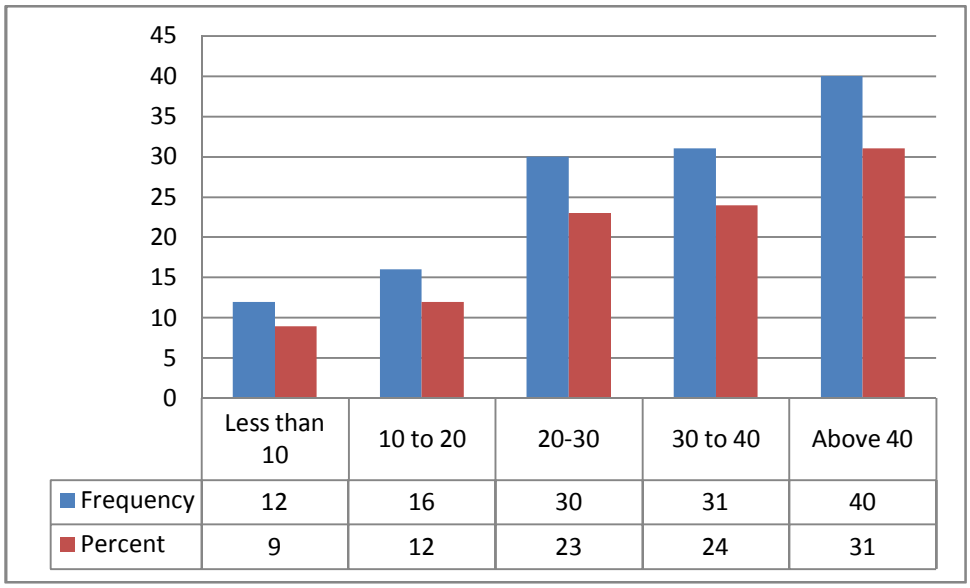


Figure 3. 4: Monthly income ('000'KSh)

3.4.2 Use of mobile devices to access health data and factors that influence the usage.

To assess the usage of mobile devices to access m-health information, respondents were asked to state whether they had used m-health before where majority (62%) reported not to have used the service.

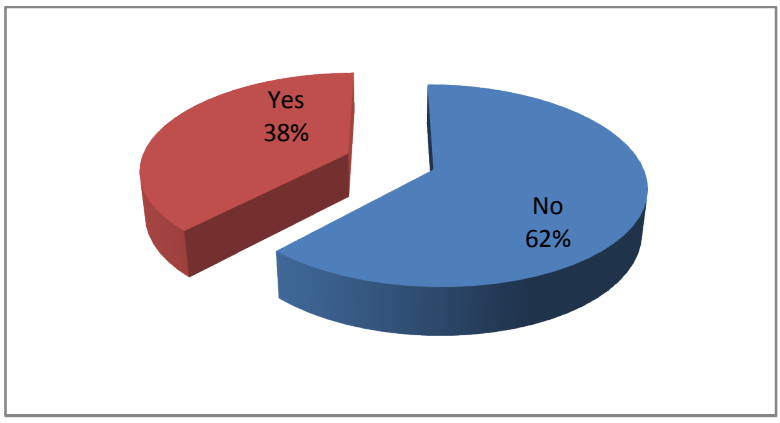


Figure 3. 5: Have you ever used m-health

To assess the perceived usefulness of m-health respondents were presented with four statements on a likert scale and asked to state how much they agreed with the statements. Most of the respondents (87%) agreed they believe using m-health will improve their health status while 88% of the respondents agreed to the statement that they perceive m-health as a complimentary in their health matters. However 40% of the respondents were

indifferent on the statement that they intend to continue using m-health now and in the future while 65% agreed that they would strongly recommend someone to use m-health.

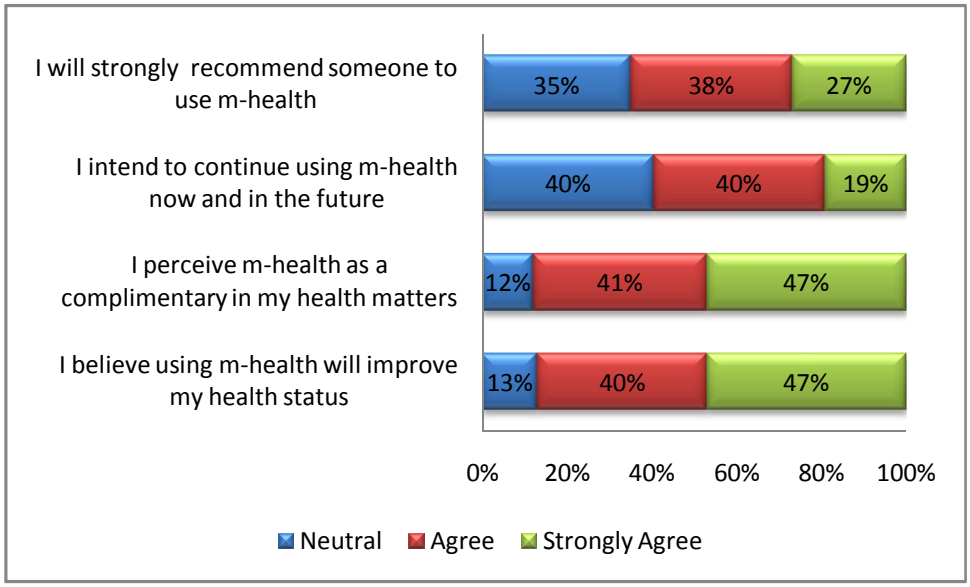


Figure 3. 6: Perceived Usefulness

To assess the perceived ease of use of m-health respondents were presented with three statements on likert scale and asked to state how much they agreed with the statements. Most of the respondents (73%) disagreed with the statement that they are able to use mobile phone to access health information easily. Half of the respondents agreed with the statement that they are able to use mobile health to access health care wherever they want. In addition, most of the respondents (80%) disagreed with the statements that in general they donôt encounter any problem whenever they want to use mobile phone to access health information.

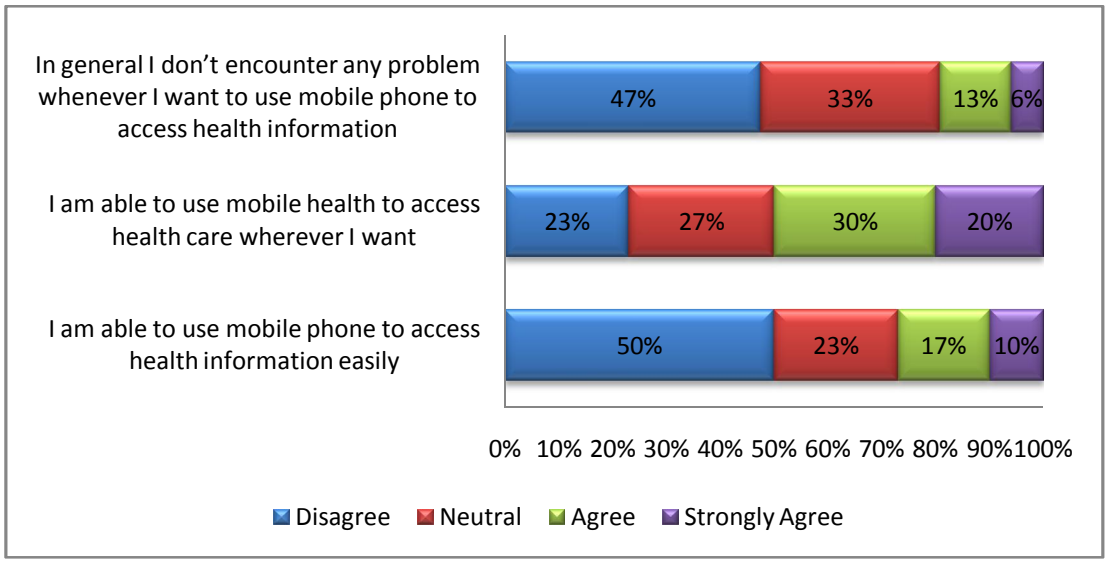


Figure 3. 7: Perceived Ease of use

To assess confidence of m-health use respondents were presented with three statements on likert scale and asked to state how much they agreed with the statements. Most of the respondents agreed to the statements that they have confidence in the information that they get through M-health and they would recommend someone to use m-health since it is helpful. However (44%) of the respondents disagreed with the statement that they are always at-ease when using mobile phone to access healthcare information.

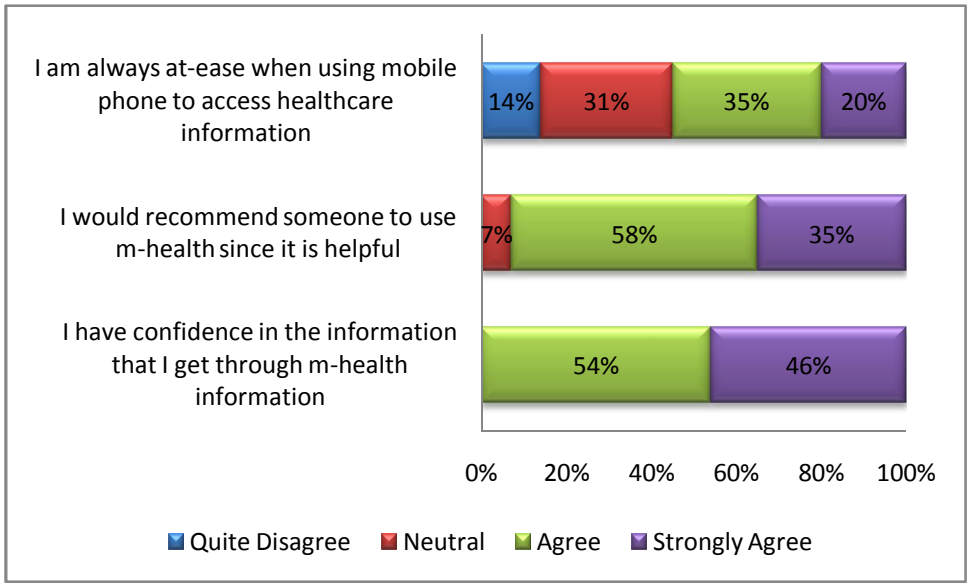


Figure 3.8: Confidence

To assess the awareness/peer influence of m-health respondents were presented with four statements on likert scale and asked to state how much they agreed with the statements. Most of the respondents (93%) agreed that they intend to use mobile phone to access health information since they are well informed about it. In contrast most of the respondents (92%) agreed to the statement that they would like to be well informed about the use of mobile phone in accessing health information.

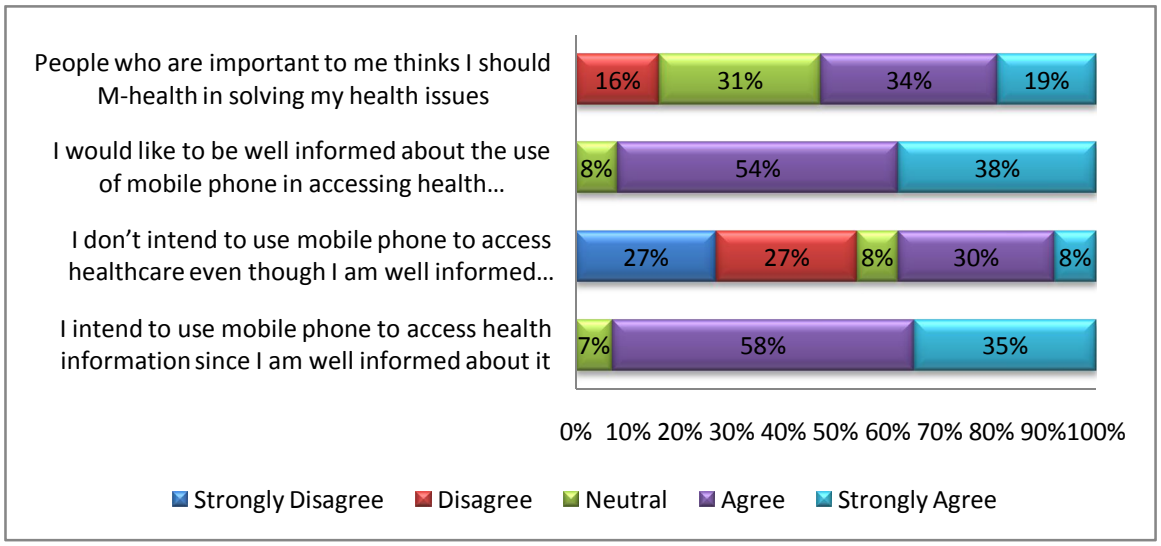


Figure 3. 9: Awareness/Peer Influence

Fear was assessed using two statements where more than half of the respondents were observed to agree with both statements i.e. They would resort into using m-health incase their life is in danger and they wonâ t use mobile health unless their health deteriorates.

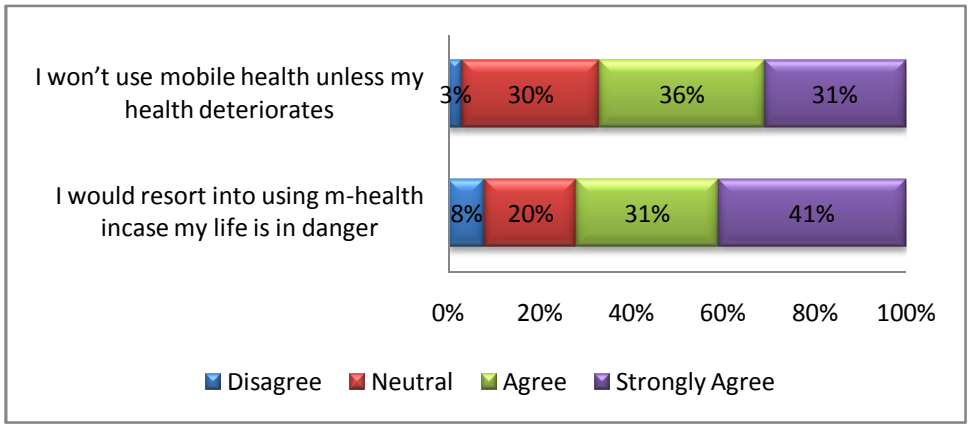


Figure 3.10: Fear

To assess effectiveness, three survey statements were used. Most of the respondents agreed with the three statements i.e. they use mobile phone to access mobile health because it is accurate, they use mobile phone to access health information because they trust the information and that they would strongly recommend someone to use mobile phone in accessing healthcare information.

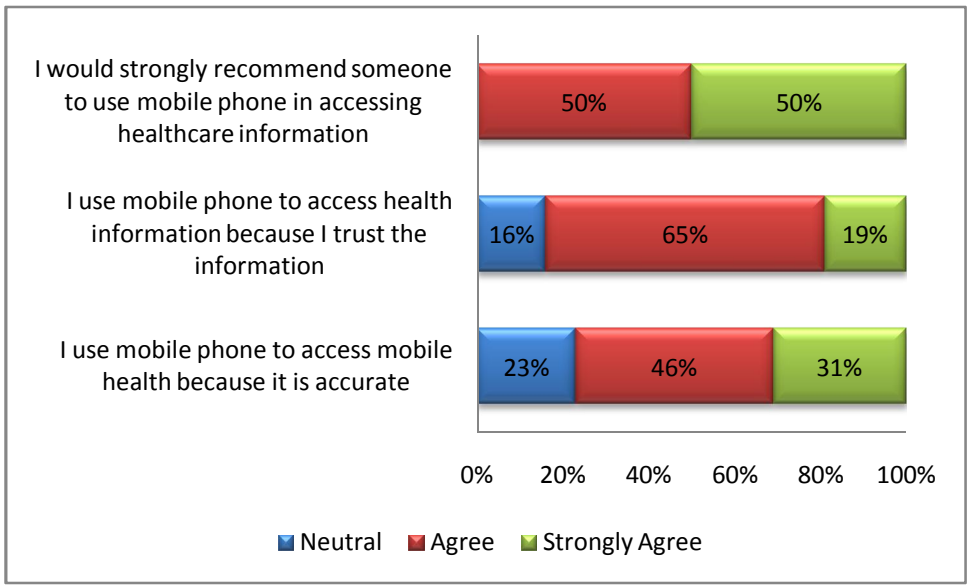


Figure 3.11: Effectiveness

3.4.3 Challenges in mobile usage in accessing health data

To assess challenges in mobile usage in accessing health data five factors each with several statements on five point likert scale were used including; cost, reliability, motivation and User Satisfaction.

To assess user satisfaction of m-health respondents were presented with three statements on likert scale and asked to state how much they agreed with the statements. Most of the respondents agreed to the statements that when they use m-health, they are able to get all the information that they need and using m-health to access healthcare information is enjoyable to them. However, half of the respondents disagreed that getting health information that they need through the phone is easy to them.

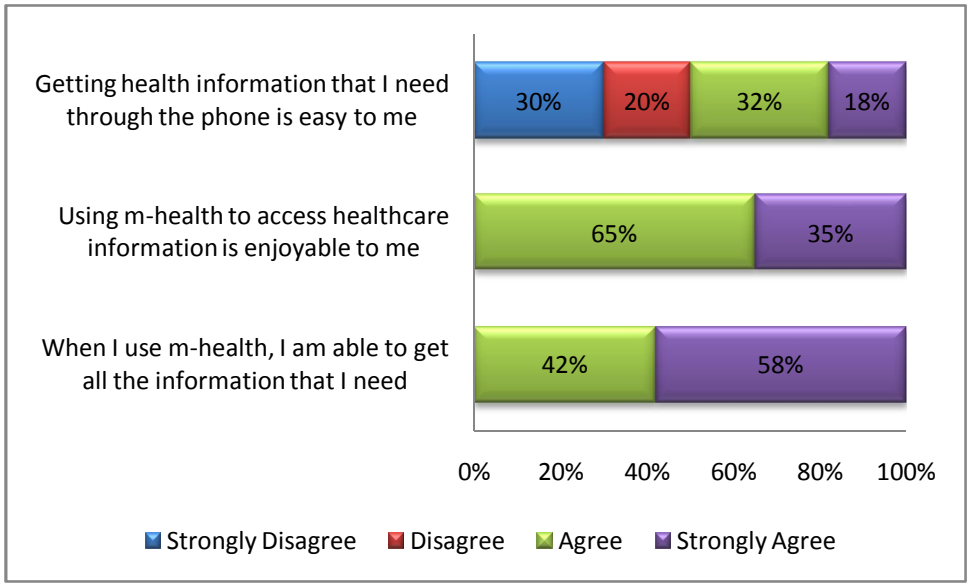


Figure 3.12: User Satisfaction

Cost was assessed using three statements where all the respondents agreed with the statements that they intend to use mobile phone to access healthcare if it is not expensive. On the other hand more than half of the respondents disagreed with the statements that they intend to use mobile phone to access healthcare irrespective of the cost and they will not use mobile phone for accessing health care matters if the cost is high

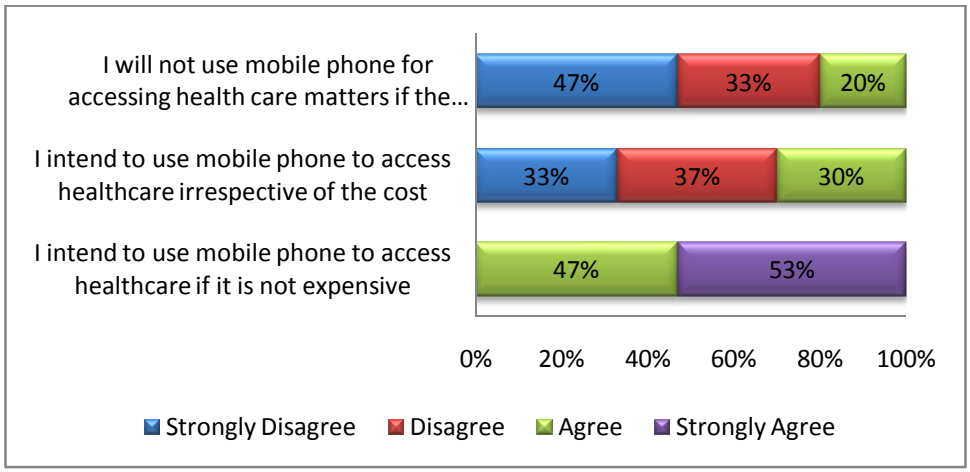


Figure 3.13 Cost

On reliability three statements were employed where most of the respondents agreed to the statements that they perceive the information that they get through mobile health to be private and confidential and that they have confidence in the information that they get through the mobile phone. On the other hand majority of the respondents disagreed with the statement that they are able to get health information through their mobile phone whenever they need.

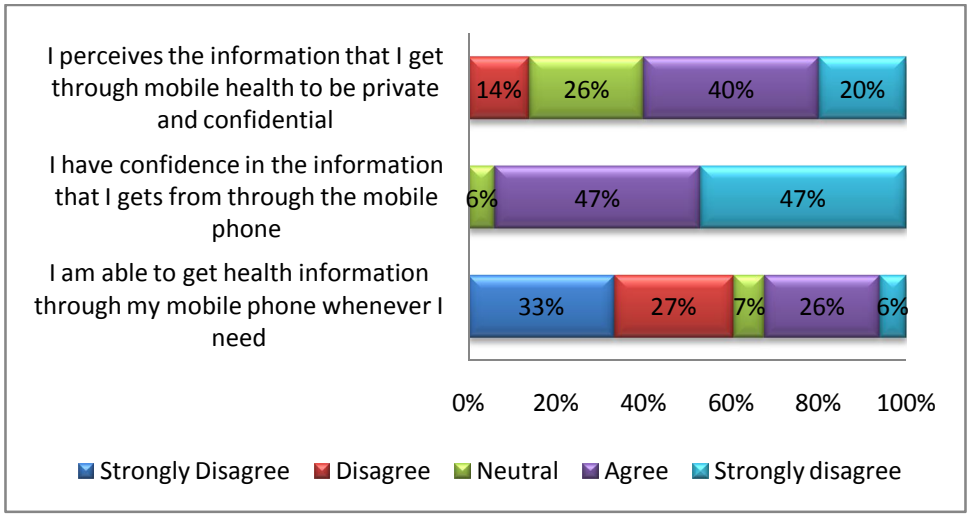


Figure 3.14: Reliability

Four statements were used to measure effect of motivation on m-health use. Most of the respondents agreed with the statements that they use mobile phone for accessing health information because it is cheap, and that they use mobile phone for accessing health information because they are offered support whenever they are stranded and that they

use mobile phone to access health information because it is fast. However, almost half the respondents (47%) disagreed with the statement that they are motivated to use mobile health through the internet because it is easily accessible.

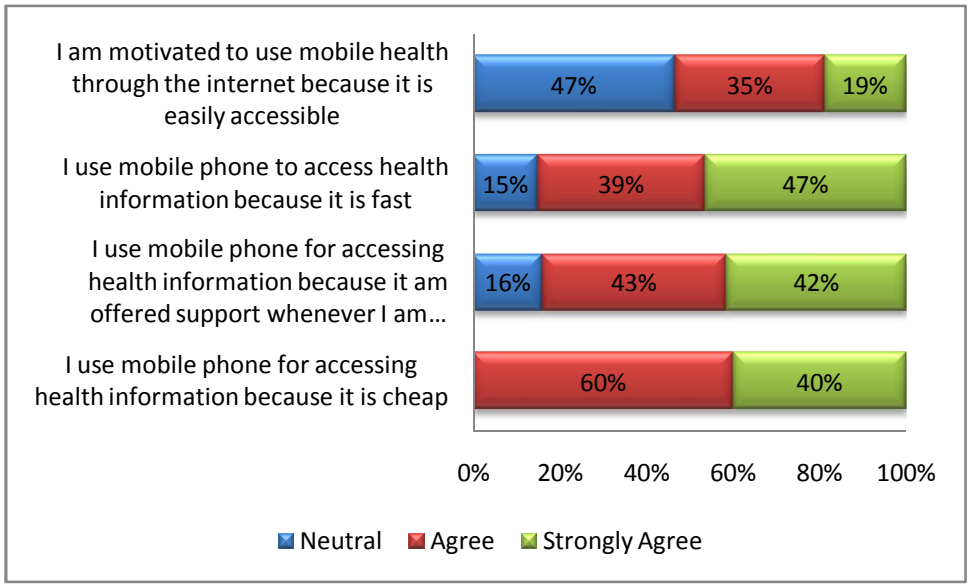


Figure 3.15: Motivation

Table 3.6 : Wald Chi Square summary

	B	S.E.	Wald	Df	Sig.	Exp(B)
Perceived Usefulness	.216	.356	.367	1	.044	1.240
Perceived Ease of use	.165	.393	.028	1	.038	.937
Reliability	.644	.377	2.908	1	.028	1.903
Cost	.029	.396	.005	1	.042	1.029
Motivation	.459	.297	2.389	1	.122	.632
Effectiveness	.116	.256	.467	1	.024	1.122
Awareness/Peer Influence	.365	.383	.328	1	.018	1.441
User Satisfaction	.654	.317	.908	1	.008	1.923
Confidence	.359	.326	1.105	1	.022	1.432
Fear	.659	.397	2.749	1	.122	1.933

The 1.240 odds ratio for Perceived Usefulness indicates that the odds of using m-health are increased by more than 100% for each one point increase in respondentôs Perceived Usefulness score. Perceived Ease of use effect is smaller, with a one point increase on the five-point Perceived Ease of use scale being associated with the odds of using m-health increasing by a multiplicative factor of .937. The 1.903 odds ratio for Reliability indicates that the odds of using m-health are increased by almost double for each point increase in respondentôs reliability score.

The 1.029 odds ratio for Cost indicates that the odds of using m-health are increased by more than 100% for each one point increase in respondentôs Cost score. The .632 odds ratio for Motivation indicates that the odds of using m-health are more than half for each one point increase in respondentôs Motivation score. Inverting this odds ratio for easier interpretation, for each one point increase on the Motivation scale there was a doubling of the odds that the respondent would not have used m-health. The 1.221 odds ratio for Effectiveness indicates that the odds of using m-health are increased by more than 100% for each one point increase in respondentôs Effectiveness score. The 1.441 odds ratio for Awareness/Peer Influence indicates that the odds of using m-health are increased by more than 100% for each one point increase in respondentôs Awareness/Peer Influence score. The 1.923 odds ratio for User Satisfaction indicates that the odds of using m-health are

increased by more than 100% for each one point increase in respondentôs User Satisfaction score. The 1.432 odds ratio for Confidence indicates that the odds of using m-health are increased by more than 100% for each one point increase in respondentôs Confidence score. The 1.933 odds ratio for Fear indicates that the odds of using m-health are increased by almost double for each one point increase in respondentôs Fear score but its significance score in relation to the rest of the variables was low.

The model below was arrived at after the above analysis.

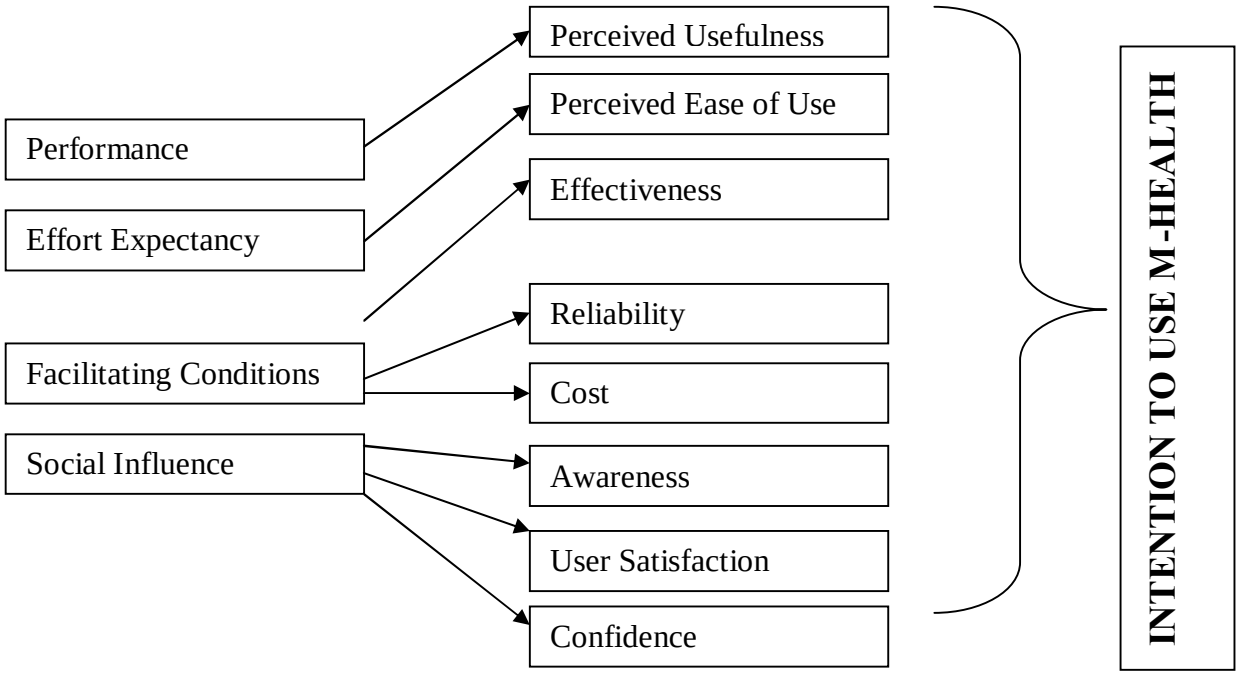


Figure: 3.16: Proposed Mobile Health Adoption Framework for Developing Countries.

CHAPTER FOUR: VALIDATION O THE FRAMEWORK

4.1 : Preamble

Qualitative and quantitative data were collected by use of a questionnaire. The number of respondents who participated in this survey and completely filled the questionnaire totaled to 129 out of the targeted 150 which translates to 88.0% response rate. All analyses were done using the Statistical Package for Social Scientists (SPSS version 20). For easy management and longevity of the data, it was captured in Ms-Excel. All data were entered and verified after effective coding. This chapter covers the process of validating the proposed framework and it involves more of qualitative analysis.

Binary regression analysis was used in the process of validating the framework and the first test was to determine the perception people have regarding m-health and whether they have any intention of adopting the technology naturally without any influence of the independent variables. This was done in-order to have a standard measure on the score of the various variables that has been proposed in the model in relation to the dependent variable. Omnibus Chi square analysis was done to test the null hypothesis i.e. to negate the assumptions that there is a direct relationship between the dependent variable and the independent variables in the model whose score did not meet the conventional threshold of 5% in significance score.

In the final analysis, two tests were conducted to give the final score of the model within the SPSS framework and they were found satisfactory. These were Cox & Snell R Square analysis which gave a score of 64.2% of the explanatory power and Nagelkerke R Square which gave a score of 75% score of the model output.

4.2. Validation of the framework:

Binary Logistic regression analysis was conducted to predict the probability that a participant would report to have the intention of using m-health. The dependant variable for this study is ñI intend to m-healthò which will be measured by a binary (Yes/no) question.

The predictor variables were perceived usefulness, perceived ease of use, reliability, cost, motivation, effectiveness, awareness/peer influence, user satisfaction, confidence and fear. A regression model predicting the logit, i.e., the natural log of the odds of having used m-health or not was conducted.

The Table below displays output for a model that includes only the intercept (which SPSS calls the constant). Given the base rates of the two options (yes=1 and no=0) 38.6 percent of the respondents reported that they intend to use m-health while 61.4 percent reported not to have used m-health and no other information as there were no predictor variables. The best strategy was therefore to predict for every case, that the subject will report using m-health. Using that strategy, one would be correct 38.6 percent of the time. To measure the probability of the outcome without the response variables.

Table 4.1: Beginning Block

			Predicted		
			Have ever used m-health		Percentage
	Observed		0	1	Correct
Step 0	Have ever used m-health	0	0	79	.0
		1	0	50	100.0
	Overall Percentage				38.6 %

a. No terms in the model.

b. Initial Log-likelihood Function: 2 Log Likelihood = 199.626

c. The cut value is .500

Table 4.2: below shows how much ôPredictor variables not in the equationô would drop the 2 Log Likelihood function if a single predictor were added to the model (which already has the intercept).

Table 4. 2 Predictor Variables Not In the Equation

			Score	Df	Sig.
Step 0	Variables	Perceived Usefulness	36.966	1	.000
		Perceived Ease of use	36.196	1	.000
		Reliability	38.840	1	.000
		Cost	36.668	1	.000
		Motivation	31.794	1	.000
		Effectiveness	35.936	1	.000
		Awareness / Peer Influence	38.296	1	.000
		User Satisfaction	37.640	1	.000
		Confidence	35.638	1	.000
		Fear	31.794	1	.000
	Overall Statistics		**39.831**	**10**	**.000**

Now looking at the Block 1 output. Here SPSS added the independent variables (perceived usefulness, perceived ease of use, reliability, cost, motivation, effectiveness, awareness/peer influence, user satisfaction, confidence and fear) as predictors.

Omnibus Tests of Model Coefficients gives us a Chi-Square of 44.061 on 10 df which is significant as the P-value was less than .05. This is a test of the null hypothesis that adding the independent variables to the model had not significantly increased the ability to predict the decisions made by the subjects on use of m-health.

Table 4.3: Block 1: Omnibus Tests of Model Coefficients

		Chi-square	Df	Sig.
Step 1	Step	44.061	10	.000
	Block	44.061	10	.000
	Model	44.061	10	.000

Under Model Summary it was identified that the -2 Log Likelihood statistics is 155.566. This statistic measures how poorly the model predicts the decisions, the smaller the statistic the better the model. The Cox & Snell R^2 can be interpreted like R^2 in a multiple regression, but cannot reach a maximum value of 1. 0.642 implies that 64.2 percent variation in the dependent variable is explained by the model. The finding of Nagelkerke R^2 of 0.751 indicates that 75.1 percent in the dependent variable is explained by the model.

Table 4. 4: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	155.566[a]	. 642	.751

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

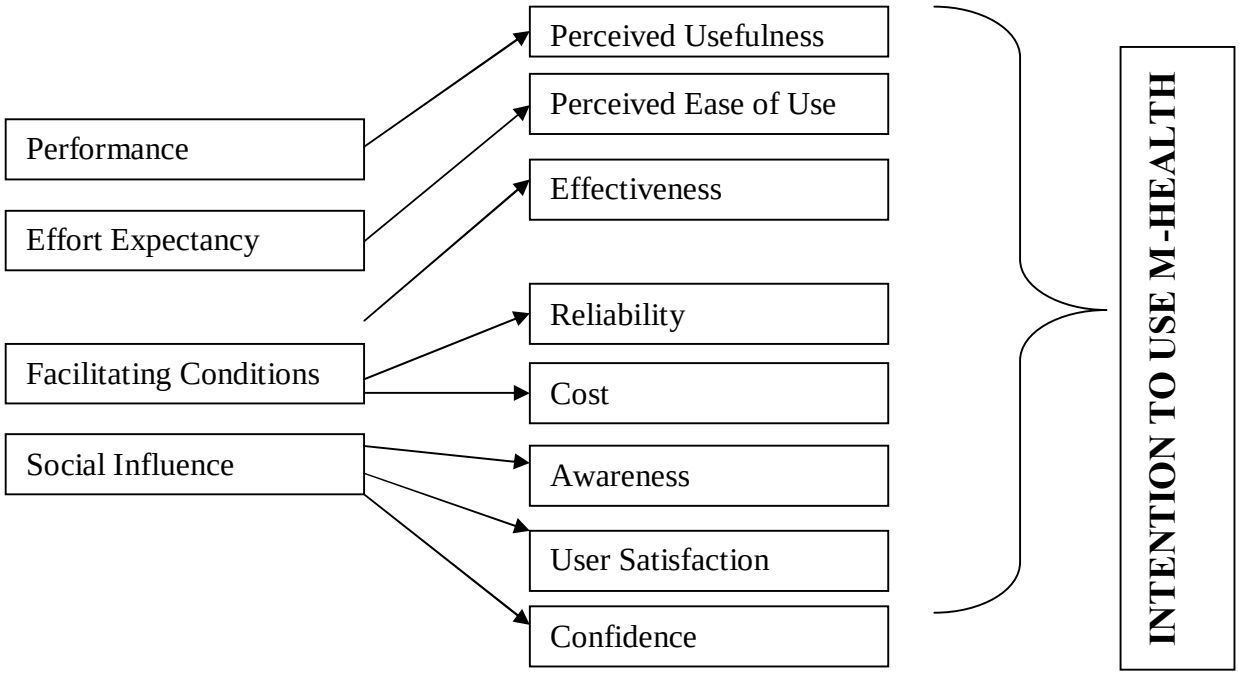


Figure 4.1 Validated Framework for Mobile health Adoption in Developing Countries

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 : Conclusions

While conducting this research our main objectives were to ascertain the extent in which the Kenyan population have adopted the m-health technology and therefore bring out those factors that can spur the uptake of this technology within the country. Its within this context that a framework was developed that can accelerate the adoption of this technology among Kenyans if all the stakeholders play their role effectively as discussed below. Factors that hinder the adoption of m-health technology in the country also came out quiet clearly and recommendations have been made on how to handle these challenges. With this in mind a comprehensive analysis of the results was done and the discussion below will try to bring out relationship of the study and the findings of the research.

The proposed framework was statistically tested using the sample data. A binary logistic approach was performed. Analyses were performed in two major steps. The first step was descriptive and was conducted to assess the agreement of the respondents with the various factors that were considered to affect adoption of m-health. In addition Cronbachôs Alpha of each construct and every measurement item loading were examined and ensured satisfactory reliability and validity of the model and measurement items. In the second step, the adequacy of the proposed research model in explaining behavioral intention to use m-health by the respondents was tested.

Table 4.4 shows the results of these tests, providing strong empirical support for most of the main constructs mentioned in the model, which posted eight direct determinants of intention to use m-health as follow: Perceived Usefulness, Perceived Ease of use, Effectiveness, Reliability, Cost, Awareness, User satisfaction and Confidence . The results showed that recognizing both technological and personality traits were important in increasing the publicsô behavioral intention to use m-health, each contributing their significant influence on behavioral intention.

As shown in Figure 4.1, eight antecedents of behavioral intention mentioned in the model were all significant determinants of respondentsô intention to adopt m-health. This means that the degree to which respondents believed that using m-health helped them to

improve their performance, their perception of how easy and understandable using the system was, and the degree to which they perceived that people who were important to them and influenced them thought they should use m-health, directly and positively affected their readiness and intention to adopt m-health systems.

The results revealed that facilitating conditions was also one of determinants of respondentsô intention to accept the usage of m-health. This shows that the existence of sufficient organizational and technical infrastructure supporting the use of m-health, was of great importance to them. In addition, the findings showed that the ability of the respondentsô to get health information through their mobile phone whenever they need and having confidence in the information that they get through the mobile phone were also important antecedents of their intention to adopt m-health. The influence of fear and motivation on intention to use m-health was not supported in the final model hence they were left out.

The results also showed that the more respondents perceived m-health to be easy to learn, the more they intended to use it and thereby the design of the m-health system needs to be carefully paid attention to, so that it would be as easy as possible to interact with. There was a direct relationship between the degree to which the respondents perceived the system to improve their performance and speed up their workflow and the degree that they intended to use the system, it has been suggested that developers of m-health systems should make these applications as simple as possible to enable users interact with them more freely and without any difficulties. This in particular would benefit the elderly and the semi literate in the society who could be skeptical in adopting to new ideas.

It was observed that itôs important for the healthcare professionals be equipped with IT skills and facilities such as PDAs so that they could immediately enter the data into the system instead of using papers to document their visits in the event the hospitals embrace the technology since they are also the intended users. This can help them to perceive m-health as a useful tool to their daily job which quickens their documentation and research process and consequently motivate them to use the system. It was also noted that it is important to ensure that IT technicians are present at the hospitals at all times to assist

the clinicians with technical whenever it is required for the program to run smoothly and increase the confidence of the users.

Cost was also noted to be a key component in determining the users intention to adopt the m-health technology and therefore the government would be expected to play its part in ensuring that this technology is affordable to the public at a reasonable cost.

5.2 Major contribution of the research:

The final theoretical model, was able to account for at least 64.2 percent of the variance in respondentsô behavioral intention to adopt m-health. Compared with other studies in various field which have carried out similar studies in explaining the attitudinal aspect of technology, this score was a substantial improvement over other UTAUTï based models such as (Said S. Al-Gahtani, 2007) with an R^2 equal to 0.391 for intention to use and Chang et al. (2007) whose proposed model explained only 28% of the variance in behavioral intention. Given such a high proportion of explanatory power for intention to use m-health, it is possible that the practical limits of the ability to explain general publicô intention to accept and use m-health were approached.

As a theoretical contribution this research was able to draw a strong relationship between the facilitating conditions and behavioral intentions in the UTAUT model and exclusively focused on Kenyan population and their intention to adopt m-health. The results showed that the main constructs of UTAUT along with facilitating conditions were all appropriate to predict respondentsô intention to use m-health in their workflow. The explained variance in behavioral intention by the final theoretical model was 64%. This high proportion of modelôs explanatory power for behavioral intention was noteworthy comparing to other studies that have explored the technology acceptance intention in healthcare industry such as (Chismar and Wileyï Patton, 2002. Therefore from a theoretical perspective, the inclusion of facilitating conditions expanded the explanatory power of the research model and furthered the understanding of the roles of technological and personality traits in innovation adoption in healthcare industry.

This research resulted in an empirical contribution to the knowledge, as it examined whether a certain extension of the UTAUT model, was valid for a new empirical object which was the Kenyan population. As an empirical contribution, this study provided a useful tool for healthcare stakeholders who may need to assess the likelihood of success

of the M-health technology when introduced to the public and this may help them understand and focus on the key drivers of acceptance in order to proactively design interventions targeted at users that have not adopted and used m-health systems.

The findings regarding the UTAUT model and the role of facilitating conditions in the respondentôs m-health acceptance context, as discussed previously have different implications at the practical level and bring up a number of considerations to all the stakeholders involved in healthcare provision if they were to promote the adoption of m-health by manipulating the aspects that are within their control and support the diffusion of this new technology in the health care system.

5.3 Recommendations

The followings are recommended for future research work:

- To conduct a longitudinal research to investigate the factors affecting the healthcare professionalsô actual use of m-health and also to verify the moderating influence of experience on m-health adoption unlike the cross-sectional research that was used in this survey.
- To identify causal antecedents of the constructs presented in this research model to provide more precise practical implications. Another study can be done to investigate why the variables has an effect on the intention to use m-health.
- To conduct the study under both voluntary and mandatory settings, so that the moderating effect of voluntariness on m-health adoption could be examined.
- To analyze the data gathered from public, doctors and nurses separately in order to be able to differentiate the results and provide more precise practical implications.

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APPENDIX

Questionnaire:

Variable		Item					
Performance Expectancy			**1**	**2**	**3**	**4**	**5**
Perceived Usefulness	PU1	I believe using m-health will improve my health status.					
	PU2	I perceive m-health as a complimentary in my health matters					
	PU3	I intend to continue using m-health now and in the future.					
	PU4	I will strongly recommend someone to use m-health					
Effort Expectancy			**1**	**2**	**3**	**4**	**5**
Perceived Ease of use	PE1	I am able to mobile phone to access health information easily.					
	PE2	I am able to use mobile health to access health care wherever I want.					
	PE3	In general I donôt encounter any problem whenever I want to use mobile phone to access health information.					
Facilitating Conditions			**1**	**2**	**3**	**4**	**5**
Reliability	R1	I am able to get health information through my mobile phone whenever I need.					
	R2	I have confidence in the information that I gets from through the mobile phone.					
	R3	I perceives the information that I gets through mobile health to be private and confidential.					
Cost	C1	I intend to use mobile phone to access healthcare if it is not expensive.					
	C2	I intend to use mobile phone to access healthcare irrespective of the cost.					
	C3	I will not use mobile phone for accessing health care matters if the cost is high.					
Motivation	M1	I use mobile phone for accessing health information because it is cheap.					
	M2	I use mobile phone for accessing health information because it am					

		offered support whenever I am stranded.					
	M3	I use mobile phone to access health information because it is fast.					
	M4	I am motivated to use mobile health through the internet because it is easily accessible.					
Effectiveness	E1	I use mobile phone to access mobile health because it is accurate.					
	E2	I use mobile phone to access health information because I trust the information.					
	E3	I would strongly recommend someone to use mobile phone in accessing healthcare information.					
Social Influence			1	2	3	4	5
Awareness / Peer Influence	A1	I intend to use mobile phone to access health information since I am well informed about it.					
	A2	I donôt intend to use mobile phone to access healthcare even though I am well informed about it.					
	A3	I would like to be well informed about the use of mobile phone in accessing health information.					
	A4	People who are important to me thinks I should M-health in solving my health issues.					
User Satisfaction	US1	When I use m-health, I am able to get all the information that I need.					
	US2	Using m-health to access healthcare information is enjoyable to me.					
	US3	Getting health information that I need through the phone is easy to me.					
Threat Appraisal			**1**	**2**	**3**	**4**	**5**
Confidence	Co1	I have confidence in the information that I get through m-health information.					
	C02	I would recommend someone to use m-health since it is helpful					
	C03	I am always at-ease when using mobile phone to access healthcare information.					
Fear	F1	I would resort into using m-health incase my life is in danger.					

	F2	I wonôt use mobile health unless my health deteriorates.					

Personal Information of the Respondents:

The following questions are for statistical purpose only and are intended to interpret your responses in section A. Please tick where appropriate.

1	Gender : Male [ ] Female [ ]
2	Age : 17-30 [ ] 31-40 [ ] 41-50 [ ] 51 & above [ ]
3	Employment: Formal [ ] Business [ ] Student [ ] Not working [ ]
4	Monthly income(ó000ôKSh) Less than 10[ ] 10-20[ ] 20-30[ ] 30-40[ ] Above 40[ ]
5	Have ever used m-health Yes [ ] No [ ]