INFORMATION AND COMMUNICATION TECHNOLOGIES AND PERFORMANCE OF ELECTRONIC HEALTH PROJECTS IN KENYA

By

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DECLARATION

This project is my original work and has not been presented for any award of a in any other university.

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DEDICATION

I wish to dedicate this work to my wife Rose and my daughter Hawi for their moral support during this study. Without their cooperation and understanding this work would not have been accomplished.

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I wish to acknowledge the support I have received in the cause of writing this Project report to my supervisor Dr. Kate Litondo for your guidance has always kept me on course while putting together this project.

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ABSTRACT

The purpose of this study was to investigate the relationship between ICT and performance of the health care projects. The study was guided by the following objectives: to establish the extent to which ICT is used in healthcare projects in Kenya, to determine the key challenges in the use of Information and Communication Technologies (ICTs) in healthcare and to establish the relationship between the utilization of the ICTs and the performance of the healthcare projects. Descriptive survey design was used in the study. The population for this study was organizations running healthcare projects in Kenya. Ten organizations running projects that have adopted e-health systems were studied. A total of 5 respondents were randomly sampled from each of the organizations targeted. A total of 50 respondents were targeted by the study out of which 48 responded giving a response rate of 96%. Questionnaires were used as instruments for data collection. Descriptive statistics such as frequencies, percentages means and standard deviation was used to analyze the data. Inferential statistics such as regression and correlation analysis was used to test on the relationship between the variables of the study. On the extent of use of ICT in the provision of healthcare projects, the study found that ICT had been used in the management of electronic health records to a large extent in managing patients' records electronically and provision of back up in cases of emergency for patients' records as indicated by 37.5% of the respondents. Regarding the challenges to the use of ICT in the provision of healthcare services, the study found that inadequate ICT infrastructure in the organization hinders service delivery to the healthcare subscribers (mean score 3.31) and that inadequate ICT infrastructure among the subscribers hinders their access to the healthcare services (mean score 3.31). Other challenges included: lack of technical knowhow, ineffective government policies and limited allocation of funds. On the relationship between the utilization of ICT and the performance of healthcare projects, the findings from the regression analysis revealed that use of electronic health records, telemedicine, health information systems, the internet and mobile health explains 73.3% of the performance of healthcare projects. The findings from correlation analysis further revealed that all variable tested had a positive relationship with the performance of healthcare projects and were all significant at 95% confidence level. The study concluded that the use of electronic health records, telemedicine, health information systems, the internet and mobile health influences the performance of healthcare projects. The study also recommends that organizations should train its staff and patients on the use of ICT in delivering and accessing healthcare services. This would improve the performance of healthcare projects. The study finally recommends that another study be carried to assess the use of ICT in the provision of healthcare services in hospitals.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Over the last decade, the use of Information and Communications Technology (ICT) has helped develop new ways of providing efficient and secure healthcare. This has resulted in a rapid increase in the use of ICT applications in health care, collectively, commonly referred to as eHealth (European Commission, 2012). ICT has been referred to as a key instrument in healthcare delivery and public health internationally (Drury, 2005). When designed and implemented effectively, ICT can improve access for geographically isolated communities; provide support for healthcare workers; aid in data sharing; provide visual tool slinking population and environmental information with disease outbreaks; and is an effective electronic means for data capture, storage, interpretation and management. In this context, ICT for health refers to any tool that facilitates the communication, processing or transmission of information by electronic means for the purpose of improving human health (Bukachi & Pakenham-Walsh, 2007).

While the early years of health ICT development and policies concentrated on technologies to be used by health professionals, home based health ICT aiming at patient users is now a prioritized area (eHealthNews.eu, 2010). More and more technologies intended for use inpatients' homes are being designed. The widespread private use of the Internet for health purposes in western populations has been taken as an indication of a new grass roots phenomenon in health care, indicating a democratic development where lay patients gain power and control on behalf of professional power (Hardey, 1999). However, the growth of patient-oriented ICT is not only a grass roots phenomenon deriving from patient needs. When outlining the background for this development, the health care system's struggle to cope with demand is also highly relevant.

In spite of large economic investments the pressure on the health care sector continues to grow. More and more human conditions are being considered relevant for professional medicine, a process often described as medicalization (Conrad & Schneider, 1980). In this historical context, ICT is investigated as a means to develop more effective health care systems, where less money is spent but tasks are being performed with undisturbed or even improved quality. The Internet has been suggested a suited channel for health

promotion campaigns, as it can reach a large number of people at high speed and low costs (Korp, 2006). The phenomenon of patient oriented health ICT is thus a complex matter. The relations between patients, ICT and health can be highlighted from different angles. This study therefore seeks to investigate the relationship between electronic healthcare and performance of the health care projects in Kenya.

1.1.1 Electronic Health

The World Health Organization defines e-health as the combined use of electronic information and communication technology (ICT) in the health sector. For the purposes of this project, eHealth is considered to be the application of Information and Communication Technologies (ICT) across the whole range of functions that affect healthcare, from diagnosis to follow-up (Denise, 2003). According to a systematic review of evaluations of e-health implementations by Blaya et al. (2010), the greatest potential for e-health may lie in systems that improve communication between health care institutions, support medication ordering and management, and help monitor and improve patient compliance with care regimens.

EHealth covers the development and use of a wide range of ICT systems for healthcare such as electronic health records, telemedicine, health information systems, mobile devices, e-learning tools, and decision support systems (Gerber *et al*., 2010). The value of eHealth is in its ability to help lower costs in health sector while delivering better care within a citizen centered approach (Currie & Finnegan, 2009). Additionally, eHealth through the use of Personal Health Records (PHR) is a key factor in empowering patients and will help them to play an increasingly central and active role in their own healthcare (Markle, 2004).

The availability and quality of ICT services are growing rapidly across Africa, with mobile network coverage rising from 16% in the late 1990s to over 90% of its population in 2011. Growth in this sector has led to increased investments, decreased costs and rapid growth in technology-enabled services. However, these gains in ICT infrastructure have not as yet benefitted the health Sector in a systematic way as many of the project remain pilots. This study therefore seeks to assess the effect of ICT on the performance of healthcare projects in the Kenyan context.

1.1.2 Performance of eHealth projects

Over the past years ICT has become a key resource in organizations from a wide array of industries and a driver of change in social and economic life (Hedman and Kalling 2002). The rapid development of ICT has allowed the information society to emerge especially through the usage of Internet and other wireless communications (Wang et al. 2006). As information and communication technologies develop and become more available it opens up new opportunities in the healthcare sector among other industries (Tornqvist 2000). Since the healthcare sector is information and knowledge intensive it is becoming clear that progression in ICT will be strongly linked to the development of core activities in healthcare (Tornqvist. 2000).

Modern ICT now offers new possibilities for improving most aspect within healthcare, from better access to integrated information of patients' health, and with this delivering improved healthcare in its broadest sense (Juciute 2007). According to Greenberg (2005), pilot projects that have demonstrated improvements such as a 50% reduction in mortality or 25-50% increases in productivity within the healthcare system. As such, the use of ICT has improved dissemination of public health information, enabled remote consultation, facilitated collaboration and cooperation among health workers, supported more effective health research add the dissemination and access to research findings, strengthened the ability to monitor the incidence of public health threats and respond in a more timely and effective manner and improved the efficiency of administrative systems in health care facilities (Greenberg, 2005).

The use of ICT has therefore helped saving lives and resources and direct improvements in people's health. In Peru, Egypt and Uganda, effective use of lCTs has prevented avoidable maternal deaths. In South Africa, the use of mobile phones has enabled TB patients to receive timely reminders to take their medication. In Cambodia, Rwanda, South Africa and Nicaragua, multimedia communication programs are increasing awareness of how to strengthen community responses to HIV and AIDS. In Bangladesh and India, global satellite technology is helping to track outbreaks of epidemics and ensure effective prevention and treatment can reach people in time (Chetley, 2006).

1.2 Statement of the Problem

To provide optimal care, healthcare institutions need timely patient information from various sources at the point-of-care, and need a comprehensive, complete and fully functional system to fulfill all these needs. One way to achieve this is through the use of ICT in health care. The introduction of the use of ICT in healthcare knows of failures and successes. Kuhn et al. (2001) allocate the success rate of a project as being 80 percent dependent on the development of the social and political interaction skills of the developer and 20 percent or less on the implementation of the hardware and software technology.

Different studies have been done on the use of ICT in e-health. Mukama (2003) studied health information systems at local levels in Tanzania and Mozambique where the findings revealed that a number of data collection tools are in use: patient cards, registers, tally sheets and forms. Musukwa (2011) studied user Perceptions on Electronic Medical Record System (EMR) in Malawi where he found that that users preferred using the EMR than paper based records and that overall, found it more effective and efficient. Ouma *et al.* (2013) did a study on implementing successful e-health implementations within developing countries. The findings revealed that just like in the majority of the developing nations, there are very few computers and e-health solutions that are currently used in the hospitals as a result of various challenges in Kenya.

Ranta (2010) studied the role of ICT in improving productivity in the health care sector. As such, the study focused on the related problems and the reasons behind the slow adoption of ICT. The study found that despite its limits, the use of ICT affects the productivity in health care greatly, and has changed the process considerably. The study further found that with the help of ICT, the focus is moving from acute type of care towards more prevention and self-care which in the long run is obviously good for the economy as well as our health. This study therefore sought to answer the following research questions: what is the extent of the use of ICT in healthcare projects in Kenya? what are the challenges facing the use of ICT in e-health projects and how does to use of ICT affect the performance of e-health projects?

1.3 Objectives of the Study

The general objective of the study was to investigate the impact of the use of ICT on the performance of the health care projects specifically to:

a. To establish the extent to which ICT is used in healthcare projects in Kenya
b. To determine the key challenges in the use of Information and Communication Technologies (ICTs) in healthcare.
c. To Establish the relationship between the utilization of the ICTs and the performance of the healthcare projects

1.4 Importance of the Study

The findings of this study will be of importance to organizations running health projects that have adopted e-health technology. By highlighting on the challenges facing the use of ICT in e-health, the organizations will be at a position to come up with appropriate strategies aimed at minimizing the challenges.

The findings of this study will also be of importance to policy makers. Through the analysis of the challenges facing the use of ICT in the provision of e-health, policy makers will be at a position to come up with policies aimed at reducing the challenges. This will improve the accessibility of healthcare services among patients.

This study will also be of importance to other scholars. By contributing the existing literature on e-health, the study will form a basis upon which other studies will be done. It will also help in creating knowledge gaps giving other researchers opportunities to contribute to the existing literature on e-health.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents relevant literature on Healthcare, ICT and healthcare, challenges to the adoption and usage of e-Health and E-health and performance of health projects. The chapter also presents the theoretical foundation and the conceptual framework.

2.2 Information Communication Technologies (ICT)

Information and Communication Technologies (ICTs) have the potential to improve the lives of people in the society. According to the United Nations Development Program (2006), increased use of ICTs enhances service delivery by: delivering economies of scale to improve access to basic services, optimizing service delivery, providing incentives for development and transfer of new technologies and products and increasing efficiency through enhanced connectivity and exchange of knowledge enabling regions to focus on delivering services where they have a comparative advantage providing access to digital development for continuous improvement.

ICTs are changing rapidly, as are businesses surrounding their implementation (Louw & Hanmer 2002). Much of the attention paid to ICT is focused on the producers and their products. Much less attention is being paid to how ICT is shaping the way society is changing and, in turn, being shaped by society. The need to develop and organize new ways to provide efficient healthcare services has thus been accompanied by major technological advances, resulting in a dramatic increase in the use of ICT applications in healthcare and e-health.

2.3 ICT and Healthcare

E-Health is defined as the use of information and communication technologies (ICT) in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research ((Joaquin *et al*., 2010). An example of areas where E-Health is used includes treating patients, conducting research, educating the health workforce, tracking diseases and monitoring public health. (World Health Organization, 2013) In short E-Health is a useful term to describe the combined use of electronic communication and information technology within the healthcare sector (Mitchell, 2009).

With today's advanced information and communications technology the distances between the inhabitants of the country, countryside as urban dwellers, is reduced and information for people in rural areas have become much more accessible (Chavula, 2013). Basically, in the current situation it can be expected that all the inhabitants of our planet, wherever they are located, in 2015 will be able to get access to the information needed to get the treatment he or she needs for their illness (Healy, 2008). In reality, this goal will probably be reached later than 2015.

E-health, when it is used with mobile phones and handheld computers, is called M-health. Both these versions of E-Health can contribute with information systems that can be of enormous value in providing health care. They can support health workers during their work in the clinics when there is no doctor around and also helps the workers to keep track of patients and accessing their patient history. In recent years this has helped technologies for information delivery within healthcare systems to be proliferated (Chan *et al*, 2010). But without electricity, a good infrastructure and a constant flow of money it will be difficult to maintain a successful technical system. Countries such as Uganda have been through thousands of E-Health projects that have subsequently come to nothing because financiers pulled out (Cameron, 2013).

2.3.1 Electronic Health Records (EHR)

Initially known as computer patient records, the concept of electronic health records has revolutionized to what it is today from the 1960's (Hanson, 2006). EHR can be relied on to act as a backup in cases of emergencies and when patients change locations unlike the case of paper based records given the fact that they are easily accessible (Blair, 2007). Essential functions of EHR include shared health records, support for external information requests, and provision of security and message transfer of health records (Edwards, 2007). The benefits of using EHR include improved quality of healthcare, reduced medical errors and reduced costs, access to medical record information and time savings (Miller and West, 2007).

2.3.2 Health Information Systems (HIS)

Health Information systems or health management information systems are according to the literature systems used to collect, analyze, retain, retrieve and evaluate health

information (Tan, 2002)). The WHO (2005) article on “Issues in health information’’ adds to this definition by stating that a health management information system incorporates all the data needed by policy makers, clinicians and health service users to improve and protect population health.

The goal of a Health Management Information System is to check quality by comparing perceptions of services delivered with the expected standards and to provide timely and accurate information leading to better health care planning and improved diagnosis and more patients getting access to health services for an entire country (Tan, 2002). A health information system usually describes one of these several separate subsystems containing data (WHO, 2005): disease surveillance and outbreak notification, data generated through household surveys, registration of vital events and censuses (births, deaths and causes of death), data collection based on patient and service records and reporting from community health workers, health workers and health facilities, program-specific monitoring and evaluation (for example for TB, HIV/AIDS, and EPI) and administration and resource management (including budget, personnel, and supplies).

The function of a health information system is to bring together data from all these different subsystems, to share and disseminate them to the many different audiences for health information and to ensure that health information is used rationally, effectively and efficiently to improve health action. A strong health information system is an essential component of sound program development and implementation, and is a requirement for strategic decision making, providing the basis upon which improved health outcomes depend.

Clinical managers and health planners rely on information in order to make decisions regarding effective functioning of health facilities, allocate resources and also to make strategic policies (AbourZahr and Boerma, 2005). Therefore, HIS consist of different software that are integrated in order to capture data in specific sections of the hospital, handle the work flow of daily medical services and also assist in managing financial, administrative and clinical data. The benefits of using HIS include improved quality, better communication, staff efficiency, reduced transcription costs and increased patient safety and increased revenues (Garrido et al., 2004).

2.3.3 Telemedicine

Telemedicine can be referred to as the provision of medical services from a distance (Wooton, Craig and Patterson, 2006). This includes diagnosis, treatment and prevention of diseases. The types of telemedicine can be categorized as real-time or pre-recorded telemedicine. Information is sent and received by the participants almost immediately in the case of real time telemedicine while in the case of pre-recorded telemedicine, information is captured and then transmitted later for subsequent reply (Anthony et al., 2005).Examples of pre-recorded telemedicine include tele-electrography, tele-obstetrics and tele-radiology (Mea, 2006). Examples of real time telemedicine include tele-consultation, tele-pathology and tele-dermatology (Wooton, Craig and Patterson2006).

Telemedicine is considered a powerful tool for improving health care delivery which has been successfully implemented in pilot projects in many countries. It can improve diagnosis and treatment of specific conditions dramatically but has proven to be very costly. Telemedicine is an implementation which requires high bandwidth and sophisticated remote equipment and has only proven practical in cases where money is not an issue or as an alternative to high-cost air transportation and lodging. Used wisely, however, telemedicine can be a cost-effective method that richer countries can employ to aid capacity building in the health care systems of poorer countries (Chetley et al., 2006). In Africa, for example, the use of telemedicine has helped people in rural areas by saving money and time for travelling and long queuing lines. Clinical staff can now sent patient information by email to specialists in the cities and symptoms can now be analyzed a day ahead from a distance.

2.3.4 The Internet

The role of the Internet in healthcare cannot be ignored. The Internet provides a platform where various stakeholders of e-health are able to achieve various goals. Key among the solutions that the Internet provides in healthcare includes:

There are various types of business operations that are conducted by organizations and individuals online within the healthcare industry. These business models include business to business to consumer models, business to business and business to consumer models (European Commission Enterprise Directorate General, 2004). Some examples of

business models within the healthcare industry include virtual doctor visits, online medical suppliers and automated systems (Tan, 2005).

The Internet has provided a platform for conducting a lot of research in healthcare. This has led to the use of online experiments, randomized trials and surveys (Couper, 2007). Additionally the numbers of publications on healthcare issues have increased tremendously (Curry, 2007).

Medical learners can now share a lot of digital information from the various digital libraries on the Internet which have been reviewed by various researchers (Ruiz, Mintzer and Leipzig, 2006). Additionally various professionals in medical fields can now access various web pages in order to take continuous medical education hence improving current standards of healthcare by use of the availed technologies on the Internet (Dario et al., 2004).

Patients are using the Internet to get information, interact with their physicians and order pharmaceutical products online (Podichetty and Biscup, 2003). Hence the patients are now taking charge of their health status by staying informed with issues regarding to their health (Lorence, 2006).

2.4 Challenges to the Adoption and Usage of E-Health

The literature analysis on the adoption of e-health standards revealed that the slow pace of the adoption of standards (both by developed and developing nations) is due to several factors. This section presents relevant literature on the factors perceived to affect the implementation of e-health projects.

Many African nations have a large number of its citizens living in rural areas. In the majority of cases, these rural communities lack even the most basic infrastructure, such as, electricity. There is also limited ICT infrastructure; broadband Internet connectivity is very low compared to developed countries. Foundational infrastructures, such as client and provider registries, as well as common terminology services are largely absent. Where ICT infrastructures are in place, they are neither standardized nor based on common platforms, making it difficult for them to interoperate (Anon, 2010).

EHealth infrastructure pertinently affects adoption of eHealth (Qureshi *et al.,* 2013). In a study conducted in Kenya, which focused on adoption of ICT in SMEs in the health sector, quality of ICT systems is noted as a significant factor in determining adoption of ICT (Muathe, Wawire & Ofafa, 2013). In their study focusing on establishing the infrastructural barriers to eHealth implementation in developing countries, Qureshi *et al,* (2013) indicated that internet connectivity is vital for successful adoption of eHealth.

In another study conducted in Kenya, it was revealed that doctors are willing to conduct e-searches in order to access and share health information with their colleagues in others parts of the world. However, insufficient ICT resources limit them in performing the searches (Gatero, 2010). In yet another study, it is indicated that cost of computers and lack of computers hinder adoption of eHealth amongst hospitals in the rural areas (Ouma & Herselman, 2008).

The low rate of internet penetration and low bandwidth are among the challenges to eHealth adoption in developing countries. Omary *et al* (2009) points out that due to poor ICT infrastructure and internet penetration in Tanzania, the majority of areas in the country cannot support internet deployment, which in turn, hampers eHealth adoption. Even in developing countries that have high internet penetration, bandwidth may still be a challenge, thereby limiting adoption of telemedicine and other internet based eHealth applications.

African countries generally have low levels of human resources with the requisite expertise to participate in standards development (The Rockerfeller Foundation, 2010). The adoption of international standard by a country often requires localization of the standard to meet the specific requirements of the country. Limited technical expertise in African countries could affect their ability to effectively carry out standards localization. Furthermore, inadequate technical expertise could lead to an absence of, or ineffective government policies regarding the adoption of e-health standards (International Telecommunication Union, 2009).

Legislation and standards on eHealth are vital in any developing countries for successful eHealth adoption. However, sufficient standards for medical imaging, interoperability,

software, transmission, infrastructure, architecture, medical informatics, and bioinformatics are yet to be formulated in developing countries (Omary *et al.*, 2009). Inadequate electronic legislation (eLegislation) and eHealth standards for instance have negatively affected eHealth adoption in Kenya which is also the case for Ghana (Kathryn, 2011).

In Ghana, it appears that apart from a few clauses contained in the Electronic Communication Act, 2008 (Act 775) Section 4(2), limiting access to electronic personal information of the customers of the communications industry, there does not seem to be a dedicated and broad based national legislation on the primary and secondary uses of electronic personal information of the individual (Norman, Alkins & Binka, 2011). This provides a good example of the gap in the legal framework for the protection of privacy when it comes to patient data in the use of information technology and this may negatively affect the adoption of information technology in the health sector.

Funding of the health sector determines adoption of electronic health (Omary *et al.*, 2010; Abdullah, 2012). Due to low funding of health sector in Tanzania, Omary *et al* (2010) argues that it is difficult to allocate much money for acquisition of ICT resources needed in the health sector.

Adoption of electronic health infrastructure is costly and this calls for increased funding in the health sectors for various developing countries. Findings show that increased funding in health sector is strongly correlated with adoption of eHealth even in the case of developed countries and this should also be the case for developing countries (Yu, 2012). It is worth noting that public funding is tied to individual institutions where the amount allocated to a given health institution is proportional to its size. Larger hospitals achieve easily economies of scale and mainly information and resources needed across the organization. Several studies show positive relationship between ICT adoption and organization size since they have more finances compared to smaller institutions (Pan & Jang, 2008).

The fact that unsuccessful implementations have many causes, it is still, from a technology-driven point of view, assumed that users have a tendency to reject changes as

“users often are seen to suffer from a lack of training as well as a lack of sufficient interest” (Millerand and Baker, 2010:138). However, developers do also generate a set of "best practices", understanding that practices can be transferred between contexts. Unfortunately, this tends to ignore the crucial fact that practices are situated and localized actions and knowing in practice is an “ongoing social accomplishment, constituted and reconstituted as actors engage the world in practice” (Orlikowski, 2002: 249).

2.5 E-health and Performance of Health Projects

Electronic healthcare services offer important economic and social benefits for our society. Patients rely on these services for their safety and care and for improving their quality of life. For physicians, electronic health and wellness services offer sup-port for providing more effective and continuous care. There are various e-health solutions that can be used in improving the quality, efficiency and to reduce costs in healthcare. Key among them includes electronic health records, hospital information systems, telemedicine and the internet.

Nilsson (2012) did a study on information and communication technology as a tool for support in home care among middle-aged people with serious chronic illness and nurses. The findings of the study revealed that using an ICT application improved accessibility for people with serious chronic illnesses living at home. The use of the ICT application also saved time and eased nurses’ work. In the case study, their use also resulted in more direct communication between the ill people and their nurses, which facilitated communication and led to less limitation on everyday life for the ill people, which seemed to mediate the development of more trusting relationships.

Olatokun and Adeboyejo (2009) investigated reproductive health workers’ (RHWs) use of ICTs, the effects of ICTs on their job functions, and the challenges limiting full exploitation of ICTs in Nigeria. The study adopted a descriptive survey design. Stratified sampling technique was used to select a sample of 360 RHWs of the University College Hospital, Nigeria. A questionnaire obtained the data, and frequencies and percentage distributions were the analytical techniques adopted. Findings revealed that RHWs indicated extensive use of ICTs in their job functions. Faster access to relevant medical information, easy exchange of information with colleagues, and increased efficiency were the major impacts of ICT usage on their activities. The information accessed through

ICTs was primarily educational, health, and research. Findings equally revealed that the major challenges in ICT use were erratic power supply and inadequate access to ICT facilities. Based on the findings, recommendations were made towards enhancing better utilization of ICTs by RHWs.

2.6 Theoretical Foundation

This section presents the theories which were used in the study. Unified Theory of Acceptance and Use of Technology (UTAUT) and Actor-Network-Theory (ANT) were used in the study.

2.6.1 Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh*et al.,* (2003) unified and completed the various models of IT acceptance and they integrated the elements of eight well-known models such as: the Theory of reasoned action (Davis *et al.,* 1989), the Technology acceptance model (Davis,1989), the Motivational model (Davis *et al.,* 1992), the Theory of planned behaviour (Ajzen, 1991), a model combining the Technology acceptance model and the Theory of planned behaviour (Taylor and Todd, 1995), the model of PC utilization (Thompson *et al.,* 1991), the Innovation diffusion theory (Rogers, 1995), and Social cognitive theory (Compeau and Higgins, 1995).

Due to the weaknesses of TAM, a number of modified TAM models were proposed, which are applicable to contemporary technologies (Horton *et al.,* 2001). However, researchers are confronted with a choice among a multitude of models. Hence, a new model was developed to address these limitations (UTAUT). The aim of this model is to understand intention/usage as a dependent variable (Venkatesh *et al.,* 2003). The research model used in this proposal to examine the use of ICT in healthcare is UTAUT.

Venkatesh *et al.,* (2003) tested the unified theoretical model in four different organizational settings for a period of six months and the study showed significant predictions of intention (performance expectancy, effort expectancy, social influence and facilitating conditions), whereas attitude toward using technology, self-efficacy and anxiety were theorized not to be direct determinants of intention. This study therefore used the theory to assess the challenges facing the use of electronic health in health projects in Kenya.

2.6.2 Actor-Network-Theory (ANT)

Actor-Network-Theory (ANT) is a useful conceptualization of the relationship between the technical and the social (Walsham, 1997).ANT deals with the social-technical divide by denying that purely technical or purely social relations are possible. The theory considers both social and technical determinism to be flawed and proposes instead a socio-technical account (Tatnall and Gilding, 1999)

ANT assumes that the world is constituted by a heterogeneous network of actors, in which humans, artefacts, manuals, norms, routines and organizational arrangements all shape the network. Each of the actors has "interests" and each will act in accordance with these to achieve their own individual goal (Latour, 1987). According to Latour (1987), "interests" lie between the actors and their goals, creating tension that will make actors select only what, among many possibilities, helps them reach these goals in their own eyes. The actors in a network may include users, project participants, existing systems, practices, and so forth. In order to make technology work in organizations, it is important to take into account all the different actors and factors that exercise an influence on the network (Law, 1987).

The theory therefore claims that users are important participants in the projects and that system designers and suppliers regard users as important contributors in the development process. However, users have traditionally had a passive role in such projects because they are often separated from the designers. To improve reciprocity, users should increase their influence in ICT projects. In this sense, users should have far greater opportunity to participate in creating the conditions for the systems. This can reduce the distance between designers and users. This theory was therefore be used in this study to explain how the relationship between the implementers and users affects in performance and success.

2.7 Summary of the Literature Review

This chapter has presented relevant literature on the use of ICT in health projects. Literature has revealed that among the challenges facing the use of ICT in e-health are: inadequate infrastructure, privacy, confidentiality and security, legislation and standards on e-health, availability of funds and individual characteristics. Unified Theory of Acceptance and Use of Technology (UTAUT) and Actor-Network-Theory (ANT) will be

used for the study. To fill the knowledge gap which exists, this study therefore seeks to investigate the relationship between electronic healthcare and performance of the health care projects

2.8 Conceptual Framework

The conceptual framework below presents the relationships between the study variables. The independent variables for the study were: electronic health records, telemedicine, health information systems, the internet and mobile health while the dependent variable is performance of healthcare projects. The intervening variable for the study were: availability of health infrastructure, technical knowhow of users, legislation and health standards, individual characteristics and inadequate allocation of funds.

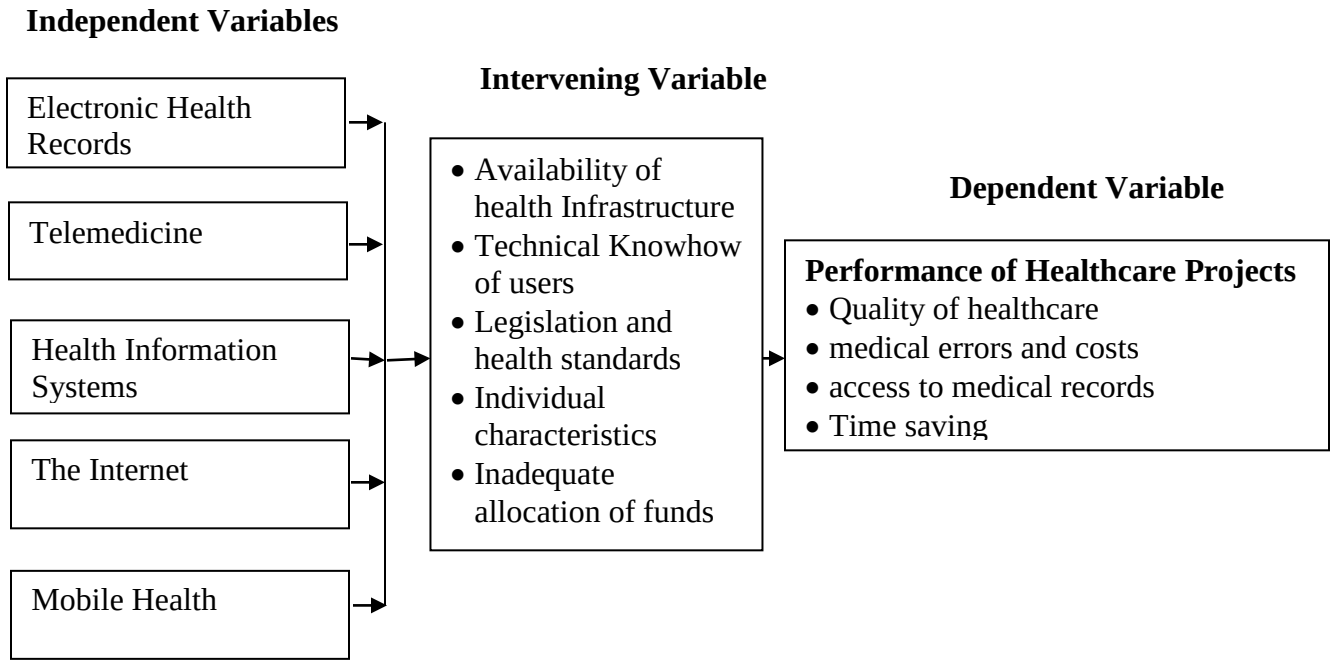

Figure 2.1 Conceptual Framework

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter describes research design, study population, data collection instrument, data collection and data analysis.

3.2 Research Design

Descriptive survey design was used in the study. According to Kothari (2003), the main advantage of this type of design is that it enables the researcher to assess the situation within the study area at the time of the study. This design was therefore deemed appropriate as the researcher was at a position to investigate the relationship between electronic healthcare and performance of the healthcare projects. The study was a survey in nature which allowed only part of the targeted population (organizations which have adopted the use of ICT in providing healthcare) to be sampled for the study.

3.3 Study Population

The population for this study was organizations running healthcare projects in Kenya. There are ten organizations running projects that have adopted e-health systems, these include: Mobile for Reproductive Health (m4RH), Knowledge for Health (K4Health), Tupange Commodity Tracking System, HELP (Health Enablement Learning Platform), eHealth, eLearning, Open MRS, Changamka project, E-learning project and StopStockouts project.

3.4 Sampling Technique and Sample Size

All the ten organizations running projects that have adopted e-health systems were studied. A total of 5 respondents were randomly sampled from each of the organizations targeted. Thus, a total of 50 respondents were targeted for the study.

3.5 Data Collection

Primary and secondary data were used for the study. Secondary data was collected from reports and publications on electronic health projects. Secondary data helped in justifying the impact of ICT on the performance of electronic health projects. Primary data was collected using a questionnaire while secondary data was collected from published records. The researcher used a questionnaire due to their characteristic that they can

capture large amounts of data which may contain both quantitative and qualitative data. Both open ended and closed ended questionnaires were used to collect data for the study.

The questionnaires were divided into four sections whereby section A contained questions on the demographic information (Organization, people and systems), section B contained items on the extent of the use of ICT in healthcare projects, section C contained items on challenges to the use of ICT in healthcare projects and section D contained items on the relationship between utilization of ICT and performance of healthcare projects.

The researcher personally administered the instruments to the respondents. The respondents were given adequate time to respond to the questions after which the filled instruments were collected.

3.7 Pre-testing of Research Instruments

Mugenda and Mugenda (1999) note that pre-testing ensures that research instruments are stated clearly and have the same meaning to all respondents. Pre-testing enables the researcher to have meaningful observations because it helps detect deficiencies in the instruments. The instruments of the study were pretested in one of the organizations running healthcare projects where e-health technology has been adopted. Pre-testing ensured clarity of the instruments for the actual data collection. It also assisted in identifying and rectifying the weakness that might have been in the study instruments. As such, pre-testing was used to test the validity and reliability of the study instruments.

3.7.1 Validity

According to Mugenda and Mugenda (2003), validity is the degree to which results obtained from the analysis of data actually represent the phenomena under study. A valid instrument should accurately measure what it is supposed to measure. After administering the instruments to the selected respondents, the data obtained should be a true reflection of the variables under study. Opinion from the researchers' supervisors was used to check on the content validity of the instruments.

3.7.2 Reliability

According to Mugenda and Mugenda (1999), reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials. To test on the reliability of the instruments, the researcher used split-half method. The method

involves scoring two halves usually odd and even items of a test separately for category of the instruments and then calculating the correlation coefficient for the two sets of scores. The coefficient indicates the degree to which the two halves of the test provide the same results and hence describes the internal consistency of the test.

Spearman Brown Prophecy Formula below was used to test on the reliability of the instruments:

$$\frac{2 \text{ x Corr. Between the Halves}}{1+ \text{ Corr. Between the Halves}}$$

$$r = \frac{2r}{r+1}$$

Where r = reliability of the coefficient resulting from correlating the scores of the odd items with the scores of the even items. The research got a correlation coefficient of 0.76. According to Orodho (2004), a correlation co-efficient of about 0.7 judged high enough for the instruments to be accepted as reliable for the study. The instruments were therefore considered reliable for the study.

3.8 Data analysis

Primary data from the field was edited first. Coding was then done to translate question responses into specific categories. Statistical Package for Social Sciences (SPSS) was used to process the data. Both qualitative and quantitative data analysis technique were used to analyze the data. Quantitative data collected were analyzed using descriptive statistics while thematic analysis technique were used to analyze the qualitative data collected through open ended questions. The analyzed data were presented in form of tables, pie-charts and bar-graphs where applicable.

Correlation and regression analysis were used test on the relationship between the utilization of the ICTs and the performance of the healthcare projects. The multiple regression model presented below was used to test on the relationship between the variables of the study:

$$Y = a + ß_1X_1 + ß_2X_2 + ß_3X_3 + ß_4X_4 + ß_5X_5 + \varepsilon$$

Where:

Y = Performance of healthcare projects

X_1 = Electronic health records

X_2 = Telemedicine

X_3 = Health information systems

X_4 = The internet

X_5 = Mobile health

a = Constant

ε = Error term

CHAPTER FOUR: RESEARCH FINDINGS AND DISCUSSIONS

4.0 Introduction

In the previous chapter, the researcher described the methodology used in the study. This chapter therefore presents the findings of the study. The objective of this study was to investigate the relationship between ICT and performance of the health care projects. A total of 50 respondents were targeted by the study out of which 48 responded giving a response rate of 96%.

4.1 General Information

This section presents the general information of the respondents including: gender, age bracket, level of education and duration of service in the organization.

4.1.1 Distribution of the Respondents by Gender

On gender distribution of the respondents, the study found that 56% were female while 44% were male. The findings were as presented in Figure 4.1.

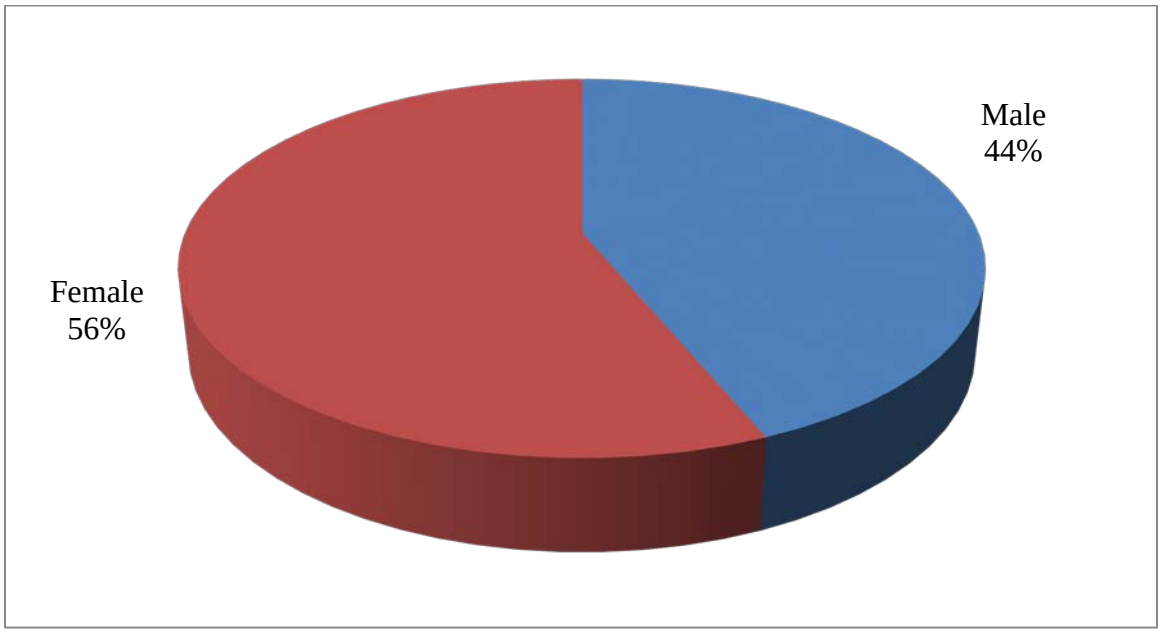

Figure 4.1 Distribution of the Respondents by Gender

4.1.2 Distribution of the Respondents by Age Bracket

On the distribution of the respondents by age bracket, the study found that 68.8% of the respondents interviewed were between 26-35 years while 31.3% between 36-45 years. The findings were as presented in Figure 4.2.

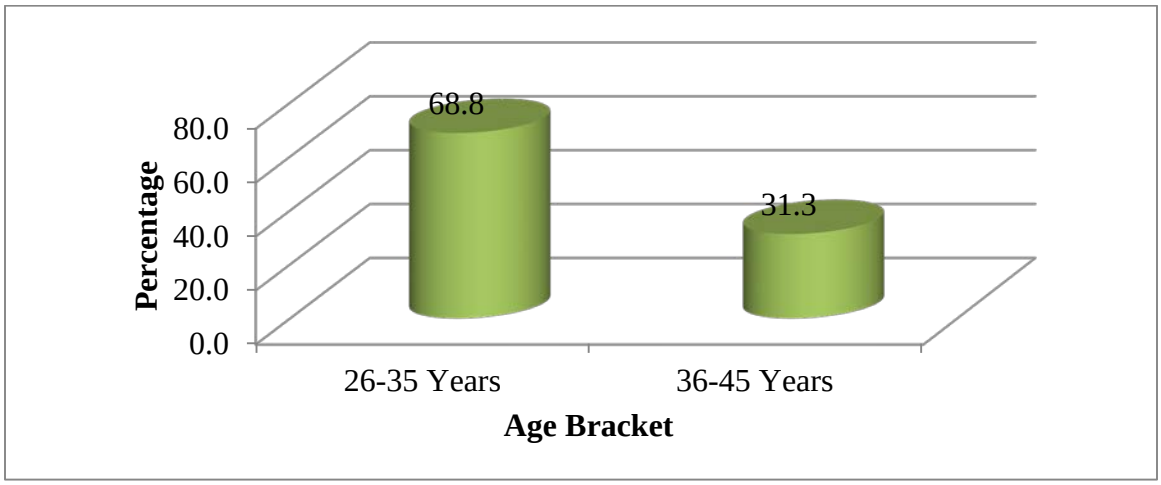

Figure 4.2 Distribution of the Respondents by Age Bracket

4.1.3 Distribution of the Respondents by Level of Education

On the distribution of the respondents by level of education, the study found that 50% of the respondents were Master's Degree holders, 44% had Bachelor's degree and 6% had diplomas. The findings were as presented in Figure 4.3.

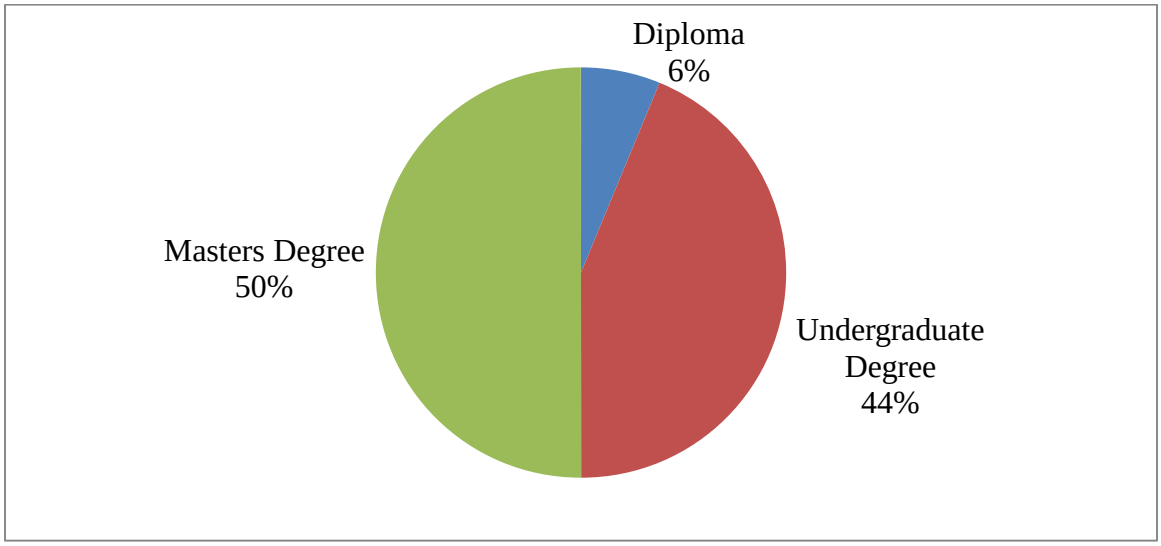

Figure 4.3 Distribution of the Respondents by Level of Education

4.1.4 Distribution of the Respondents by Duration of service in the organization

The study found that 50% had served in the organization for duration of between 4-5 years. It was also found that 37.5% of the respondents had served in their organizations for duration less than 3 years and that 12.5% had served in their organizations for a period between 6-10 years. From the findings of the study, it can be said that most of the respondents interviewed had served in the organization for a period more than 3 years and were therefore considered knowledgeable on the use of ICT in the provision of healthcare. The findings were as presented in Figure 4.4.

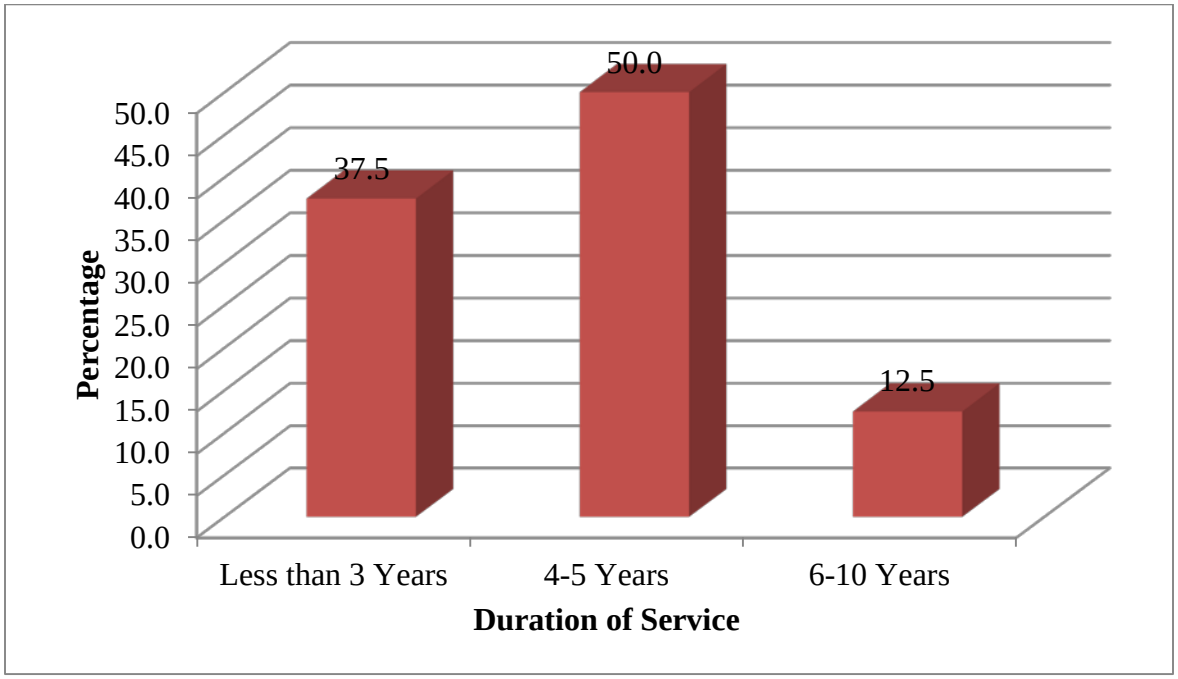

Figure 4.4: Distribution of the Respondents by Duration of service in the organization

4.2 The extent to which ICT is used in healthcare projects in Kenya

The respondents were asked to indicate the extent to which different aspects of ICT had been used in their organizations. The findings are as presented in Table 4.1

Table 4.1 Extent of use of ICT in healthcare projects in Kenya

Use of ICT	No extent at all		Small extent		Neutral		Large extent		Very large extent		Total	
	f	%	f	%	f	%	f	%	f	%	f	%
Electronic health records												
Managing patients records electronically	3	6.3	9	18.8	12	25	18	37.5	6	12.5	**48**	**100**
Provide back up in cases of emergency for patients records	6	12.5	6	12.5	12	25	18	37.5	6	12.5	**48**	**100**
Telemedicine												
Provision of medical services from a distance	9	18.8	15	31.3	9	18.8	15	31.3	0	0	**48**	**100**
Sharing of information between patients and healthcare provider	12	25	9	18.8	3	6.3	21	43.8	3	6.3	**48**	**100**
Health information systems												
Gathering information about patients	0	0	6	12.5	9	18.8	15	31.3	18	37.5	**48**	**100**
Checking quality by comparing perception of services delivered	6	12.5			9	18.8	27	56.3	6	12.5	**48**	**100**
The internet												
Use of internet for research and training	0	0	6	12.5	3	6.3	15	31.3	24	50	**48**	**100**
Use of internet by patients to get information	6	12.5	12	25	9	18.8	9	18.8	12	25	**48**	**100**
Mobile health												
Communicating with patients	9	18.8	3	6.3	12	25	6	12.5	18	37.5	**48**	**100**
Sharing patients' information	5	10.4	4	8.3	9	18.8	12	25	18	37.5	**48**	**100**

The findings on Table 4.1 show that ICT had been used in the management of electronic health records to a large extent in managing patients' records electronically and provision of back up in cases of emergency for patients' records as indicated by 37.5% of the respondents. These findings are in line with that of Blair (2007) who found that electronic health records can be relied on to act as a backup in cases of emergencies and when patients change locations unlike the case of paper based records given the fact that they are easily accessible. According to Edwards (2007), the essential functions of EHR include shared health records, support for external information requests, and provision of security and message transfer of health records.

The study also found that in telemedicine, ICT had been used in sharing of information between patients and healthcare providers to a large extent as indicated by 43.8% and in the provision of medical services from a distance as indicated by 31.3% of the respondents. According to Chetley et al. (2006), telemedicine can be a cost-effective

method that richer countries can employ to aid capacity building in the health care systems of poorer countries. In Africa, for example, the use of telemedicine has helped people in rural areas by saving money and time for travelling and long queuing lines. Clinical staff can now sent patient information by email to specialists in the cities and symptoms can now be analyzed a day ahead from a distance (Chetley et al., 2006).

In health information systems, the study found that ICT had been used to a large extent in checking quality by comparing perception of services delivered as indicated by 56.3% and in gathering information about patients as indicated by 31.3% of the respondents. In line with these findings, AbourZahr and Boerma (2005) found that clinical managers and health planners rely on information generated from the health information systems in making decisions regarding effective functioning of health facilities, allocate resources and also to make strategic policies.

The findings further revealed that internet was used to a large extent in carrying out research and training and that patients use the internet neutrally in gathering information as indicated by 18.8%. Finally, in mobile health, the study found that ICT was used to a very large extent in communicating with patients and in sharing patients' information and indicated by 37.5% of the respondents. In line with these findings, the use of the internet has made it easy for medical learners to share a lot of digital information from the various digital libraries on the Internet which have been reviewed by various researchers (Ruiz, Mintzer and Leipzig, 2006). Additionally various professionals in medical fields can now access various web pages in order to take continuous medical education hence improving current standards of healthcare by use of the availed technologies on the Internet (Dario et al., 2004).

4.3 Challenges to the use of Information and Communication Technologies (ICTs) in healthcare

This section tests on the respondents rating on the challenges facing the use of ICT in the provision of healthcare. This was tested on a five point Likert scale of 1-5; where 1 represented 'Strongly disagree', 2 represented 'Disagree', 3 represented 'Neither agree nor disagree', 4 represented 'Agree' and 5 represented 'Strongly agree'.

The scores 'Strongly Agree' was taken to be equivalent to mean score ranging from 4.1 to 5. 'Agree' with mean score ranging from 3.1 to 4.0, 'Neither agree nor disagree' with a mean score ranging from 2.1 to 3.0, 'Disagree' with a means score ranging from 1.1 to 2.0 and 'Strongly Disagree' with a means score ranging from 0.0 to 1.0. A standard deviation of > 1 represented a significant difference in the responses given. The findings are as presented in Table 4.2.

Table 4.2 Challenges in the use of ICTs in healthcare

Statement	No	Mean	Std. Deviation
Availability of health infrastructure			
Inadequate ICT infrastructure in the organization hinders service delivery to the healthcare subscribers	48	3.31	1.417
Inadequate ICT infrastructure among the subscribers hinders their access to the healthcare services	48	3.88	.937
Technical Knowhow			
The organization lack technical expertise to support the use of ICT in the provision of healthcare services	48	2.25	1.101
Most of the healthcare subscribers lack the technical knowhow on the use of ICT in accessing the healthcare services	48	3.50	1.288
Legislation and health standards			
Ineffective government policies in the use ICT in the provision of healthcare services	48	3.31	1.323
Legislation on the access to personal information limits the use of ICT in the provision of healthcare services	48	3.37	1.231
Individual characteristics			
The employees within the organization are resistant to change thus affecting the use of ICT in the provision of healthcare services	48	2.19	1.249
The subscribers of the healthcare services have negative attitude towards the use of ICT in access the services	48	2.38	1.064
Inadequate allocation of funds			
Allocation of limited funds for health projects in the organization limits the use of ICT in the provision of healthcare	48	3.69	1.323
Limited funding is allocated to the construction of ICT infrastructure which hinder the provision of healthcare services	48	3.50	1.337

The finding on Table 4.2 shows that the respondents agreed with the statements that inadequate ICT infrastructure in the organization hinders service delivery to the healthcare subscribers (mean score 3.31) and that inadequate ICT infrastructure among the subscribers hinders their access to the healthcare services (mean score 3.31).

This is an indication that availability of health infrastructure is a challenge to the use of ICT in the provision of healthcare services. The findings are in line with that of Muathe, Wawire and Ofafa, 2013) who studied adoption of ICT in SMEs in the health sector in Kenya where they found that quality of ICT systems is noted as a significant factor in determining adoption of ICT. Qureshi *et al.* (2013) in their study focusing on establishing the infrastructural barriers to eHealth implementation in developing countries, they found that internet connectivity is vital for successful adoption of eHealth. Omary *et al* (2009) points out that due to poor ICT infrastructure and internet penetration in Tanzania, the majority of areas in the country cannot support internet deployment, which in turn, hampers eHealth adoption. Even in developing countries that have high internet penetration, bandwidth may still be a challenge, thereby limiting adoption of telemedicine and other internet based eHealth applications.

The study also found that the respondents were neutral on the statement that their organization lack technical expertise to support the use of ICT in the provision of healthcare services (mean score of 2.25) while they agreed with the statement that most of the healthcare subscribers lack the technical knowhow on the use of ICT in accessing the healthcare services (Mean score 3.50). This is an indication that technical knowhow is a challenge to the use of ICT in the provision of healthcare services. According to International Telecommunication Union (2009), limited technical expertise in African countries could affect their ability to effectively carry out standards localization. They added that inadequate technical expertise could lead to an absence of, or ineffective government policies regarding the adoption of e-health standards.

Regarding legislation and health standards, the study found that the respondents agreed with the statements that ineffective government policies in the use ICT in the provision of healthcare services (Mean score of 3.31) and legislation on the access to personal information limits the use of ICT in the provision of healthcare services (mean score of 3.37). This is an indication that legislations and health standards is a challenge to the use

of ICT in the provision of healthcare services. According to Omary *et al.* (2009), sufficient standards for medical imaging, interoperability, software, transmission, infrastructure, architecture, medical informatics, and bioinformatics are yet to be formulated in developing countries. Inadequate electronic legislation (eLegislation) and eHealth standards for instance have negatively affected eHealth adoption in Kenya which is also the case for Ghana (Kathryn, 2011).

On individual characteristics, the study found that the respondents were neutral with the statements that the employees within the organization are resistant to change thus affecting the use of ICT in the provision of healthcare services (mean score of 2.19) and that the subscribers of the healthcare services have negative attitude towards the use of ICT in access the services (Mean score of 2.38). Finally, on the allocation of funds, the study found that the respondents agreed with the statements that allocation of limited funds for health projects in the organization limits the use of ICT in the provision of healthcare (Mean score of 3.69) and that limited funding is allocated to the construction of ICT infrastructure which hinder the provision of healthcare services (Mean score of 3.50). There was standard deviation of >1 in all the statements with an exception of one statement on the availability of healthcare infrastructure. According to Abdullah (2012), funding of the health sector determines adoption of electronic health. Due to low funding of health sector in Tanzania, Omary *et al* (2010) argues that it is difficult to allocate much money for acquisition of ICT resources needed in the health sector.

4.4 Relationship between the utilization of the ICTs and the performance of the healthcare projects

4.4.1 Effect of the use of ICT on the Performance of Healthcare Projects

To test on the effect of the use of ICT on the performance of healthcare projects, the respondents were asked to indicate how the use of ICT had impacted in different performance indicators of health projects. The findings are as presented in Table 4.3.

Table 4.3 Effect of the use of ICT on the Performance of Healthcare Projects

Use of ICT	No extent at all		Small extent		Neutral		Large extent		Very large extent		Total	
	f	%	f	%	f	%	f	%	f	%	f	%
Quality of healthcare												
Use of internet for research	0	0	3	6.3	3	6.3	18	37.5	24	50	48	100
Comparing perceptions of services delivered with the expected standards leading to improvement			3	6.3	12	25	24	50	9	18.8	48	100
Medical errors and cost												
Reduces the cost of movement in search for healthcare services	3	6.3	9	18.8	3	6.3	18	37.5	15	31.3	48	100
Use of health information systems to facilitate decision making			3	6.3	3	6.3	21	43.8	21	43.8	48	100
Accessibility to medical records												
Facilitates accessibility to patients medical records			6	12.5	6	12.5	18	37.5	18	37.5	48	100
Provides back up in cases of emergency			6	12.5	6	12.5	21	43.8	15	31.3	48	100
Time												
Saves on time spent to access patients information	3	6.3	0	0	6	12.5	12	25	27	56.3	48	100
Saves on time spent to look for healthcare services	3	6.3	3	6.3	9	18.8	9	18.8	24	50	48	100

Table 4.3 show that the respondents indicated that the use of ICT had impacted on the quality of health through the use of internet for research to a very large extent as indicated by 50% and that it had made it easy to compare perceptions of services delivered with the expected standards leading to improvement to a large extent as indicated by 50% of the respondents. On medical errors and cost, the respondents indicated that the use of ICT reduces the cost of movement in search for healthcare services to a large extent as indicated by 37.5% and that the use of health information systems facilitates decision making to a very large extent as indicated by 43.8%.

On the accessibility of medical records, the study found that the respondents indicated that the use of ICT facilitates accessibility to patients' medical records to very large extent as indicated by 37.5% and that it provides back up in cases of emergency to a large extent as indicated by 43.8% of the respondents. Finally, the study found that the use of ICT saves on time spent to access patients information to very large extent as indicated

by 56.3% and that it saves on time spent to look for healthcare services to a very large extent as indicated by 50% of the respondents.

4.4.2 Benefits of the use of ICT in the Provision of Healthcare Services

This section tests on the respondents rating on the benefits of the use of ICT in the provision of healthcare. This was tested on a five point Likert scale of 1-5; where 1 represented 'No extent at all', 2 represented 'Small extent', 3 represented 'Neutral', 4 represented 'large extent' and 5 represented 'Very large extent'.

The scores 'Very large extent' was taken to be equivalent to mean score ranging from 4.1 to 5.0 'Large extent' with mean score ranging from 3.1 to 4.0, 'Neutral' with a mean score ranging from 2.1 to 3.0, 'Small extent' with a means score ranging from 1.1 to 2.0 and 'No extent at all' with a means score ranging from 0.0 to 1.0. A standard deviation of > 1 represented a significant difference in the responses given. The findings are as presented in Table 4.4.

Table 4.4 Benefits of the use of ICT in the Provision of Healthcare Services

The use of ICT in the management of electronic health records has made it easy to access patients records thus improving the performance of the health projects	48	4.06	1.040
The use of health information systems has made it possible to collect, analyze, retain, retrieve and evaluate health information thus improving the quality of services rendered	48	4.44	1.070
Telemedicine has made it possible for those who are far away to receive medical services in real-time	48	3.81	1.142
The use of internet has allowed patients to get information, interact with their physicians and order pharmaceutical products online thus improving the performance of health projects	48	3.62	1.231
The use of mobile health has made it possible for the marginalize to access healthcare services thus improving the performance of healthcare projects	48	3.41	1.282

The findings on Table 4.4 show that the respondents strongly agreed with the statements that the use of ICT in the management of electronic health records has made it easy to access patients records thus improving the performance of the health projects (Mean score 4.06) and that the use of health information systems has made it possible to collect, analyze, retain, retrieve and evaluate health information thus improving the quality of

services rendered. These findings are in line with that of Miller and West (2007) who found that the benefits of using electronic health records include improved quality of healthcare, reduced medical errors and reduced costs, access to medical record information and time savings. According to Garrido et al. (2004), the benefits of using health information systems include improved quality, better communication, staff efficiency, reduced transcription costs and increased patient safety and increased revenues.

The study also found that the respondents agreed with the statements that Telemedicine has made it possible for those who are far away to receive medical services in real-time (Mean score 3.81), the use of internet has allowed patients to get information, interact with their physicians and order pharmaceutical products online thus improving the performance of health projects (Mean score 3.62) and that the use of mobile health has made it possible for the marginalize to access healthcare services thus improving the performance of healthcare projects (Mean score 3.41). Podichetty and Biscup (2003) findings further supports that patients are using the internet to get information, interact with their physicians and order pharmaceutical products online. Hence the patients are now taking charge of their health status by staying informed with issues regarding to their health.

4.4.3 Regression Analysis

Multiple regression analysis was done to test on the relationship between the variables of the study. The relationship was tested between performance of healthcare projects (dependent variable) and the independent variables such: the use of electronic health records, telemedicine, health information systems, the internet and mobile health.

Multiple regression model presented below was used to test on the relationship between the variables of the study:

$Y = a + ß_1X_1 + ß_2X_2 + ß_3X_3 + ß_4X_4 + ß_5X_5 + \varepsilon$

Where:

Y = Performance of healthcare projects

X_1 = Electronic health records

X_2 = Telemedicine

X_3 = Health information systems

X_4 = The internet

X_5 = Mobile health

a = Constant

ε = Error term

The study carried out an overall regression model to determine the significance of each of the independent variables on the dependent variable. As can be observed in Table 4.5, R Square was 0.733 and R was 0.856 at 0.05 significant level. The coefficient of determination indicates that 73.3% of the variations on performance of healthcare projects can be explained by the use of electronic health records, telemedicine, health information systems, the internet and mobile health. The remaining 26.7% can be explained by other variables not included in the study. R square and adjusted R is high an implication that there is a high variation that can be explained by the model.

Table 4.5 Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.856[a]	.733	.701	.467
a. Predictors: (Constant), Mobile Health, The Internet, Telemedicine, Health Information Systems, Electronic Health Records				

Further analysis of ANOVA as shown in Table 4.6 showed that significance of F statistics is 0.000, which less than 0.05 and the value of F (23.003) is being significant at 0.00 confidence level.

Table 4.6 ANOVA

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.134	5	5.027	23.003	.000[b]
	Residual	9.178	42	.219		
	Total	34.313	47			
a. Dependent Variable: Performance of Healthcare Projects						
b. Predictors: (Constant), Mobile Health, The Internet, Telemedicine, Health Information Systems, Electronic Health Records						

Table 4.7 presents the beta coefficients of all independent variables versus the dependent variable.

Table 4.7 Coefficients

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.960	.312		9.498	.000
	Electronic Health Records	1.472	.183	1.791	8.032	.000
	Telemedicine	.568	.126	.711	4.521	.000
	Health Information Systems	.384	.098	.513	3.898	.000
	The Internet	.611	.086	.880	7.136	.000
	Mobile Health	.283	.070	.410	4.027	.000
a. Dependent Variable: Performance of Healthcare Projects						

The regression model is written as: Performance of healthcare projects = 1.472* Electronic health records +0.568* Telemedicine+ 0.384* Health information systems + 0.611* The internet + 0.283* Mobile health.

The Beta Coefficients in the regression show that all the variables tested: use of electronic health records, telemedicine, health information systems, the internet and mobile health have positive relationship with performance of healthcare projects. The findings show that all the variables tested are statistically significant with p-values less than 0.05.

The implication of Beta Coefficient

X_1 = 1.472; one unit increase in the use of electronic health records results in 1.472 units improvement in the performance of healthcare projects

X_2 =0.568; one unit improvement in the use of telemedicine results into 0.568 units improvement in the performance of healthcare projects.

X_3 =0.384; one unit improvement in the use of health information systems results in 0.384 units improvement in the performance of healthcare projects.

X_4 =0.611; one unit improvement in the use the internet results in 0.611 units improvement in the performance of healthcare projects

X_5 =0.283; one unit increase in the use of mobile health results in 0.283 units improvement in the performance of healthcare projects.

4.4.4 Correlation Analysis

This study conducted correlation analysis to test on the strength of association/relationship between the variables of the study. Correlation is a measure of the relationship or association between two continuous numeric variables. It indicates both the direction and degree to which they vary with one another from case to case without implying that one is causing the other. Correlation analysis results give a correlation coefficient which measures the linear association between two variables (Crossman, 2013).

Values of the correlation coefficient range between -1 and +1. A correlation coefficient of +1 indicates that two variables are perfectly related in a positive linear. A correlation of -1 indicates that two variables are negatively linearly related and a correlation efficient of 0 indicates that there is no linear relationship between two variables (Wond, 2012).

Table 4.8 Correlation Analysis

Performance of Healthcare Projects	Pearson Correlation	1					
	Sig. (2-tailed)						
	N	48					
Electronic Health Records	Pearson Correlation	.549	1				
	Sig. (2-tailed)	.039					
	N	48	48				
Telemedicine	Pearson Correlation	.127	.835**	1			
	Sig. (2-tailed)	.031	.000				
	N	48	48	48			
Health Information Systems	Pearson Correlation	.323*	.763**	.591**	1		
	Sig. (2-tailed)	.025	.000	.000			
	N	48	48	48	48		
The Internet	Pearson Correlation	.417**	.717**	.466**	.584**	1	
	Sig. (2-tailed)	.003	.000	.001	.000		
	N	48	48	48	48	48	
Mobile Health	Pearson Correlation	.483**	.546**	.482**	.587**	.461**	1
	Sig. (2-tailed)	.001	.000	.001	.000	.001	
	N	48	48	48	48	48	48
*. Correlation is significant at the 0.05 level (2-tailed).							
**. Correlation is significant at the 0.01 level (2-tailed).							

The results of the correlation analysis on Table 4.8 shows that performance of healthcare projects is positively related with the use of electronic health records with a Pearson's Correlation Coefficient of r = 0.549 and that at a level of significance of 0.039, it is

statistically significant at p value less than 0.05. The results also show that there is a positive correlation between performance of healthcare projects and the use of telemedicine with a Pearson's Correlation Coefficient of r = 0.127 and a level of significance of 0.031 (statistically significant). The results further show that performance of healthcare projects have a positive relation with use of health information systems with a Pearson's Correlation Coefficient of 0.323 and 0.025 level of significance. It was also found that performance of healthcare projects have a positive relation with the use of internet with a Pearson's Correlation Coefficient of 0.417 and 0.003 level of significance. The results finally show that performance of healthcare projects have a positive relation with the use of mobile health with a Pearson's Correlation Coefficient of 0.483 and 0.001 level of coefficient. The significance values tell us that the probability of the correlation being a fluke is very low; hence the study can have confidence that the relationship between the variables is genuine.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter presents the summary of the study, conclusion and recommendation.

5.2 Summary of the Study

The purpose of this study was to investigate the relationship between ICT and performance of the health care projects. The study was guided by the following objectives: to establish the extent to which ICT is used in healthcare projects in Kenya, to determine the key challenges in the use of Information and Communication Technologies (ICTs) in healthcare and to establish the relationship between the utilization of the ICTs and the performance of the healthcare projects

5.2 Summary of Findings

5.2.1 The extent to which ICT is used in healthcare projects in Kenya

On the extent of use of ICT in the provision of healthcare projects, the study found that ICT had been used in the management of electronic health records to a large extent in managing patients' records electronically and provision of back up in cases of emergency for patients' records as indicated by 37.5% of the respondents. The study also found that ICT had been used in telemedicine to share information between patients and healthcare providers to a large extent as indicated by 43.8% and in the provision of medical services from a distance as indicated by 31.3% of the respondents. In health information systems, the study found that ICT had been used to a large extent in checking quality by comparing perception of services delivered as indicated by 56.3% and in gathering information about patients as indicated by 31.3% of the respondents. The findings further revealed that internet was used to a large extent in carrying out research and training and that patients use the internet neutrally in gathering information as indicated by 18.8%. Finally, in mobile health, the study found that ICT was used to a very large extent in communicating with patients and in sharing patients' information and indicated by 37.5% of the respondents.

5.2.2 Challenges to the use of Information and Communication Technologies (ICTs) in healthcare

Regarding the challenges to the use of ICT in the provision of healthcare services, the study found that inadequate ICT infrastructure in the organization hinders service delivery to the healthcare subscribers (mean score 3.31) and that inadequate ICT infrastructure among the subscribers hinders their access to the healthcare services (mean score 3.31). It was also found that most of the healthcare subscribers lack the technical knowhow on the use of ICT in accessing the healthcare services (Mean score 3.50). The study further found that ineffective government policies in the use ICT in the provision of healthcare services (Mean score of 3.31) and legislation on the access to personal information limits the use of ICT in the provision of healthcare services (mean score of 3.37). The study finally found that allocation of limited funds for health projects in the organization limits the use of ICT in the provision of healthcare (Mean score of 3.69) and that limited funding is allocated to the construction of ICT infrastructure which hinder the provision of healthcare services (Mean score of 3.50).

5.2.3 Relationship between the utilization of the ICTs and the performance of the healthcare projects

On the relationship between the utilization of ICT and the performance of healthcare projects, the study found that the use of ICT had impacted on the quality of health through the use of internet for research to a very large extent as indicated by 50% and that it had made it easy to compare perceptions of services delivered with the expected standards leading to improvement to a large extent as indicated by 50% of the respondents. On medical errors and cost, the respondents indicated that the use of ICT reduces the cost of movement in search for healthcare services to a large extent as indicated by 37.5% and that the use of health information systems facilitates decision making to a very large extent as indicated by 43.8%.On the accessibility of medical records, the study found that the respondents indicated that the use of ICT facilitates accessibility to patients' medical records to very large extent as indicated by 37.5% and that it provides back up in cases of emergency to a large extent as indicated by 43.8% of the respondents. Finally, the study found that the use of ICT saves on time spent to access patients information to very large extent as indicated by 56.3% and that it saves on time

spent to look for healthcare services to a very large extent as indicated by 50% of the respondents.

The findings from the regression analysis revealed that use of electronic health records, telemedicine, health information systems, the internet and mobile health explains 73.3% of the performance of healthcare projects. The findings from correlation analysis further revealed that all variable tested had a positive relationship with the performance of healthcare projects and were all significant at 95% confidence level.

5.3 Conclusion

From the study, it was concluded that the use of electronic health records, telemedicine, health information systems, the internet and mobile health influences the performance of healthcare projects.

The study therefore concluded that ICT is used to a large extent in the management of health records where they provide back up in cases of emergency.

The study also concludes that ICT is used in telemedicine where it allows sharing of information between patients and healthcare providers.

The study further concludes that health information systems is used to large extent in checking quality by comparing perception of services delivered and gathering information about patients.

The study finally concludes that mobile health is used to a very large extent in communicating with patients and sharing patients' information. This improves the quality of healthcare service delivery.

5.4 Recommendations

The following were the recommendations of the study:

The study recommends that organizations that have adopted the use of ICT in running healthcare projects should develop health application that is a "one stop shop" for all health needs. This will improve the delivery of healthcare services.

The study further recommends that organizations should train its staff and patients on the use of ICT in delivering and accessing healthcare services. This would improve the performance of healthcare projects.

The study also recommends that organizations providing e-health should services should explore more simple technologies which can be used by patients and staff to ensure quality service delivery. This will promote adoption resulting from simplicity of the technology.

The study finally recommends that more resources be allocated for ICT infrastructure. This would improve the use of ICT in delivering and accessing healthcare services.

5.5 Recommendations for Further Research

The study was carried to investigate the relationship between ICT and performance of the health care projects. The researcher therefore recommends that another study be carried to assess the use of ICT in the provision of healthcare services in hospitals.

The study also recommends that another study be done on the preparedness of public hospitals in Kenya for the adoption of e-health technology which was not the concern of this study.

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APPENDICES

APPENDIX I: LETTER OF INTRODUCTION

August 2015

Dear Sir/Madam,

REF: REQUEST FOR RESEARCH DATA

I am a Master of Business in Management Information Systems student at the University of Nairobi. I am required to submit as part of my course work assessment a research project report on "**INFORMATION AND COMMUNICATION TECHNOLOGIES AND PERFORMANCE OF ELECTRONIC HEALTH PROJECTS IN KENYA**". Your organization has been selected to participate in the study. I would appreciate for your cooperation and time to help me fill the attached questionnaire. Please be assured that all your responses shall be kept strictly anonymous and confidential and shall only be used for academic purposes.

Thank you in advance.

Simeon Ominde Wasonga

Student (Researcher)

University of Nairobi

APPENDIX II: QUESTIONNAIRES

SECTION A: BACKGOUND INFORMATION

1. Gender Male [ ] Female [ ]

2. Age 19 – 25 years [ ] 26– 35 years [ ] 36 – 45 years [ ]
46-55 years [ ] Above 55 Years [ ]

3. Level of education: "O" Level [ ] Diploma [ ]
Degree [ ] Masters [ ]

Any other (specify) _____

4. Years of service at the organization

Less than 3 years [ ] between 4 – 5 [ ]

6 – 10 years [ ] 10 years and above [ ]

5. Name of the organization (Optional) _____

6. Position in the organization:_____

7. When did your organization adopt the use of ICT in providing healthcare services?___

_____

SECTION B: EXTENT OF THE USE OF ICT IN HEALTHCARE PROJECTS IN KENYA

8. The following are some of the areas where ICT has been used in the provision of healthcare services in health projects in Kenya. Please indicate the extent to which you organization has used ICT in the provision of each of the services.

1-No extent at all **2-Small extent** **3-Neutral**
4-Large extent **5-Very large extent**

	Use of ICT	1	2	3	4	5
A	**Electronic health records**					
	Managing patients records electronically					
	Provide back up in cases of emergency for patients records					
B	**Telemedicine**					
	Provision of medical services from a distance					
	Sharing of information between patients and healthcare provider					
C	**Health information systems**					
	Gathering information about patients					
	Checking quality by comparing perception of services delivered with expected standards					
D	**The internet**					
	Use of internet for research and training					
	Use of internet by patients to get information					
E	**Mobile health**					
	Communicating with patients					
	Sharing patients' information					
F	**Any other use of ICT?**					

SECTION C: CHALLENGES TO THE USE OF ICT IN THE PROVISION OF HEALTHCARE SERVICES

9. The following are some statements on the challenges facing the use of ICT in the provision of health services. Please indicate the level of your agreement with each statement in relation to your organization.

1-Strongly disagree 2-Disagree 3-Neither agree nor disagree

4-Agree 5-Strongly agree

	Statement	1	2	3	4	5
A	**Availability of health infrastructure**					
	Inadequate ICT infrastructure in the organization hinders service delivery to the healthcare subscribers					
	Inadequate ICT infrastructure among the subscribers hinders their access to the healthcare services					
B	**Technical Knowhow**					
	The organization lack technical expertise to support the use of ICT in the provision of healthcare services					
	Most of the healthcare subscribers lack the technical knowhow on the use of ICT in accessing the healthcare services					
C	**Legislation and health standards**					
	Ineffective government policies in the use ICT in the provision of healthcare services					
	Legislation on the access to personal information limits the use of ICT in the provision of healthcare services					
D	**Individual characteristics**					
	The employees within the organization are resistant to change thus affecting the use of ICT in the provision of healthcare services					
	The subscribers of the healthcare services have negative attitude towards the use of ICT in access the services					
E	**Inadequate allocation of funds**					
	Allocation of limited funds for health projects in the organization limits the use of ICT in the provision of healthcare					
	Limited funding is allocated to the construction of ICT infrastructure which hinder the provision of healthcare services					
F	**Any other challenge**					

SECTION D: RELATIONSHIP BETWEEN THE UTILIZATION OF THE ICTS AND THE PERFORMANCE OF THE HEALTHCARE PROJECTS

10. Do you think the use of ICT has improved the performance of healthcare projects in your organization in any way? Yes [ ] No [ ]

11. The following are some of the indicators of performance resulting from the use of ICT in the provision of healthcare. Please indicate the extent to which each has been realized from the use of ICT in healthcare by your organization.

1-No extent at all **2-Small extent** **3-Neutral**

4-Large extent **5-Very large extent**

	Indicators of performance	1	2	3	4	5
A	**Quality of healthcare**					
	Use of internet for research					
	Comparing perceptions of services delivered with the expected standards leading to improvement					
B	**Medical errors and cost**					
	Reduces the cost of movement in search for healthcare services					
	Use of health information systems to facilitate decision making					
C	**Accessibility to medical records**					
	Facilitates accessibility to patients medical records					
	Provides back up in cases of emergency					
D	**Time**					
	Saves on time spent to access patients information					
	Saves on time spent to look for healthcare services					
E	**Any other indicator?**					

12. The following are some statements on the effect of the use of ICT in the provision of healthcare services of the performance of healthcare projects. Please indicate the level of your agreement with each statement in relation to your organization.

1-Strongly disagree 2-Disagree 3-Neither agree nor disagree

4-Agree 5-Strongly agree

	Statements	**1**	**2**	**3**	**4**	**5**
i.	The use of ICT in the management of electronic health records has made it easy to access patients records thus improving the performance of the health projects					
ii.	The use of health information systems has made it possible to collect, analyze, retain, retrieve and evaluate health information thus improving the quality of services rendered					
iii.	Telemedicine has made it possible for those who are far away to receive medical services in real-time					
iv.	The use of internet has allowed patients to get information, interact with their physicians and order pharmaceutical products online thus improving the performance of health projects					
v.	The use of mobile health has made it possible for the marginalize to access healthcare services thus improving the performance of healthcare projects					
vi.	Any other benefit					

13. What would you recommend to be done by organization that has adopted the use of ICT in the provision of healthcare services to improve their performance?

_____

_____

_____

Thank you for your time and cooperation

APPENDIX III: LIST OF ORGANIZATIONS USING ICT IN HEALTHCARE PROJECTS IN KENYA

Project/ Program	Technology/ Platform	Roles
AMPATH (Academic Model for Providing Access to Healthcare)	OpenMRS http://openmrs.org/	An open source medical record system which allows medical workers to track and store medical information. It is developed by many volunteers worldwide to support health delivery in developing countries. OpenMRS is also supported by WHO, the CDC, the Rockefeller Foundation, and the President's Emergency Plan for AIDS Relief. The first ideas of OpenMRS were conceived at the AMPATH clinic in Eldoret, Kenya.
Changamka	Runs on Kenya's popular mobile money micro financing system called M-PESA.	Changamka developed a revolutionary platform that runs on Kenya's popular mobile money micro financing system called M-PESA. Using their cell phones Kenyans are able to put aside small sums of money to save to purchase micro insurance. By enabling customers to save at their own pace, this process makes access to healthcare an attainable goal for most Kenyans. Changamka's micro insurance costs just $140 a year to insure an entire family and includes several value-added services such as dental and vision coverage as well as income replacement during hospitalization.
Danya International	**eLearning**	Danya is a one-stop resource for interactive eLearning services. We apply research-based, client-centered approaches to create, design, develop, manage, distribute, and evaluate eLearning programs for computers and mobile devices. We use both open-source and proprietary eLearning management systems and cloud or network-based hosting solutions to meet the varied needs of our clients and their requirements. Danya produces engaging online courses, tutorials, and webcasts that can be accessed anytime, anywhere. We also develop online event registration, interactive and automated screening instruments, streaming audio and video, and graphic arts and animation and provide technical assistance for all aspects of course design and implementation.
AMREF	**eHealth**	In 2005, AMREF set up the Kenya eLearning Nurses Upgrading Programme with support from Accenture (a global management consulting, technology services and outsourcing company), and in partnership with the Ministry of Health in Kenya and the Nursing Council of Kenya. The programme was a national programme which scaled up from 12 (four schools and eight eCentres) pilot sites to over 100 sites, including 34 schools, in a span of five years.

AMREF	**HELP** (Health Enablement Learning Platform)	The Health Enablement & Learning Platform (HELP) provides Kenya Ministry of Health-approved training content to community health volunteers (CHVs). Based on a sophisticated mobile learning methodology HELP works on all mobiles (basic to smart), empowering health workers through learning opportunities and enablement tools. HELP has been developed through a cross-sector collaboration between Amref Health Africa, Accenture, Mezzanine, Safaricom and the M-Pesa Foundation.
FHI360 (Family Health International)	**Knowledge for Health (K4Health)**	Knowledge for Health (K4Health) is a knowledge management project led by the Johns Hopkins University Centre for Communication Programs, in partnership with FHI 360 and Management Sciences for Health. The K4Health mission is to increase the use and dissemination of evidence-based, accurate and up-to-date information in order to improve health service delivery and health outcomes worldwide.
FHI360 (Family Health International)	**Mobile for Reproductive Health** (m4RH)	Through its Mobile for Reproductive Health (m4RH) project, FHI 360 developed a set of text messages on family planning methods that users in Kenya and Tanzania can access via their mobile phones. This low-cost approach to reaching contraceptive users was part of a research study aimed at determining the feasibility of providing family planning information via text message. The m4RH messages were developed using evidence-based content, including the World Health Organization family planning handbook for providers, and were crafted specifically for short message service (SMS), or text message, use. Each message was designed and tested to ensure user comprehension within the 160-character limit. The m4RH service provides information on long- and short-acting family planning methods, including implants, intrauterine devices, permanent methods, injectables, oral contraceptive pills, emergency contraception, condoms and natural methods such as the lactational amenorrhea method. The messages address side effects, method effectiveness, duration of use and ability to return to fertility. The service also lists local clinics in a database that is searchable by province in Kenya or by ward in Tanzania.
KURHI (Kenya Urban Reproductive Health initiative)	**Tupange Commodity Tracking System**	The Tupange SMS Commodity Tracking System was one of the mobile technologies showcased by the Kenya Team at an international conference on the use of mobile technology to strengthen family planning and reproductive health programs. Tupange Project established the multi-dimensional information system to ensure commodity security in collaborating facilities in the public and private sector. The system tracks current stock status (quantification) at a

		facility; using a password, health facility staff can access the system and report quantity levels in time to avert stock-outs. It is also used to determine the need for redistribution of commodities between and among facilities.
IMS (International Media Support)	**FrontlineSMS**	A new project aims to improve diabetes awareness and reliable communication about the disease throughout Kenya through mobile phone technology and a web portal.
MSF **(Medicins Sans Frontieres)**	**StopStockouts**	The Stop Stock Outs Project will crowdsource stock out reports from patients, healthcare workers and sentinel surveyors, mapping the reported cases and tracking specific issues. All reports will be escalated through the supply chain and resolution sought through the direct engagement of civil society with accountable government individuals and entities. It is the hope of the Stop Stock Outs Project that the data from the reports will provide essential information to identify and understand the root causes of stock outs and shortages and bring visibility and transparency to a struggling health system. The Stop Stock Outs Project is calling on patients and healthcare workers to report any medication stock outs or shortages that have resulted in patients' treatment being changed, patients being turned away from their clinic and referred elsewhere and/or being given an insufficient supply of medication.