

**ADOPTION OF TELEMEDICINE IN HOSPITALS IN NAIROBI
COUNTY**

**BY
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DECLARATION

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

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This research project has been submitted with my approval as the University supervisor.

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DEDICATION

To my wife and Children

ABSTRACT

Telemedicine has been advocated as a way of reducing geographical and distance barriers in healthcare service delivery to enable patients in distant locations access healthcare services through the use of information and communication technologies (ICT). According to World Health Organization WHO (2010), telemedicine simply means healing at a distance using information and communication technologies. Though various studies have reported that adoption of telemedicine in sub-Saharan Africa is low, there is little knowledge on attitude of doctors towards telemedicine in sub-Saharan Africa. This research was therefore undertaken with three objectives of determining the attitude of doctors towards telemedicine, the extent of adoption of telemedicine in hospitals in Nairobi County and the factors influencing adoption of telemedicine in hospitals. Descriptive survey method was used in this research. The target population was both public and private hospitals in Nairobi County. Respondents were doctors in these hospitals. The sampling frame was obtained from the list of hospitals in Nairobi County that are registered with National Hospital Insurance Fund (NHIF). Sample size of 36 hospitals was targeted. The research instrument used was structured questionnaire on a five point Likert scale. The data was analyzed using frequency, percentages, mean scores, standard deviation and factor analysis. The data was presented using tables and graphs. On the first objective regarding attitude towards telemedicine, the research findings established that doctor's attitude to telemedicine is positive. The research established that doctors agree that telemedicine is beneficial and compatible with healthcare service delivery. Doctors also agreed that telemedicine reduces the need for patients travelling to see the doctor, increases the speed of healthcare service delivery and that telemedicine can be used by doctors for getting second opinion regarding patient's diagnosis. On the second objective regarding extent of adoption of telemedicine in hospitals, the research established that in hospitals, telemedicine had been adopted to a small extent in doctor consultations, laboratory, radiology and pharmacy. In other hospital service areas such as dental, dermatology, physiotherapy, cardiology, ophthalmology, surgery etc, telemedicine had not been adopted. In general, the extent of adoption of telemedicine in hospitals is low. In regards to factors influencing adoption of telemedicine, the research established that Availability of ICT connectivity (internet links), cost of ICT connectivity, Data transmission speed and reliability of ICT systems influence adoption of telemedicine to a large extent. Resistance by hospital administration and hospital staff was also reported to affect adoption of telemedicine in hospitals. In conclusion, the research established that the attitude of doctors towards telemedicine is favorable; however the adoption of telemedicine in hospitals is low. The low adoption of telemedicine in hospitals despite the positive attitude of doctors towards telemedicine could be attributed to ICT infrastructure issues mentioned above and lack of commitment by hospital administration to implement telemedicine.

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LIST OF ABBREVIATION

ICT - Information and communication technologies

NHIF- National Hospital Insurance Fund

WHO - World Health Organization

ATA- American Telemedicine Association

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The use of Information and communication technology (ICT) has become very popular in healthcare management. In the past the traditional use of ICT in healthcare management has been keeping patient medical records, financial and inventory management. However recently there have been efforts to extent the use of ICT to greater heights in healthcare management. Telemedicine is one such way through which ICT is being extended further in healthcare management. The concept of telemedicine is about the use of ICT to provide healthcare services to patients without the need for patients travelling to physically meet with the doctor. Telemedicine has the potential to significantly impact healthcare in developing countries where there is a chronic shortage of medical personnel (Isabaliya et al, 2011).

Telemedicine has been defined in several ways by various researchers. Telemedicine is the process through which doctors can provide healthcare services to patients located in distant areas through the use of Information and communication technologies (ICT). Goldberg (1996) refers to telemedicine as delivery of healthcare across geographic separation by the use of telecommunications and computers. Goldberg (1996), further explains that telemedicine has the potential to improve access to care for rural areas or areas underserved by healthcare specialists; improve access to medical education; and enhance the quality of care.

According to World Health Organization WHO (2010), telemedicine simply means healing at a distance. WHO (2010) broadly defines telemedicine as the delivery of

healthcare services where distance is critical by healthcare professionals using Information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease. According to American Telemedicine Association, Telemedicine includes Patient consultations via video conferencing, electronic transmission of patient still images, patient portals, remote monitoring of patient vital signs and electronic transmission of patient's medical information to distant locations for specialist doctors to review and provide diagnostic reports or second opinion (www.americantelemed.org).

Telemedicine can either be “store and forward” or real-time (Duncan and Sally, 2012). Store and forward telemedicine does not require real-time interaction between the doctor and the patient. In this case, the medical data of the patient such as lab tests and radiology images can be captured and transmitted electronically to the specialist doctor in a distant location. The specialist doctor reviews the medical data at a convenient time and sends the assessment electronically back to the facility where the patient visited. Store and forward telemedicine does not require the presence of the patient and the doctor at the same time (Duncan and Sally, 2012). Real time (interactive) telemedicine provide real-time interaction between the patient and the doctor at the same time. It may include telephone conversations or videoconferencing (Duncan and Sally, 2012).

Reports published by the American Telemedicine Association (www.americantelemed.org), identify several benefits of telemedicine. According to American Telemedicine Association, telemedicine can be used to bring healthcare

services to patients in distant locations. Telemedicine allows physicians and healthcare facilities to expand their reach beyond their own offices. Therefore telemedicine has the capacity to increase healthcare service to millions of new patients. The American Telemedicine Association also reports that telemedicine reduces healthcare costs and increases quality of healthcare services. Doctors can share expert or second opinion through ICT by jointly reviewing the patient electronic clinical reports with other expert doctors located in other towns. Other benefits attributed to telemedicine are; reduction in patient's referrals to offsite facilities and reduction in patient transfers hence reducing related transfer costs (WHO, 2010).

1.1.1 Attitude towards New Technology

Attitude towards new technology refers to the willingness of an individual to become a regular user of the technology. According to David (2003), there are underlying forces that govern an individual's attitude towards a new technology. David (2003) further adds that perception and interpretation of an innovation varies on individual basis and these are contributing factors of an individual's attitude towards a new innovation. How an individual perceives introduction of the technology is critical to whether the individual will eventually adopt the innovation. According to David (2003) past experience of an individual with the new technology also affects the individuals attitude towards the technology, individuals that have had positive past experience with the innovation will have a positive attitude towards the innovation. Individuals Age also affects attitude towards new innovation. Older people are less likely to adopt new technology (David, 2003). However introduction of new technology is now common in many organizations,

some employees embrace the changes that the technology brings whereas others resist. According to the Technology Acceptance Model by Davis (1985), perceived benefits and perceived ease of use of the new technology are determinants of the individual's attitude towards the new technology. Perceived benefits and ease of use of telemedicine are therefore important determinants of doctor's attitude towards telemedicine.

1.1.2 Application of Telemedicine in Healthcare

Review of the literature shows that Telemedicine can be used in almost all service areas of the hospital (www.telehealthresourcecentre.org). However research done in Maryland by Craig (2013), shows that most hospitals use telemedicine for Consultations and Imaging, but telemedicine is also used in Diagnostics, Monitoring and Emergency. Telemedicine Consultations provides care to patients or advice to other medical providers where the recipient of the service is located at a different geographic location from that of the provider. Telemedicine services are offered by hospitals or large medical groups that employ a diverse collection of experts and highly experienced medical and healthcare specialists. The specialists communicate with patients or providers at physically separate locations using a variety of communications and information technologies to exchange medical information. These technologies may range from complex live, interactive videoconferencing equipment and associated devices, to simple image capture and transmission devices for storage and review of medical information. The specialist examines the patient's medical information, orders for additional diagnostic tests if necessary and provides direct treatment. Sometimes the specialist may not provide direct

treatment but instead creates a consultation report for the referring physician (www.telehealthresourcecentre.org).

1.1.3 Factors Influencing Adoption.

According to Rogers (1995), individuals possess different degrees of willingness to adopt an innovation. The individuals can be classified into five categories depending on their willingness to adopt new innovation. The categories are; innovators, early adopters, early majority, late majority, and laggards. The innovators are the first to adopt whereas the laggards are the last to adopt. According to Kotler and Keller (2006) the factors that influence adoption of an innovation are; Relative advantage of the innovation as compared to already existing technologies. Kotler and Keller (2006) further report that Compatibility and complexity of the innovation also affects adoption of the innovation. According to Maurice (2010) adoption of telemedicine in developing countries has been very low. Maurice (2010) attributes the low level of adoption to Poor ICT infrastructure, high ICT connectivity costs, lack of capacity development and lack of Telemedicine Policy framework.

1.1.4 Kenya Health System

The major players in provision of health services in Kenya are; Public hospitals and Private hospitals. Like any other developing country, Kenya has shortage of doctors (WHO, 2013). Whereas developed countries have about 2.42 doctors for every 1000 people, Kenya has 0.18 doctors for every 1000 people (WHO, 2013). Moreover most of the specialist doctors in Kenya are concentrated in the cities (Kenya Ministry of Health & WHO, 2004).

Kenya with a population of about 40 million people has only two public referral hospitals and two private referral hospitals. The Public referral hospitals are; Kenyatta National Hospital and Moi Referral Hospital for the public. The private referral hospitals are Aga Khan university Hospital and Nairobi hospital. Apart from Moi referral hospital which is located in Eldoret town, the other three referral hospitals are located in Nairobi city (The Kenya government, National Human Resources for Health, Annual Report, 2010). The referral hospitals receive patient's referral cases from across the country. For instance Kenyatta National hospital sees about 580,000 patients annually, an average of about 1500 patients per day (<http://knh.or.ke>).

The general process of receiving healthcare service is that first the patient visits a general doctor or a clinical officer who examines the patient and either provides treatment or refers the patient to a specialist doctor depending on the illness of the patient. If the specialist doctor is not within the hospital where the patient has visited then the patient may be referred to a specialist doctor in another hospital. Depending on the location of the hospital where the patient has been referred to, the patient may have to travel long distances to be seen by the specialist doctor. Considering that specialist doctors in Kenya are concentrated in the cities, patients in the other towns are likely to be referred to the cities to be seen by the specialist doctors (Kenya Ministry of Health & WHO 2004). The public health system consists of Dispensaries, health centers, District hospitals, Provincial Hospitals and the National referral hospitals. Provincial hospitals act as referral hospitals

at provincial level whereas National referral hospitals are at the apex of the healthcare system providing sophisticated healthcare services at national level (Muga et al, n.d.).

Recently there have been efforts by the Kenya government and the private sector to create a conducive environment for e-health through improving the ICT infrastructure and formulating policy framework. In the last decade, Kenya has experienced significant improvement in ICT infrastructure (National Broadband Strategy, 2013). Currently several telecommunication companies are competing in laying out the fiber optic cable to interconnect all major towns in the country. In Nairobi city and other towns, we have seen trenches being dug all over along the roads for laying out the fiber optic cable. The government has played a major role in this improvement by lowering import taxes on ICT equipment and liberalizing the telecommunication sector.

The Kenya government communication Act (1998) was a precursor for opening up competition in the ICT industry. To ensure equity in access to broadband, the Kenya government has formulated a strategy to ensure that all Kenyans have access to broadband by year 2017(The National Broadband strategy for Kenya, 2013). The main objective of the National Broadband Strategy (2013) is to provide quality broadband services to all citizens. In regards to the benefits of broadband, the National Broadband Strategy cites e-health as one of the benefits of broadband. The National broadband strategy (2013) further explains that broadband internet access has the capacity to provide solutions to the constraints of healthcare delivery systems in the rural areas and other marginalized areas by facilitating roll-out of e-health applications in the country.

There have been some efforts in Kenya to implement telemedicine in the past few years. In the year 2012, Safaricom teamed up with African Air Rescue (AAR) to launch telemedicine services. During the launch, Safaricom CEO Bob Collymore emphasized that the adoption of telemedicine would help address the skewed doctors-to-patient ratio. Patients will be able to get quality health care irrespective of their locations. The Safaricom CEO Collymore added that using telemedicine technology, all a doctor needs is a computer or a tablet to treat a patient (www.telecompaper.com).

The Aga Khan University Hospital which has a large branch network has implemented telemedicine in radiology department whereby the specialist doctors at the main hospital in parklands Nairobi provide second opinion on radiology images done in outreach branches. The specialist doctors access the radiology images through the picture archiving and communication system (PACS) and enter their observations (radiology report) in the system. The radiology report is then accessed by the doctor in the outreach branch to provide treatment to the patient. This has reduced the need for specialist doctors to physically travel to the hospital's outreach branches (www.eastafricaaidproject.org). Aga Khan University Hospital is also reported to have performed successful telesurgery through video links (<http://africahealthitnews.com>).

1.2 Statement of the Problem

Telemedicine has been advocated as a means of improving access to healthcare and mitigating the shortage of doctors. However the adoption of telemedicine in developing countries has been very low (Maurice, 2010). According to Maurice (2010), the factors

that impede the use of telemedicine in sub-Saharan Africa include poverty, shortage of human resources, very limited existing infrastructure, lack of connectivity, high connectivity costs, lack of capacity development, policy and legislative issues.

According to research done in Uganda, the key factors hindering adoption of telemedicine are; lack of telemedicine policy, knowledge and skills and resistance to change by members of staff in Hospitals (Isabaliya et al, 2011). Some studies have also been done in Kenya to assess the status of e-health. The study done on the current status of e-health in Kenya reports that adoption of e-health is highly influenced by development of national e-health policies and strategies which are in tune with national development plans, national ICT policies and with buy-in from healthcare workers (Kilwake et al, 2012).

Considering that Kenya has a shortage of doctors and that most of the specialist doctors are concentrated in the cities, there is inequality in access to quality healthcare services for those who live in distant towns or remote areas. Patients who live in distant areas have to travel to the major cities in search of specialist doctors. Telemedicine can therefore be used to reduce this inequality (Kenya Ministry of Health & WHO 2004). Since doctors are the key players in provision of healthcare services; doctor's perception of telemedicine is paramount to adoption of telemedicine in hospitals. Considering this, the question that arises is what is the perception of doctors in Kenya towards telemedicine and what is the extent of adoption of telemedicine in Kenya's hospitals? Therefore this study provided an insight on adoption of telemedicine in Kenya.

1.3 Study Objectives

The study refers to Hospitals in Kenya and its objectives were to:

- i. Determine the attitude (Perception) of doctors towards telemedicine.
- ii. Determine extent of adoption of telemedicine by Hospitals in Nairobi County.
- iii. Determine factors influencing adoption of telemedicine.

1.4 Value of the study

The findings of this research will be useful in providing an insight on attitude of doctors towards telemedicine and the extent of adoption of telemedicine in Kenyan Hospitals. The research will also provide an understanding on factors that influence adoption of telemedicine in Kenya. The findings will benefit Hospital administrators, doctors and other institutions that may want to implement telemedicine in Kenya. The government and other policy makers will also benefit from the findings of this study. Other researchers can also use the findings of this study in their research works or carry out more research based on the research limitations. The research will also contribute to the information system theory, Technology Acceptance Model by determining the perception of doctors towards telemedicine. The research will contribute knowledge to the Technology acceptance model by determining how perceived ease of use and perceived benefits of telemedicine influence attitude of doctors towards telemedicine.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

This chapter reviews information from other researchers who have studied adoption of telemedicine in other countries in Africa. Factors influencing adoption of telemedicine and Information Systems Models that influence acceptance of Technology are also discussed in this chapter.

2.2 Telemedicine Practice

Over the years, there have been efforts by several countries to improve healthcare service delivery through the use of ICT. Telecommunication technologies have been advocated as powerful tools for breaking the time and space barrier between the patient and healthcare providers (Tachakra et al, 2003). The general concept of telemedicine is delivery of healthcare services at a distance thereby reducing the need for Patients and doctors to travel. Telemedicine can either be Patient to Doctor or Doctor to Doctor. Patient to Doctor Telemedicine is whereby the doctor provides healthcare services to a patient in distant location through the use of information and communication technologies. Doctor to Doctor telemedicine occurs when a doctor seeks second opinion from another specialist doctor by exchanging the medical information of the patient through information and communication technologies (www.americantelemed.org).

According to WHO(2010), ICT has a great potential to address some of the challenges faced by both developed and developing countries in providing accessible, cost effective, high quality healthcare services. Research done by Croteau (2002) and Vieru (2002)

reports that the clinical areas where telemedicine can be applied are consultations, radiology, pathology, dermatology, surgery, cardiology, home healthcare and teaching through teleconferencing. Doctor consultation done through telemedicine is referred to as Teleconsultation. This can be done through video conferencing (American Telemedicine Association, 2013). Application of telemedicine in pathology is referred to as Telepathology whereas when applied in radiology it is referred to as Teleradiology (Croteau and Vieru, 2002).

2.3 New Innovation Adoption Process

Kotler and Keller (2006) report that adoption is an individual's decision to become a user of a product. When customers learn about new products they try them and either become users of the product or reject the product depending on the trial experience. According to Kotler and Keller (2006) adoption is a process from the time an individual hears about a new innovation to final adoption of the new innovation. Kotler and Keller (2006) classified the adoption process into five stages. The first stage is awareness; this is the stage at which the individual becomes aware of the innovation but lacks information about it. The second stage is interest; at this stage the individual seeks information about the innovation. The third stage is evaluation; the individual considers trying the innovation. The fourth stage is trial; the individual actually tries the innovation. The fifth stage is adoption; at this stage the individual makes full use of the innovation. Adoption of telemedicine in hospitals is expected to undergo these five stages especially among the doctors as they are the main users of these services.

According to Kotler and Keller (2006) the factors that influence adoption of an innovation are: Relative advantage; this is the extent to which the innovation is superior to other existing services. In this case adoption of telemedicine is influenced by its benefits to healthcare services delivery. Compatibility and complexity of the innovation also affects adoption of the innovation. In the case of telemedicine, its compatibility to healthcare service and ease of use determines its adoption in hospitals. Other factors that influence adoption as reported by Kotler and Keller (2006) are Divisibility and communicability. Divisibility refers to the degree to which the innovation can be tried whereas communicability refers to the extent to which the benefits of the innovation can be observed and communicated to others. The degree to which telemedicine can be tried and its benefits communicated or observed by others affects adoption of telemedicine in hospitals.

2.4 Adoption of Telemedicine

Various studies have been done on adoption of telemedicine in Africa and other parts of the world. Maurice (2010) identified a number of factors that impede the use of telemedicine in sub-Saharan Africa. These include poverty, shortage of human resources, very limited existing infrastructure, lack of connectivity, high connectivity costs, lack of capacity development, policy and legislative issues. On poverty Maurice (2010) explains that majority of the sub-Saharan countries are poor, hence they allocate very small percentage of their budget on healthcare. Therefore most of the sub-Saharan countries are less likely to invest in the necessary information technology that supports telemedicine. In our country Kenya, Public Hospitals are poorly equipped; therefore the little budget available for healthcare is likely to be allocated to other healthcare priorities such as

Hospital equipment, medicines, staff salaries etc. Maurice (2010) further explains that lack of Policy and legal framework is a major obstacle to growth of telemedicine in the developing world. Maurice (2010) suggests that legal and policy framework that supports telemedicine should be formulated while at the same time protecting the patient and the professional. Issues of patient confidentiality and privacy should be considered in the legal and policy framework. Maurice (2010) further explains that the policy and legal framework should consider cross border telemedicine, whereby doctors in one country can provide consultation service to patients in another country through Information communication technology and computers.

Maurice (2010) points out that in sub-Saharan Africa; Nigeria is the only country with a national telemedicine society. However according to Maurice (2010) about half of the countries in the world are working on an e-health policy. In Kenya, the government has shown some efforts towards formulating policies and legal framework to govern telemedicine. For example the Kenya ICT Policy (2006) emphasizes developing legislation governing telemedicine and health information systems. The Kenya ICT Policy (2006) further explains the need to establish measures to ensure electronic security, Privacy and ICT legislation. In regards to the use of electronic signatures, the Kenya communication Act (2009) clarifies the minimum requirements that an electronic signature must meet. These ICT policies and legislation are a step forward towards creating a conducive environment for adoption of telemedicine in Kenya. On capacity development, Maurice (2010) explains that ignorance and lack of understanding of telemedicine has been cited as reasons for poor uptake of telemedicine in developing

countries. Maurice (2010) suggests that there is need to train doctors and nurses on telemedicine. Ideally telemedicine training should be part of medical student education and nurse training (Maurice, 2010). In regards to connectivity, Maurice (2010) explains that internet penetration in Africa is low, access to broadband is poor and its usage is limited by high broadband costs. Therefore Maurice (2010) points out that lack of broadband remains an obstacle to adoption of telemedicine in Africa.

Despite the obstacles to adoption of telemedicine in sub-Saharan Africa, Maurice (2010) explains that there are several successful examples of telemedicine in sub-Saharan Africa. iPath, run by Telemed Association Basel, is an international open source web based platform for store and forward telemedicine, discussion groups and education. Doctors in nine sub-Saharan countries have formed discussion groups in the iPath platform (Maurice, 2010). Other successful examples of telemedicine in Africa cited by Maurice (2010) are; The African Teledermatology project which offers free store and forward teledermatology services through the web based teleder.org platform. However Maurice (2010) points out that the uptake has been very low. Another successful telemedicine example cited by Maurice (2010) is Remote Access for Health professionals that provide Internet based support for Ismaili health professionals in Tanzania.

However even after telemedicine has been adopted, there are still some challenges that face the use of telemedicine. Issues related to Physicians, Institutions, Patients and the general public still remain a challenge even after adoption of telemedicine (Sanders et al, 1995). Issues of patient's privacy and the general public acceptance of telemedicine

cause challenges in the use of telemedicine (Sanders et al, 1995). Considering that ICT removes geographical barriers and enables delivery of services across geographical boundaries, challenge arises when telemedicine services are offered between different countries or states. Each country or state has its own healthcare policies hence challenge on which healthcare policies to apply when doctor and patient are located in different states (American Telemedicine Association, 2013). Hence the need for formulating interstate telemedicine policies to regulate provision of cross border telemedicine services (www.americantelemed.org).

Research on adoption of telemedicine has also been done by other researchers on factors influencing adoption of telemedicine in specific African countries. According to research done in Uganda, the key factors hindering adoption of telemedicine are; lack of telemedicine policy, knowledge, skills and resistance to change by members of staff in Hospitals (Isabalija et al, 2011). Studies done in Kenya report that ICT and electronic health policies are major determinants of adoption of e-health and telemedicine, however the Kenya government has shown significant efforts towards formulating the necessary e-health policies (Kilwake et al, 2012).

2.5 Doctors Attitude towards the Use of ICT in Healthcare

Doctors are the key players in delivery of healthcare services; therefore the attitude of doctors towards telemedicine is likely to affect the adoption of telemedicine in healthcare service delivery. Resistance to change by members of hospital staff has been reported as one of the hindrances to adoption of telemedicine. Schaper (2007) and Pervan (2007) report that reluctance by health professionals to accept and utilize information and

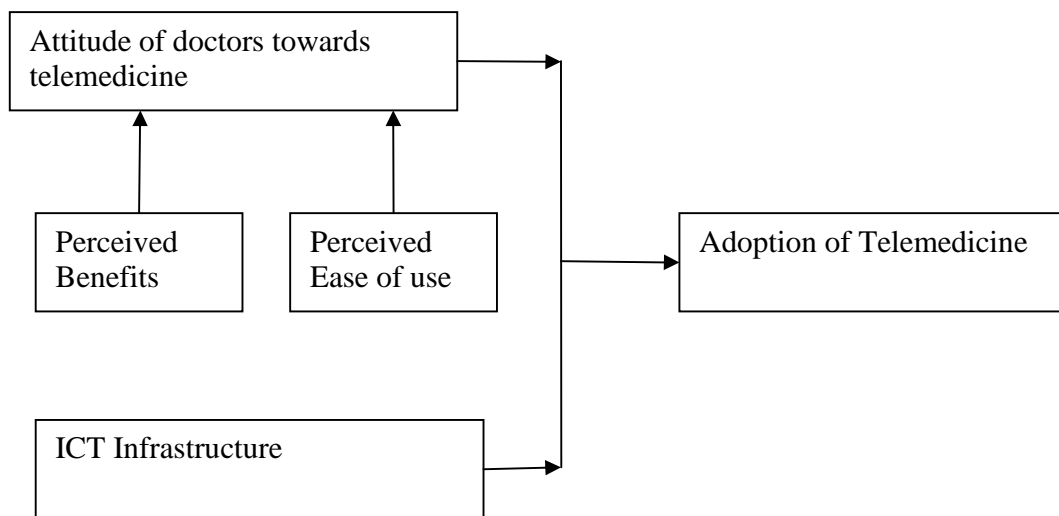
communication technologies are contributing to the lag in adoption and utilization of ICT across the health sector. However other studies have reported contradicting findings on attitude of healthcare professionals towards the use of ICT in healthcare. Studies with contradicting results report that majority of healthcare professionals are positive to the use of ICT tools in healthcare ([www. biomedcentral.com](http://www.biomedcentral.com)). According to Technology Acceptance Model by Davis (1989), attitude towards new technology is influenced by perceived benefits and perceived ease of use of the technology. This research studied the attitude of doctors towards telemedicine from the perspective of technology acceptance model.

2.6 Summary

Review of the literature shows that the main factors that influence adoption of telemedicine are; ICT infrastructure, knowledge of telemedicine and ICT skills among healthcare providers, resistance by hospital staff and hospital administration, lack of telemedicine and e-health policies and community acceptance of telemedicine. Though relevant studies done by other researchers show that telemedicine can be implemented in several departments in hospitals, there was need to study the attitude of doctors in Kenya towards telemedicine and the extent to which telemedicine has been implemented in Kenyan hospitals. Doctors being the major players in delivery of healthcare services, the research studied the attitude of doctors towards telemedicine and how this influences its adoption. According to Croteau (2002) and Vieru (2002), one of the causes of telemedicine implementation failures is lack of physician's adoption of new technology and poor quality of technology. This research therefore determined the key factors that

influence doctor's adoption of telemedicine and how doctors rate the technologies used in telemedicine. The study also examined the extent to which ignorance and lack of ICT training among doctors influences adoption of telemedicine. The main factors that influence adoption of telemedicine can be summarized into: ICT infrastructure and doctor's attitude towards telemedicine. This research examined how attitude of doctors towards telemedicine and ICT infrastructure influence adoption of telemedicine in hospitals. According to Davis (1989) attitude towards new technology is influenced by Perceived Benefits and Perceived ease of use. The conceptual framework for this research is shown in Figure 2.1

Figure 2. 1: Conceptual Framework

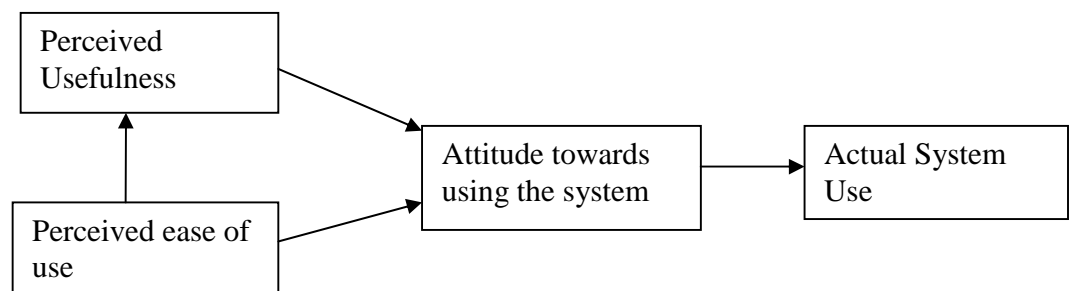


Source: Researcher (2013)

2.7 Theoretical Framework

Technology acceptance model (Davis, 1989) is important for this study because it explains the factors that influence acceptance of new technology. Davis (1989) suggested that user's motivation towards a new system can be explained by three factors: Perceived Ease of Use, Perceived Usefulness and Attitude towards using the system. Davis (1989) further suggested that attitude of a user towards a system is a major determinant of whether the user will actually use or reject the system. The attitude of the user, in turn, is influenced by two main factors: Perceived usefulness and perceived ease of use. Perceived ease of use has direct influence on perceived usefulness (Davis, 1989). Diagrammatic representation of Davis (1989) Technology acceptance model is shown in Figure 2.2.

Figure 2.2: Technology Acceptance Model



Source: Davis, F.D.(1989). Perceived usefulness, perceived ease of use and user acceptance of Information technology. Technology Acceptance model (TAM).

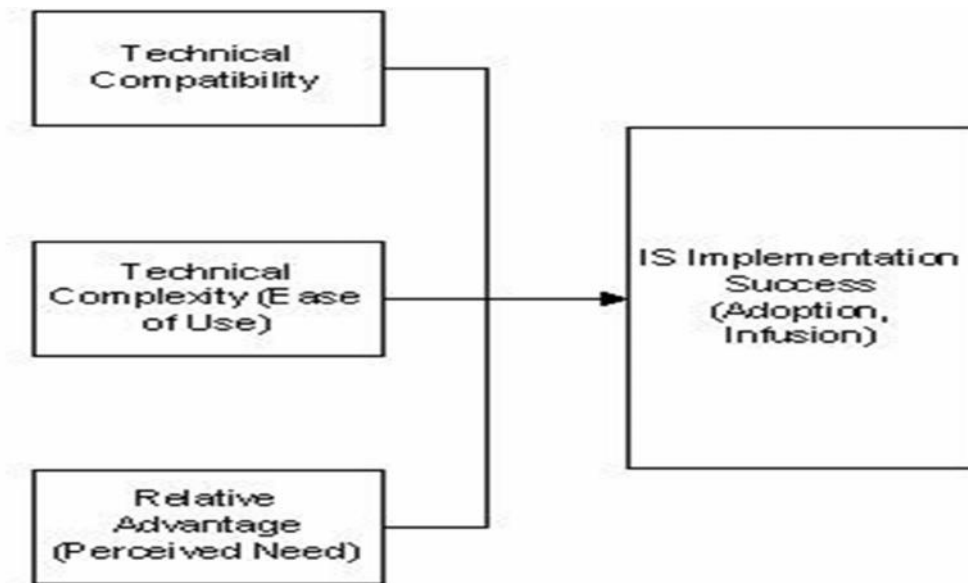
Perceived usefulness is the degree to which a person believes that using a particular system will have some benefits whereas perceived ease of use is the degree to which a

person believes that a particular system will be easy to use. In this research Technology Acceptance Model was used to determine how Perceived Usefulness, Perceived Ease of Use and Attitude of doctors towards Telemedicine influence adoption of Telemedicine.

Besides the technology acceptance model, Diffusion of innovation theory is also relevant for this research. The diffusion of innovation theory sees innovation as being communicated through certain channels overtime and within a particular social system (Rogers, 1995). According to Rogers (1995), individuals possess different degrees of willingness to adopt an innovation. Therefore individuals can be classified into five categories from earliest to latest adopters. These are; innovators, early adopters, early majority, late majority, and laggards (Rogers, 1995).

According to Rogers (1995) the rate of adoption of innovations is influenced by five factors: relative advantage, compatibility, trialability, observability, and complexity. The first four factors are generally positively correlated with rate of adoption while the last factor, complexity, is generally negatively correlated with rate of adoption. Further information systems research based on Diffusion of innovation theory has revealed that technical compatibility, technical complexity and relative advantage are important antecedents to adoption of innovation leading to the model below (Rogers, 1995). In this research, compatibility, complexity and advantages of telemedicine in healthcare were evaluated in determining the doctor's attitude towards telemedicine.

Figure 2. 3: Diffusion of Innovation Theory



Source: Rogers, E. M. (1995). Diffusion of Innovations Theory.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter explains the research design and the methods used in collecting and analyzing data. The target population and sample design is also explained in this chapter.

3.2 Research Design

Descriptive survey was used in this research. According to Sekaran and Bougie (2010), descriptive research explains certain characteristics of the phenomena of interest. Descriptive study was suitable for this research because the objective was to determine and explain certain characteristics that influence adoption of telemedicine. Maurice (2010) used similar approach to identify issues facing uptake of telemedicine in sub-Saharan Africa.

3.3 The Target Population

The target Population for this research was Hospitals in Nairobi County. According to the list of hospitals registered in Nairobi obtained from National Hospital Insurance Fund, there are about 40 hospitals in Nairobi County (Refer to Appendix III) .The respondents were doctors in these hospitals. The choice of this target population was based on the fact that most doctors are found in the hospitals. Both public and private hospitals were targeted.

3.4 Sampling

Purposive sampling technique was used to identify the target hospitals. About 36 Hospitals were targeted. As cited by Sekaran and Bougie (2010), a sample size larger than 30 and less than 500 are suitable for most researches.

3.5 Data Collection

Primary data was captured using structured questionnaire. The questionnaire begins by giving a brief definition of telemedicine to aid the respondent in understanding the concept of telemedicine. The questionnaire was divided into four sections. Section A captured demographic information of the respondent and the hospital. Section B captured the attitude of the respondent towards telemedicine. Section C captured the extent of adoption of telemedicine in hospitals. Section D covers factors affecting adoption. The questionnaires was administered to the respondents (doctors) in person and collected back from the respondent after the respondent had filled the questionnaire. The target for respondents was about 36 doctors, one from each Hospital. Out of the targeted 36 respondents, I received response from 34 respondents.

3.6. Data Analysis

The data collected was analyzed based on research objectives to determine; attitude of doctors towards telemedicine, extent of adoption of telemedicine in hospitals and factors influencing adoption of telemedicine. Data collected in Section A of the questionnaire relating to the demographic information of the respondent and the hospital was analyzed using frequencies and percentages. Data collected in Section B of the questionnaire regarding attitude towards telemedicine was analyzed using mean scores, standard

deviation and Factor analysis. Data collected in Section C of the questionnaire on extent of adoption of telemedicine in hospitals was analyzed using mean scores and standard deviation. Similarly data collected in Section D of the questionnaire on factors influencing adoption of telemedicine in hospitals was also analyzed using mean scores, standard deviation and Factor analysis.

CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents analysis of the data on adoption of telemedicine in hospitals in Nairobi County. The research targeted Hospitals in Nairobi County; the respondents were doctors in these hospitals. The data collection instrument used was questionnaires. Out of the 36 questionnaires distributed 34 were collected back fully filled. The data was analyzed based on the research objectives. Mean scores, standard deviation and factor analysis was used to analyze the data.

4.2 Demographic Information

Demographic information was collected from respondents in regards to; age, gender, level of education, years the hospital has been in operation, the type of the hospital and number of patients seen at the hospital per day. The analysis of the demographic information is presented below.

4.2.1 Age Distribution

To understand the age distribution of the respondents, the respondents were asked to indicate their age bracket. The findings are presented in Table 4.1. From the data findings, 29.4% of the respondents indicated that they were aged between 26-30, 23.5% were aged between 31-35, 20.6% were aged between 36-40, 11.8% were aged between 18-25, in both cases 5.9% indicated that they were aged between 46-50 and 51-55, and 2.9% indicated that they are aged between 41-45.

Table 4.1: Age Distribution

	Frequency	Percentage
18-25	4	11.8
26-30	10	29.4
31-35	8	23.5
36-40	7	20.6
41-45	1	2.9
46-50	2	5.9
51-55	2	5.9
Over 55	0	0.0
Total	34	100.0

There were no respondents aged over 55 years. From this findings majority of the respondents were aged between 26-30 years.

4.2.2 Gender Distribution

The research also sought to understand the gender distribution of the respondents; the respondents were asked to indicate their gender. The findings are presented in Table 4.2.

Table 4.2: Gender Distribution

	Frequency	Percentage
Male	19	55.9
Female	15	44.1
Total	34	100.0

From the data findings, majority (55.9%) of the respondents were male while 44.1% were female.

4.2.3 Level of Education

The respondents were also asked to indicate their academic qualifications. The findings are presented in Table 4.3.

Table 4.3: Level of Education

	Frequency	Percentage
Certificate/Diploma	6	17.6
Bachelor's Degree	21	61.8
Post graduate degree/Diploma	6	17.6
PHD	1	2.9
Total	34	100.0

From the data findings, 61.8% of the respondents indicated that their highest level of education was bachelor's degree. Those respondents who indicated Certificate/Diploma and Post graduate degree/Diploma were 17.6% in both cases while 2.9% had attained PHD as their highest level of education. These study findings imply that the respondents involved in the study were well educated and knowledgeable on the topic of study hence the information they provided was reliable in addressing the objective of the study.

4.2.4 Years in Operation

To understand the number of years the Hospitals had been in operation, the respondents were asked to indicate for how long the hospital has been in operation. The findings are presented in Table 4.4.

Table 4.4: Years in Operation

	Frequency	Percentage
1-5 Years	12	35.3
6-10 Years	8	23.5
11-15 Years	3	8.8
16-20 Years	2	5.9
More than 20 years	9	26.5
Total	34	100.0

From the data findings, 35.3% of the respondents indicated that their hospitals had been in operation for 1-5 years, 26.5% indicated more than 20 years, 23.5% indicated 6-10 years, 8.8% indicated 11-15 years while 5.9% indicated 16-20 years. From the study findings, the hospitals had been in operation for duration long enough to incorporate Telemedicine in their operations hence they were well suited to be incorporated in the study.

4.2.5 Hospital Type

The study sought to find out the types of hospitals. The respondents were asked to indicate the type of hospital. The findings are presented in Table 4.5.

Table 4.5: Hospital Type

	Frequency	Percentage
Public Hospital	5	14.7
Private Hospital	29	85.3
Total	34	100.0

From the data findings, 85.3% of the respondents indicated that their hospitals were private while 14.7% indicated that their hospitals were public. This shows that the study was representative enough as both public and privately owned hospital were represented in the study.

4.2.6 Number of Patients seen per day

To understand the number of patients seen in the hospitals per day, the respondents were asked to indicate the number of patients that visit the hospital per day. The findings are presented in Table 4.6.

Table 4. 6: Number of Patients seen per day

	Frequency	Percentage
<200	16	47.1
201-400	9	26.5
401-600	3	8.8
601-800	1	2.9
801-1000	3	8.8
Over 1000	2	5.9
Total	34	100.0

From the data findings, 47.1% of the respondents indicated that in their hospitals, the number of patients seen per day were less than 200, 26.5% indicated 201-400 patients, 8.8% indicated 401-600 as well as those who indicated 801-1000 patients, 5.9% indicated over 1000 patients while 2.9% indicated 601-800 patients.

4.3 Attitude Towards Telemedicine

4.3.1 Introduction.

The first objective of this research was to determine the attitude of doctors towards Telemedicine. To understand the attitude of the respondents towards telemedicine, the research sought to establish the extent to which the respondents agreed with statements related to perceived benefits and perceived ease of use of Telemedicine. The responses were rated on a five point Likert scale where 1 equals strongly disagree, 2 equals disagree, 3 equals neither agree nor disagree, 4 equals agree and 5 equals strongly agree.

4.3.2 Attitude Towards Telemedicine, Means and Standard Deviation.

The Means and Standard deviations of the responses were determined as shown in Table 4.7. The means were interpreted according to the Five point Likert scale, for example a

mean of 3.8765 is in the range 3.5- 4.4 hence closer to 4. This is therefore interpreted as “Agree”.

Table 4.7: Attitude Towards Telemedicine

	Mean	Std. Deviation
Telemedicine is easy and convenient to use.	3.8824	1.03762
Telemedicine is beneficial to healthcare service delivery.	4.0882	.83003
Lack of physical contact between the patient and the doctor will not compromise the quality of healthcare service to Patient.	2.9118	1.19005
Telemedicine improves quality of healthcare services.	3.7941	.88006
Telemedicine can help alleviate the problem of shortage of doctors.	3.7353	.99419
Healthcare services offered through telemedicine are good.	3.7059	.71898
Telemedicine improves speed of service to patients.	4.2647	.61835
Telemedicine reduces the need for patients to travel to be seen by the doctor.	4.1471	.85749
Through telemedicine, doctors can share second opinion regarding patient treatment.	4.4412	.74635
Telemedicine is compatible with healthcare service delivery.	3.9412	.91920
In general telemedicine is a useful tool	4.3824	.65202

From the study findings the respondents agreed that through telemedicine, doctors can share second opinion regarding patient treatment as shown by a mean of 4.4412. The respondents also agreed that telemedicine reduced the need for patients to travel to be seen by the doctor as shown by a mean of 4.1471. The respondents further agreed that Telemedicine improves speed of service to patients as shown by a mean of 4.2647. In

regards to whether lack of physical contact between the patient and the doctor would not compromise the quality of healthcare service to patient, the respondents were neutral as shown by a mean score of 2.9118. Asked if telemedicine was beneficial to healthcare service delivery, the respondents agreed as shown by mean score of 4.3824. The study findings further established that the respondents' were in agreement with the statements that telemedicine helped alleviate the problem of shortage of doctors as shown by a mean score of 3.7353. The respondents also agreed that healthcare services offered through telemedicine were good and that telemedicine is compatible with healthcare service delivery as shown by means of 3.7059 and 3.9412 respectively. The study findings also established that the respondents agreed with the statements that telemedicine is easy and convenient to use and that telemedicine improved quality of healthcare services as shown by means of 3.8824 and 3.7941 respectively. In general, respondents agreed that telemedicine is a useful tool in healthcare as shown by a mean score of 4.3824. Most respondents shared similar opinion that Telemedicine improves speed of service delivery to patients as shown by the lowest standard deviation of 0.61835. However most respondents had varied opinion on the statement that lack of physical contact between the patient and the doctor will not compromise the quality of healthcare service to Patient as shown by the highest standard deviation of 1.19005.

4.3.3 Factor Analysis (Communalities), Attitude Towards Telemedicine

4.3.3.1 Introduction.

Factor analysis is a method of reducing the numerous variables used in the survey questions into less number of variables that are easier to work with and perform other

types of analysis on. The reduction is based on the fact that most of the variables used in the survey are related and can therefore be condensed into a common variable. Responses collected on attitude towards telemedicine were subjected to factor analysis. Communality measures the percentage of variance in a given variable explained by all the factors jointly and may be interpreted as the reliability of the indicator. The extraction method used was the principle component analysis. The Communalities are shown in the Table 4.8.

Table 4.8: Factor Analysis (Communalities), Attitude towards telemedicine

Communalities		
	Initial	Extraction
Telemedicine is easy and convenient to use.	1.000	.533
Telemedicine is beneficial to healthcare service delivery.	1.000	.866
Lack of physical contact between the patient and the doctor will not compromise the quality of healthcare service to Patient.	1.000	.804
Telemedicine improves quality of healthcare services.	1.000	.765
Telemedicine can help alleviate the problem of shortage of doctors.	1.000	.642
Healthcare services offered through telemedicine are good.	1.000	.806
Telemedicine improves speed of service to patients.	1.000	.608
Telemedicine reduces the need for patients to travel to be seen by the doctor.	1.000	.806
Through telemedicine, doctors can share second opinion regarding patient treatment.	1.000	.851
Telemedicine is compatible with healthcare service delivery.	1.000	.863
In general telemedicine is a useful tool	1.000	.616

Extraction Method: Principal Component Analysis.

4.3.3.2 Factor Extraction, Attitude Towards Telemedicine

The total variance of all the factors is presented in Table 4.9. The extraction was done using the principle analysis component. Eigen values measure the amount of variation in the total sample accounted for by each factor. If a factor has low Eigen value, then it's contributing little to the variance in the variables and may be ignored. From Table 4.9, only 3 factors were important for the analysis.

Table 4.9: Factor Extraction (Total Variance), Attitude Towards Telemedicine

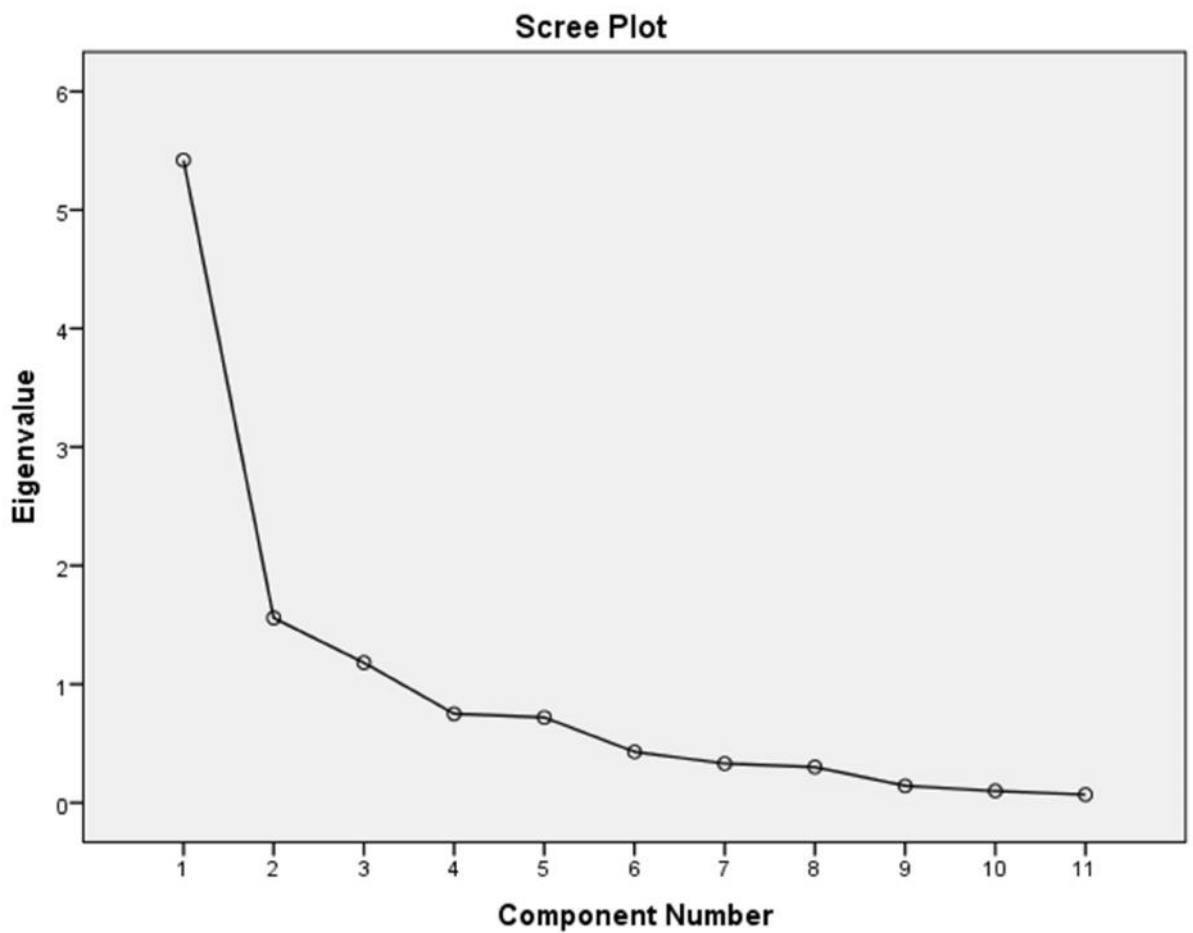
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.420	49.273	49.273	5.420	49.273	49.273
2	1.558	14.168	63.441	1.558	14.168	63.441
3	1.181	10.737	74.178	1.181	10.737	74.178
4	.750	6.820	80.998			
5	.719	6.540	87.538			
6	.430	3.905	91.443			
7	.330	3.004	94.448			
8	.301	2.734	97.182			
9	.143	1.298	98.479			
10	.099	.899	99.378			
11	.068	.622	100.000			

Extraction Method: Principal Component Analysis.

4.3.3.3 Scree Plot, Attitude Towards Telemedicine

In a scree plot, the components are plotted on X axis whereas the Eigen values are on the Y axis. As one moves to the right on the Scree plot, the Eigen values drop as shown in Figure 4.1. From the scree plot obtained, three factors are significant because the curve becomes less steep from this point due to low Eigen values.

Figure 4.1: Scree Plot, Attitude towards telemedicine



4.3.3.4 Factor Analysis (Component Matrix), Attitude Towards Telemedicine

Factor analysis of the attitude toward telemedicine is presented in Table 4.10 with 3 components extracted. The component represents the correlation between the variable and the factor (for example correlation between Telemedicine is easy and convenient to use and Factor 1 is 0.729).

Table 4.10: Factor Analysis (Component Matrix), Attitude towards telemedicine

Component Matrix^a

	Component		
	1	2	3
Telemedicine is easy and convenient to use.	.729	-.012	-.040
Telemedicine is beneficial to healthcare service delivery.	.800	.382	.282
Lack of physical contact between the patient and the doctor will not compromise the quality of healthcare service to patient.	.781	.271	.346
Telemedicine improves quality of healthcare services.	.772	-.025	-.409
Telemedicine can help alleviate the problem of shortage of doctors.	.561	-.565	.089
Healthcare services offered through telemedicine are good.	.817	-.219	.302
Telemedicine improves speed of service to patients.	.759	.124	-.127
Telemedicine reduces the need for patients to travel to be seen by the doctor.	.406	.789	.134
Through telemedicine, doctors can share second opinion regarding patient treatment.	.705	-.120	-.583
Telemedicine is compatible with healthcare service delivery.	.587	-.564	.447
In general telemedicine is a useful tool	.690	.010	-.374

Extraction Method: Principal Component Analysis.

Table 4.11: Factor Analysis (Rotated Component Matrix), Attitude towards telemedicine

Rotated Component Matrix^a

	Component		
	1	2	3
Doctors can share second opinion through Telemedicine	.909		
Telemedicine is beneficial to healthcare	.818		
In general Telemedicine is a useful tool	.735		
Telemedicine improves speed of service to patients	.588		
Telemedicine is easy to use	.511		
Telemedicine reduces the need for patients to travel to see the doctor		.849	
Lack of physical contact between doctor and patient will not affect quality of healthcare service		.833	
Telemedicine alleviates the problem of shortage of doctors.		.769	
Telemedicine is compatible with health care service			.919
Healthcare services through telemedicine are good			.726
Telemedicine improves quality of healthcare			.724

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

4.3.3.5 Factor Isolation, Attitude Towards Telemedicine

In factor analysis the variables were isolated and grouped according to the 3 extracted factors. Table 4.12 shows the results. The grouping is based on a minimum correlation of 0.5.

Table 4.12: Factor Isolation, Attitude towards Telemedicine

Factor Group	Variables
Factor 1	<ul style="list-style-type: none">• Doctors can share second opinion through Telemedicine• Telemedicine is beneficial to Healthcare• In general, Telemedicine is a useful tool• Telemedicine improves speed of service to Patients• Telemedicine is easy to use
Factor 2	<ul style="list-style-type: none">• Telemedicine reduces the need for patients to travel to see the doctor• Lack of physical contact between the patient and the doctor will not compromise the quality of healthcare service to patient.• Telemedicine alleviates the problem of shortage of doctors
Factor 3	<ul style="list-style-type: none">• Telemedicine is compatible with healthcare service• Healthcare Services offered through telemedicine are good• Telemedicine improves quality of healthcare

From Table 4.12, there are 3 extracted groups regarding attitude of respondents towards telemedicine. Group factor 1 had the most number of variable components which measured attitude towards telemedicine. These include the following statements; Doctors can share second opinion through Telemedicine, Telemedicine is beneficial to Healthcare, In general Telemedicine is a useful tool, Telemedicine improves speed of service to Patients and Telemedicine is easy to use. Group factor 1 can therefore be described as Benefits of telemedicine as most of the variables in this group relate to benefits of telemedicine. Factor 2 comprised the following statements; Telemedicine reduces the need for patients to travel to see the doctor, Lack of physical contact between the patient and the doctor will not compromise the quality of healthcare service to patient and Telemedicine alleviates the problem of shortage of doctors. Group factor 2 can be described as Remote healthcare service delivery since most of the variables in this group relate to healthcare service delivery without physical contact between the patient and the

doctor. Factor 3 comprised of the following statements in regards to attitude towards telemedicine: Telemedicine is compatible with healthcare service, Healthcare Services offered through telemedicine are good and Telemedicine improves quality of healthcare. Group factor 3 can therefore be described as compatibility of telemedicine with healthcare service delivery since the variables in this group relate to compatibility of telemedicine with healthcare service.

4.4 Extent of Adoption of Telemedicine

4.4.1 Introduction.

The second objective of the research was to determine the extent to which Telemedicine had been adopted in Hospitals. The study sought to establish the respondents rating on the extent to which telemedicine had been adopted in hospital's service areas. The respondents were asked to what extent telemedicine had been implemented in their hospital. The responses were rated on a five point Likert scale where 1 equals no extent, 2 equals small extent, 3 equals moderate extent, 4 equals large extent and 5 equals very large extent.

4.4.2 Extent of Adoption of Telemedicine, Means and Standard Deviations.

The means and standard deviations on extent of adoption of telemedicine were determined and the results shown in Table 4.13. The means were interpreted according to the Five point Likert scale, for example a mean of 2.3824 is in the range 1.5- 2.4 hence closer to 2. This is therefore interpreted as "Small Extent".

Table 4.13: Extent of Adoption of Telemedicine

	Mean	Std. Deviation
Doctor consultations	2.3824	.65202
Laboratory	2.3118	.92499
Radiology	2.1824	.98518
Pharmacy.	2.0024	1.01548
Dental	1.3294	1.08670
Dermatology	1.4118	.85697
Cardiology	1.3471	.77391
Physiotherapy	1.3235	.53488
Minor Surgery	1.3529	.69117
Major Surgery	1.4412	.89413
Ophthalmology	1.2059	.59183
Antinatal clinics	1.1471	.35949
Post Natal clinics	1.4118	.70141
Maternity	1.1267	.91189
Wound Dressing	1.1471	.43571

From the research findings in Table 4.13, telemedicine had been implemented in doctor consultations and laboratory to Small extent as shown by mean scores of 2.3824 and 2.3118 respectively which are closer to 2.0 on the Likert scale. The study further established that telemedicine had also been implemented to a small extent in radiology and pharmacy as shown by mean scores of 2.1824 and 2.0024 respectively. However the study found out that telemedicine had been implemented to no extent in the other hospital service areas such as dental, dermatology, cardiology, physiotherapy etc. as shown by their mean scores which are closer to 1.0. The lowest standard deviation was reported in Antenatal clinic as shown by standard deviation of 0.35949. This implies that most respondents shared similar opinion that Telemedicine had not been adopted in Antenatal clinic. Dental had the highest standard deviation of 1.08670 meaning that most

respondents had varied opinion on to what extent telemedicine had been implemented in dental department.

4.5 Factors Influencing Adoption of Telemedicine

4.5.1 Introduction.

The third objective for the research was to determine the factors influencing adoption of Telemedicine. The research sought to establish the respondents’ rating on the extent to which the following factors affected adoption of telemedicine in the hospital. The responses were rated on a five point Likert scale where 1 equals no extent, 2 equals small extent, 3 equals moderate extent, 4 equals large extent and 5 equals very large extent.

4.5.2 Factors Influencing Adoption of Telemedicine, Means and Standard Deviations

The responses on extent of adoption were analyzed using means and standard deviations as shown in Table 4.14. The means were interpreted according to the Five point Likert scale, for example a mean of 4.1765 is in the range 3.5- 4.4 hence closer to 4. This is therefore interpreted as “Large Extent”.

Table 4. 14: Factors Influencing Adoption of Telemedicine

	Mean	Std. Deviation
Availability of ICT connectivity (Internet links)	4.1765	1.11384
Bandwidth, Data Transmission speed	3.9118	1.26414
Availability of ICT supports services	3.9412	1.15316
Reliability of ICT systems	4.0294	1.11424
Availability of ICT systems	4.0882	1.11104
Cost of ICT connectivity (Bandwidth cost).	3.7941	1.27397
Training in ICT or ICT skills among healthcare providers	3.7353	1.23849
Knowledge of telemedicine among healthcare providers	3.6471	1.06976
Resistance by hospital staff or Administration	3.0882	1.52490

Quality of services offered through telemedicine	3.3824	1.27955
Patients Privacy issues.	3.2059	1.36580
Community (Patients) acceptance of telemedicine.	3.1176	1.47226
Compatibility of telemedicine with healthcare service delivery	3.3824	1.18103
Telemedicine Policy framework	3.4706	1.44044

From the study findings, the respondents indicated that availability of ICT connectivity (Internet links) affected adoption of telemedicine in the hospital to a large extent as indicated by mean of 4.1765. The respondents further indicated that availability of ICT systems as well as reliability of ICT systems affected adoption of telemedicine in the hospital to a large extent as indicated by means of 4.0882 and 4.0294 respectively. The study findings further established that availability of ICT supports services, Bandwidth/Data Transmission speed, Cost of ICT connectivity (Bandwidth cost), Training in ICT or ICT skills among healthcare providers and Knowledge of telemedicine among healthcare providers affected adoption of telemedicine in the hospital to a large extent as indicated by means of 3.9412, 3.9118, 3.7941, 3.7353 and 3.6471 respectively. From the study findings, Telemedicine Policy framework, Quality of services offered through telemedicine, Compatibility of telemedicine with healthcare service delivery, Resistance by hospital staff or Administration, Patients Privacy issues and Community (Patients) acceptance of telemedicine affected adoption of telemedicine in the hospital to a moderate extent as indicated by means of 3.4706, 3.3824, 3.3824, 3.0882, 3.2059 and 3.1176 respectively.

4.5.3 Factor Analysis (Communalities), Factors influencing adoption

4.5.3.1 Introduction

Factor analysis is the process through which the numerous variables used in the survey can be reduced into fewer variables. This is necessary because most of the variables are related and can be condensed into a common variable. Responses collected on factors that influence adoption of telemedicine were subjected to factor analysis. Communality measures the percentage of variance in a given variable explained by all the factors jointly and may be interpreted as the reliability of the indicator. The extraction method used was the principle component analysis. The Communalities are shown in the Table 4.15.

Table 4.15: Factor Analysis (Communalities), Factors influencing adoption

Communalities		
	Initial	Extraction
Availability of ICT connectivity (Internet links)	1.000	.825
Bandwidth, Data Transmission speed	1.000	.878
Availability of ICT supports services	1.000	.815
Reliability of ICT systems	1.000	.850
Availability of ICT systems	1.000	.879
Cost of ICT connectivity (Bandwidth cost).	1.000	.695
Training in ICT or ICT skills among healthcare providers	1.000	.784
Knowledge of telemedicine among healthcare providers	1.000	.489
Resistance by hospital staff or Administration	1.000	.616
Quality of services offered through telemedicine	1.000	.820
Patients Privacy issues.	1.000	.588
Community (Patients) acceptance of telemedicine.	1.000	.750
Compatibility of telemedicine with healthcare service delivery	1.000	.652
Telemedicine Policy framework	1.000	.639

Extraction Method: Principal Component Analysis.

4.5.3.2 Factor Extraction, Factors influencing Adoption

The total variance of all the factors that influence adoption is presented in Table 4.16. The extraction was done using the principle analysis component. Eigen values measure the amount of variation in the total sample accounted for by each factor. If a factor has low Eigen value, then it's contributing little to the variance in the variables and may be ignored. From Table 4.16, only 2 factors were important for the analysis.

Table 4.16: Factor Extraction (Total Variance), Factors influencing adoption

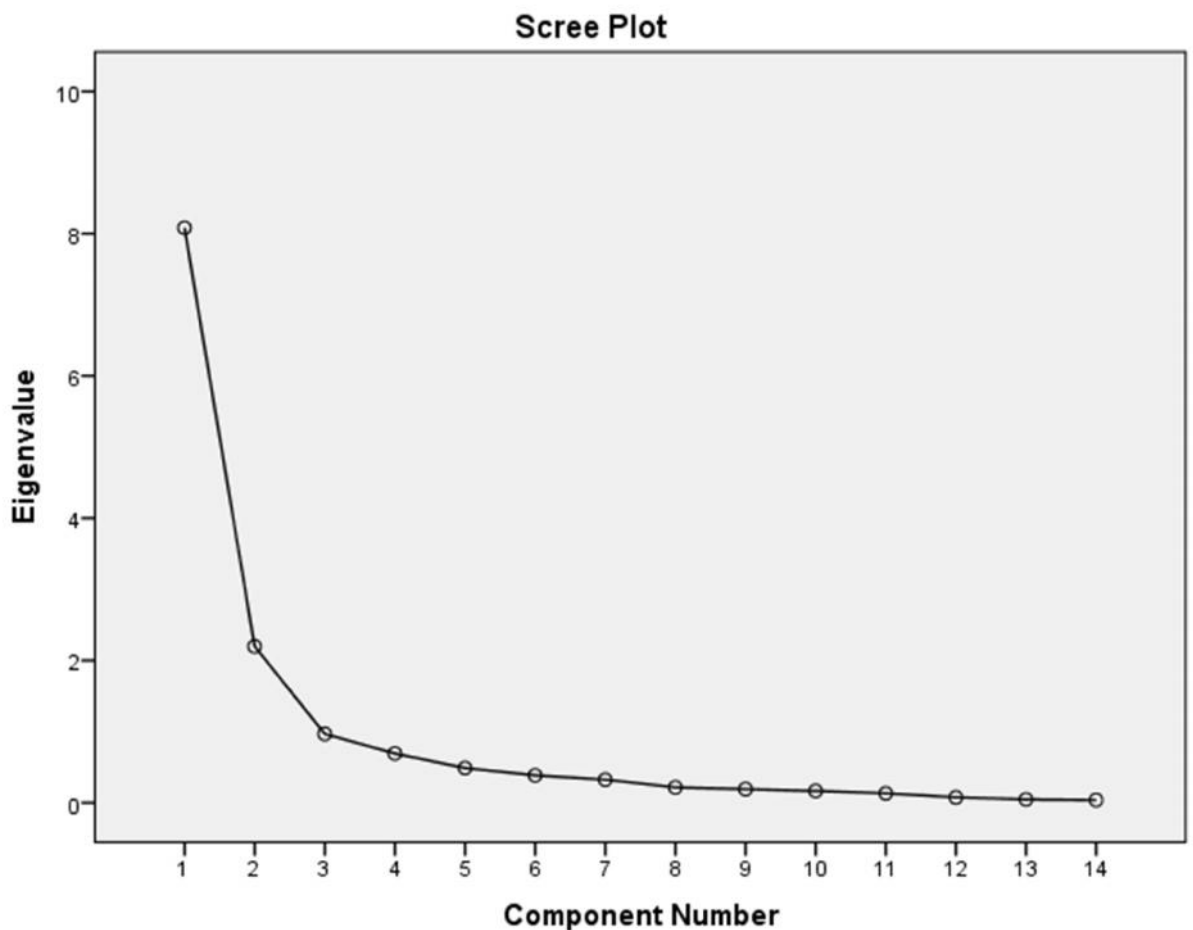
Component	Initial Eigenvalues			Total Variance Explained		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.082	57.729	57.729	8.082	57.729	57.729
2	2.198	15.699	73.428	2.198	15.699	73.428
3	.967	6.906	80.334			
4	.692	4.945	85.279			
5	.487	3.481	88.760			
6	.385	2.753	91.513			
7	.324	2.315	93.828			
8	.216	1.541	95.369			
9	.191	1.364	96.733			
10	.165	1.181	97.914			
11	.132	.946	98.860			
12	.075	.537	99.397			
13	.047	.336	99.733			
14	.037	.267	100.000			

Extraction Method: Principal Component Analysis.

4.5.3.3 Scree Plot, Factors influencing Adoption

In a scree plot, the components are plotted on X axis whereas the Eigen values are on the Y axis. As one moves to the right on the Scree plot, the Eigen values drop as shown below. From the scree plot obtained below, two factors are significant on factors that influence adoption because the curve becomes less steep from this point due to low Eigen values.

Figure 4.2: Scree Plot, Factors influencing Adoption



4.5.3.4 Factor Analysis (Component Matrix), Factors influencing adoption

Factor analysis of factors influencing adoption of telemedicine is presented in Table 4.17 with 2 components extracted. The component represents the correlation between the variable and the factor (for example correlation between Availability of ICT connectivity and factor 1 is 0.836)

Table 4.17: Factor Analysis (Component Matrix), Factors influencing Adoption

Component Matrix^a

	Component	
	1	2
Availability of ICT connectivity (Internet links)	.836	-.355
Bandwidth, Data Transmission speed	.912	-.213
Availability of ICT supports services	.885	-.178
Reliability of ICT systems	.885	-.258
Availability of ICT systems	.874	-.340
Cost of ICT connectivity (Bandwidth cost).	.759	-.344
Training in ICT or ICT skills among healthcare providers	.828	-.314
Knowledge of telemedicine among healthcare providers	.686	-.135
Resistance by hospital staff or Administration	.468	.631
Quality of services offered through telemedicine	.805	.414
Patients Privacy issues.	.477	.600
Community (Patients) acceptance of telemedicine.	.687	.528
Compatibility of telemedicine with healthcare service delivery	.585	.556
Telemedicine Policy framework	.761	.245

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

Table 4.18: Factor Analysis (Rotated Component Matrix), Factors influencing Adoption

Rotated Component Matrix^a

	Component	
	1	2
Availability of ICT systems	.920	
Availability of ICT connectivity	.896	
Reliability of ICT systems	.886	
Bandwidth (Data transmission speed)	.885	
ICT Training or ICT skills among healthcare workers	.868	
Availability of ICT support services	.843	
Cost of connectivity	.826	
Knowledge of Telemedicine among healthcare workers	.652	
Community acceptance of Telemedicine		.813
Resistance by hospital staff or administration		.783
Compatibility of Telemedicine with healthcare services		.783
Quality of services offered through Telemedicine		.780
Patients Privacy issues		.762
Telemedicine Policy Framework	.513	.613

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

4.5.3.5 Factor Isolation, Factors influencing Adoption

In factor analysis the variables are isolated and grouped according to the 2 extracted factors. Table 4.19 shows the results. The grouping is based on a minimum correlation of 0.5.

Table 4.19: Factor Isolation, Factors influencing Adoption

Factor Group	Variables
Factor 1	<ul style="list-style-type: none"> • Availability of ICT systems • Availability of ICT connectivity(Internet Links) • Reliability of ICT systems • Bandwidth(Data Transmission speed) • ICT Training or ICT skills among healthcare workers • Availability of ICT support services • Cost of connectivity • Knowledge of telemedicine among healthcare providers
Factor 2	<ul style="list-style-type: none"> • Community (Patients) acceptance of telemedicine. • Resistance by Hospital staff or administration • Compatibility of telemedicine with healthcare service delivery • Quality of services offered through telemedicine • Patients Privacy issues. • Telemedicine Policy framework

From the Table 4.19, there are 2 extracted groups regarding factors influencing adoption of telemedicine. Group factor 1 had the most number of variable components which are: Availability of ICT systems ,Availability of ICT connectivity (Internet links), Reliability of ICT systems, Bandwidth(Data Transmission speed), ICT training or ICT skills among healthcare workers, Availability of ICT supports services, Cost of connectivity, Knowledge of telemedicine among healthcare providers. Group factor 1 can be described as Technological factors since most of the variables relate to ICT. Group factor 2 comprised the following: Community (Patients) acceptance of Telemedicine, Resistance by hospital staff or administration, compatibility of telemedicine with healthcare service delivery, Quality of services offered through telemedicine, Patients Privacy issues, Telemedicine Policy framework. Group factor 2 can be described as Social factors since most of the variables in this group relate to people issues.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This study sought to determine the attitude (Perception) of doctors towards telemedicine, the extent of adoption of telemedicine by Hospitals in Nairobi County and the factors influencing adoption of telemedicine. The findings, conclusion and recommendations are presented below.

5.2 Summary of Findings

From the research findings, majority of the respondents were aged 26-30 followed by those aged 31-35. The study findings further established that majority of the respondents were male. The study findings further established that the highest level of education of majority of the respondents was bachelor's degree followed by those who had Certificate/Diploma and Post graduate degree/Diploma. In addition, the study found out that most of the hospitals had been in operation for 1-5 years followed by those that had been in operation for more than 20 years. The study further established that most of the hospitals were private and that most of the hospitals attended to less than 200 patients per day.

With regard to attitude towards telemedicine, the study findings revealed that the respondents were in agreement that telemedicine was compatible with healthcare service delivery and that telemedicine reduced the need for patients to travel to be seen by the doctor. The findings further revealed that the respondents agreed that through

telemedicine, doctors could share second opinion regarding patient treatment and that telemedicine is easy and convenient to use. In addition, the study revealed that in general telemedicine was a useful tool, telemedicine was beneficial to healthcare service delivery, and telemedicine helped alleviate the problem of shortage of doctors. The respondents were neutral that lack of physical contact between the patient and the doctor would not compromise the quality of healthcare service to patient. From the research findings we can therefore conclude that the respondent's attitude towards telemedicine was favorable.

With regard to the extent of adoption of Telemedicine in hospitals, the study findings established that telemedicine had been adopted in doctor consultations, laboratories, radiology and pharmacy to a small extent. In the rest of the hospital service areas such as surgery, post natal clinics, dermatology, physiotherapy, ophthalmology, antenatal clinics, Wound Dressing and other areas, telemedicine had been adopted to no extent.

On factors influencing adoption of telemedicine, the study findings established that availability of ICT connectivity (Internet links), reliability of ICT systems, availability of ICT supports services, Bandwidth/Data Transmission speed, Cost of ICT connectivity (Bandwidth cost), Training in ICT or ICT skills among healthcare providers and Knowledge of telemedicine among healthcare providers affected adoption of telemedicine in the hospital to a large extent. Telemedicine Policy framework, Quality of services offered through telemedicine, Compatibility of telemedicine with healthcare service delivery, Resistance by hospital staff or Administration, Patients Privacy issues and

Community (Patients) acceptance of telemedicine affected adoption of telemedicine in the hospital to a moderate extent.

5.3 Conclusion

The study concludes that doctors have a favorable or positive attitude towards telemedicine and that they find it easy to use and beneficial to healthcare service delivery. These findings agree with the technology acceptance model (TAM) which states that attitude towards new technology is influenced by perceived ease of use and perceived benefits (Davis 1989).

However the extent of adoption of telemedicine in hospital service areas is low with only doctor consultations, laboratories, Radiology and Pharmacy reporting small extent of adoption. Other service areas such as dental, physiotherapy, maternity etc. reported no extent of adoption. These agree with Maurice (2010) that adoption of telemedicine in developing countries has been very low. The low adoption of telemedicine in hospitals despite the positive attitude of doctors towards telemedicine could be attributed to the factors affecting adoption of telemedicine. The study concludes that availability of ICT connectivity (Internet links), reliability of ICT systems, availability of ICT supports services, Bandwidth/Data Transmission speed, Cost of ICT connectivity (Bandwidth cost), Training in ICT or ICT skills among healthcare providers and Knowledge of telemedicine among healthcare providers affect adoption of telemedicine in the hospital to a large extent. The study further concludes that Telemedicine Policy framework, quality of services offered through telemedicine, compatibility of telemedicine with healthcare service delivery, Resistance by hospital staff or administration, Patients

Privacy issues and community (Patients) acceptance of telemedicine affect adoption of telemedicine in the hospital to a moderate extent.

5.4 Recommendations

The study findings established that doctors have a positive attitude towards telemedicine and that telemedicine is beneficial to healthcare service delivery. This study therefore recommends that the hospital management as well as the government should initiate programs that aim at implementing telemedicine in healthcare services delivery. Hospital management should ensure that ICT infrastructure does not hinder adoption of telemedicine by investing in high speed ICT connectivity (Internet links) in the hospitals. The government should initiate programs that lower the cost of bandwidth and ensure adequate ICT broadband connectivity across the country to enhance adoption of telemedicine. The government should also facilitate enacting telemedicine policy framework to govern healthcare service delivery through telemedicine.

5.5 Limitations of the study

Due to time constraints, the research was confined only to hospitals in Nairobi County. Some respondents also declined to respond to the questionnaire. The research targeted only healthcare providers (doctors) as respondents; this could have been extended to hospital administrators or management as they are responsible for allocating resources necessary for adoption of telemedicine.

5.6 Suggestions for further Studies

The study recommends that further studies should be done on the challenges faced in the implementation of Telemedicine, in both private and public Hospitals. Studies can also be done on attitude of patients or community towards telemedicine. Since allocation of resources in hospitals is done by hospital administrators, research can also be done on attitude of hospital administrators (management) towards telemedicine. Considering that this research covered only hospitals in Nairobi County, similar research can be done targeting hospitals across the country.

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APPENDICES

Appendix I: Letter to respondents

Shikuku Shituma,
University of Nairobi,
School of Business,
P.O. Box 30197- 00100,
Nairobi,
28/09/2013

Dear respondent,

I am doing research on adoption of telemedicine in Kenya as part of the requirement for Master of Business Administration Degree at the University of Nairobi. Telemedicine is the process through which doctors can provide some healthcare services to patients in distant locations through the use of information and communication technologies (ICT) without meeting the patient physically. The objective of this research is to survey adoption of telemedicine in hospitals in Nairobi County. I request your assistance by filling the attached questionnaire.

Your response to this questionnaire will be kept strictly confidential. Thank you in advance for taking time to fill this questionnaire.

Kind regards

Shikuku Shituma

Appendix II: Questionnaire.

SECTION A: DEMOGRAPHIC INFORMATION

Please tick the numbers representing the most appropriate responses in respect to the following.

1. Your Age (Years). Please tick one.

1. 18-25.....[]
2. 26-30.....[]
3. 31-35.....[]
4. 36-40.....[]
5. 41-45.....[]
6. 46-50.....[]
7. 51-55.....[]
8. Over 55.....[]

2. Your Gender.

1. Female.....[]
2. Male.....[]

3. Your highest Level of education. Please Tick one.

1. Certificate/Diploma.....[]
2. Bachelor's Degree.....[]
3. Post graduate degree/Diploma..... []
4. PHD.....[]

4. For how long has the Hospital been in operation?. Please Tick one.

1. Less than one year.....[]
2. 1-5 Years.....[]
3. 6-10 Years.....[]
4. 11-15 Years.....[]
5. 16-20 Years.....[]
6. More than 20 years.....[]

5. What is the type of the hospital?

1. Public Hospital.....[]

2. Private Hospital.....[]

6. Number of Patients seen in the hospital per day. Please select one. Please tick one.

1. <200.....[]

2. 201- 400.....[]

3. 401- 600.....[]

4. 601- 800.....[]

5. 801- 1000.....[]

6. Over 1000.....[]

SECTION B: ATTITUDE TOWARDS TELEMEDICINE.

Please indicate the extent to which you agree with each of the following statements in regards to telemedicine.

Statement	1.Strongly Disagree	2.Disagree	3.Neither Agree Nor Disagree	4.Agree	5.Strongly Agree
1.Telemedicine is easy and convenient to use.					
2.Telemedicine is beneficial to healthcare service delivery.					
3.Lack of physical contact between the patient and the doctor will not compromise the quality of healthcare service to patient.					

4. Telemedicine improves quality of healthcare services.					
5. Telemedicine can help alleviate the problem of shortage of doctors.					
6. Healthcare services offered through telemedicine are good.					
7. Telemedicine improves speed of service to patients.					
8. Telemedicine reduces the need for patients to travel to be seen by the doctor.					
9. Through telemedicine, doctors can share second opinion regarding patient treatment.					
10. Telemedicine is compatible with healthcare service delivery.					
11. In general telemedicine is a useful tool					

SECTION C: EXTENT OF ADOPTION OF TELEMEDICINE

Please indicate the extent to which telemedicine has been implemented in your hospital in each of the following areas.

Areas	1. No Extent	2. Small Extent	3. Moderate Extent	4. Large Extent	5. Vary Large Extent
1. Doctor consultations					
2. Laboratory					
3. Radiology					
4. Pharmacy.					
5. Dental					
6. Dermatology					
7. Cardiology					
8. Physiotherapy					
9. Minor Surgery					
10. Major Surgery					

11.Opthamology					
12. Antinatal clinics					
13.Post Natal clinics					
14. Maternity					
15.Wound Dressing					
16. Any other Areas not included above (Please specify and rate)					

Section D: FACTORS INFLUENCING ADOPTION OF TELEMEDICINE.

Please tick in the appropriate boxes to indicate the extent to which each factor affects adoption of telemedicine in your hospital.

Factors	1. No Extent	2. Small Extent	3. Moderate Extent	4. Large Extent	5. Vary Large Extent
1.Availability of ICT connectivity (Internet links)					
2.Bandwidth, Data Transmission speed.					
3. Availability of ICT supports services.					
4.Reliability of ICT systems.					
5.Availability of ICT systems					
6. Cost of ICT connectivity (Bandwidth cost).					
7. Training in ICT or ICT skills among healthcare providers.					
8. Knowledge of telemedicine among healthcare providers.					
9.Resistance by hospital staff or Administration.					
10. Quality of services offered through telemedicine.					
11. Patients Privacy issues.					

12.Community(Patients) acceptance of telemedicine.					
13. Compatibility of telemedicine with healthcare service delivery.					
14.Telemedicine Policy framework.					
15.Any other (please specify and rate).					

I appreciate your time and efforts in filling this questionnaire.

Appendix III. List of Major Hospitals in Nairobi County.

Private Hospitals.

1. The Nairobi Hospital
2. The Aga Khan University Hospital
3. M.P. Shah Hospital
4. The Mater Hospital
5. Metropolitan Hospital
6. Gertrude Garden Children Hospital
7. Guru Nanak Ramagaria Sikh Hospital\
8. Avenue Hospital
9. Coptic Hospital
10. Jama Hospital
11. Karen Hospital
12. The Nairobi Womens Hospital
13. Nairobi West Hospital
14. Nairobi Equator Hospital
15. St. Mary's Mission Hospital
16. South B. Hospital
17. Melchizedek Hospital
18. Lions Sight First Hospital
19. Mother and Child Hospital
20. Mariakani Cottage Hospital
21. Maria Immaculate Hospital
22. Marie stopes Hospitals
23. Olive tree hospital
24. St. Francis Community Hospital
25. Umoja Hospital
26. Radent Hospital
27. Menelik Hospital
28. Langata Hospital

29. Masaba Hospital
30. Marura Hospital
31. Madina Hospital
32. Chiromo lane Hospital
33. St. John's Hospital
34. AAR Hospitals

Public Hospitals

1. Kenyatta National Hospital
2. Mathare Hospital
3. Nairobi Hospice Hospital
4. Mbagathi District Hospital
5. National Spine injury Hospital
6. Pumwani Hospital