FACTORS INFLUENCING THE ADOPTION OF ELECTRONIC MEDICAL RECORDS TECHNOLOGY IN PUBLIC HEALTH INSTITUTIONS IN KENYA: A CASE OF HOSPITALS IN NAIROBI COUNTY

BY

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A Research Project Report Submitted in Partial Fulfilment for the Requirements of the Award of the Degree of Master of Arts in Project Planning and Management of the University of Nairobi

2015

DECLARATION

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

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Sign…..... Date.....

REG. NO: L50/61375/2013

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

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DEDICATION

This research is dedicated to my loving parents Mr. and Mrs. Wilson Chepkwony and my siblings Robert, Agnes and Charles, my nieces Maryann, Nicole and Natalia and my nephew Nathaniel.

ACKNOWLEDGEMENT

I thank God the Almighty, to whom I owe what I have achieved so far. I am grateful to Prof. Christopher Mwangi Gakuu my supervisor, who patiently stood by me, always offering boundless encouragement and unwavering support. He offered guidance through questions of every conceivable level of difficulty with his sharp analytical intellect while always displaying humility.

My deepest gratitude must also be extended to the chairman Department of Extra Mural studies Professor. Charles Rambo, warm regards are also extended to lecturers at the Department of Extra Mural studies, Professor. Harriet J. Kidombo, Dr. John Mbugua, Dr. Ndunge Kyalo, Dr. Peter Makokha, Prof. Ganesh Porkhariyal, Dr. Steve Mogere, Dr. Stephen Luketero, Mr. Eliud Muriithi among others for providing intellectual guidance at important stages of my research work. Their considerable foresight opened the door for me to the challenging academic life provided by this master's program. I sincerely cannot thank them enough for enriching my academic life. Thanks to my family I would not have been what I am now without having such a great family that supported and encouraged me to be a better person and to follow my dreams. Moreover, I can never forget to thank my faithful friends who have been there for me all the way through until this work was finally done.

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ABBREVIATIONS AND ACRONYMS

AIDS:	Acquired Immune Deficiency Virus
ANOVA:	Analysis of Variance
EMR:	Electronic Medical Records
EMRT:	Electronic Medical Records Technology
HIV:	Human Immunodeficiency virus
IDA:	International Development Association
IFAD:	International Fund for Agricultural Development
KDHS:	Kenya Demographic Health survey
KNBS:	Kenya National Bureau of Statistics
NACOSTI:	National Council for Science, Technology and Innovation
NGO:	Non-governmental Organization
PERT:	Performance Evaluation Review Technique
PM&E:	Participatory Monitoring and Evaluation
SME:	Small and Micro Enterprises
SPSS:	Statistical Package for Social Scientists
UNDP:	United Nations Development Program
UK:	United Kingdom
WHO:	World Health Organization

ABSTRACT

The application of Electronic Medical Records Technology has gained much prominence and is widely used in Kenyan hospitals today. This technology agitates for paperless transactions health care. Many studies have been done in other countries to study the factors influencing adoption and utilisation of EMR technology, but a small number of studies exist in Kenyan situation. This study sought to examine why the application of EMR technology has not kept pace with its demand. This study sought to answer four key research questions derived from the study objectives which include the influence of resource availability, accessibility to network infrastructure, capacity building and staff levels of education on the adoption of electronic medical records technology in public health institutions in Nairobi County. This study was guided by four hypotheses derived from study objectives. Empirical literature of the works of widely published scholars was reviewed. The study was guided by diffusion and technology acceptance model as its theoretical framework. The study adopted across sectional survey design with a target population of 200 respondents. Using the Krejcie and Morgan table to determine the sample size, 127 respondents were sampled for this study. To achieve a desired representation, simple random sampling was used. A questionnaire with a 5-point Likert scale was constructed and used. The data obtained was analysed by descriptive statistics using SPSS Version 20.0 and the findings was appropriated to the research questions. Qualitative data was analysed by inferential methods and presented descriptively. Both content and construct validity were used to ensure validity of the research instrument's while reliability was determined by using the Cronbach-Alpha Coefficient. Pilot testing to pre-test and validate the research instruments was done prior to the main study. Two of the four hypothesis were rejected, there seemed to exist no significant relationship between accessibility to network and adoption of EMR technology with ($p = 0.836 > 0.05$), no significant relationship between staff level of education and competencies and adoption of EMR technology with ($p = 0.151 > 0.05$) and two hypothesis were accepted, there seemed to exist a significant relationship between resource availability and adoption of EMR technology with ($p = 0.027 < 0.05$) and a high significant relationship between capacity building with adoption and use of EMR in public health institutions in Nairobi with ($p = 0.000 < 0.05$). Computed MLR results showed that the four factors studied accounted for 28.5% of variance with adoption of EMR. The study recommends that health facilities should increase infrastructure and resources that support EMR use, employees should be supported for further training on EMR operation and suppliers should regularly support and training health staff on how to use EMR usage. The study results may be useful to hospitals as they gear towards integrating all their process by using technology.

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Over the last 25 years, public healthcare delivery has been undergoing continuing changes (Abdel-Wahab, Omer, & Attalla, 2008). Progress in medicine and also in information and communication technologies (ICT), are resulting in new methods and new opportunities to support or even enable new types of health care services (Marques, Oliveira, & Martins, 2011). This has included the use of new information and communication technologies in a bid to improve services to patients, speed up waiting times, and addressing structural problems in the health service (Leonidas *et al.,* 2011). These changes have been largely driven by technical competence on the medical side but not matched sufficiently in technical organizational improvements (Osbourne, 2006).

Primary care has unique characteristics with specific data and information needs that require suitable informatics solutions (Gagnon, *et al.,* 2010). Studies suggest that high-quality primary care can be enabled through computerized health records (Singh & Muthuswamy, 2013; Marques *et al.,* 2011; Gagnon *et al.,* 2010). Therefore, EMRs could improve patient safety and the efficiency of primary health care. The need for portability and instant communication has transformed the use of the Electronic Medical Records (EMR). EMR provides a repository of information among patients, healthcare providers, government organizations, employers, and insurance agencies (Canadian Medical Association, 2008). Abdel-Wahab *et al.,* (2008) argued that Increases in the use of information technology in health care, especially the introduction of clinical decision support and better linkages in and among systems, resulting in process simplification that could result in substantial improvement in healthcare services.

In the United States, Institute of Medicine (2001) reported that utilisation of information technology in health institutions led to improvement in patient safety, effectiveness, patient centeredness, timeliness, efficiency and equity of healthcare. The EMR has been augmented by a component that utilizes current technological developments such as internet technology to create a more complete source of healthcare data management (Sood et al., 2008). These technologies have the potential

to transform aspects of information management in health care, from the way health information is documented to the way it is retained and stored. Such technologies are exposing individuals to improvements in healthcare and generating positive attitudes toward managing their own medical information (Hannan, *et al.*, 2000). Sood *et al.*, (2008) informed that United States, United Kingdom and Australia have growing and robust healthcare infrastructures that have incorporated EMR. Schoen *et al.,* (2006) study showed that only 23% of Canadian primary care doctors used electronic patient medical records.

In Asia, a survey conducted by the Japan Hospital Association [JHA] (2001) reports that most hospitals in Japan have adopted EMR with only 30% citing the high cost of computerisation as the major barrier to EMR adoption. In India Singh and Muthuswamy (2013) found out despite use of electronic health record in increasing the efficiency of healthcare, many factors like cost, time, training, fear, security and privacy, lack of standards that stops healthcare practitioners to adopt electronic records. In South Korea, Park and Lee (2014) found that the EMR adoption rate of small hospitals was 40.3%, which is slightly higher than in the neighbouring Japan. Though significant failures still exist in these systems, there is strong support and motivation to accomplish goals associated with comprehensive development of successful EMR systems (Avison & Young, 2007) in developed countries. These countries are able to make significant investments in research to develop information systems that would meet the need of their particular healthcare system. For instance, near universal EMR take-up in countries such as the Netherlands has been supported by financial incentives, standards, and technical support at the national level (Canadian Medical Association, February 2009). This is in sharp contrast to the healthcare infrastructure of middle and least developed countries.

In Nigeria, less than 5% implementation of any form of hospital information technology in a country of more than 150 million people (Idowu, Adagunodo, & Adedoyin, 2006). Ayodele (2011) established that hindrance to the adoption of hospital information systems in Nigeria included; the high cost of full implementation of a hospital information system, inadequate human capital, corruption, and problems associated with poor infrastructure in Nigeria.

Studies done in various developing countries including Mozambique, South Africa and Mongolia suggest that there is limited use of available health information where local health services and population based decision making are concerned. Health workers at health centres in these countries indicate that Health Information Systems (HISs) such as EMRs are used purely as upward reporting tools (systems used to report to governments), not to support clinician decision making (by physicians and nurses) in patient monitoring and disease management (Gebre-Mariam, Borycki, Kushniruk, & Ellen, 2012).

Majority of Sub Saharan African countries Sood *et al.,* (2008) observed that the delivery and management of healthcare services alone comes with many challenges. In many of these countries, implementers of healthcare information technology based solutions are faced with complex challenges such as inadequate funding, lack of resources and weak healthcare infrastructure (Bra, Monteiro &Sahay, 2004). In addition, some economies may have just a rudimentary application level of healthcare technology. Rao *et al.,* (2011) explained that though health information technology promises benefits to healthcare, many problems exist.

In Kenya, the Academic Model for the Prevention and Treatment of HIV (AMPATH) Medical Record System (AMRS) was the first sub-Saharan African EMR system used in the comprehensive and clinical care of patients infected with HIV (Siika, 2005). Ochieng and Hosoi (2005) informed that EMR promises rapid access to health information, which leads to improved healthcare outcomes and more efficient use of resources. Mulwa (2013) argued that capacities of developing nations' health systems fall short of demand. Despite years of research in the area of information technology, the progression in adaptation remains low.

Reviewed studies and literature provides a common position among various authors that disparities exist in the implementation of hospital information systems in developing and developed countries (Grimm & Shaw, 2007; Williams & Boren, 2008). Speculated reasons include poor technological and funding support in developing nations, poor management capacity at all levels that ensures seamless workflow, and a complex milieu of health care service delivery. It is not understood factors influencing the adoption of EMR by hospitals in Nairobi Kenya which has

limitedly been researched. The study looked at how resource availability, accessibility to network infrastructure, capacity building and staff levels of education influence adoption of EMR technology by healthcare organisations in the County of Nairobi, Kenya. Moreover, despite the importance of these systems in health care, little is known about the adoption. This study addresses the existent research gap by analyzing the adoption of EMR in Nairobi hospitals.

1.2 Statement of the Problem

The slow adoption of electronic medical records (EMR) has become a critical challenge in the health care industry of the Kenya. Quicker adoption of EMR is necessary to streamline key processes in the health care industry, integrate activities across health care organizations, reduce overall health care costs, improve medical record management, health program management and improve patient care quality. Despite the government commitment to subsidize medical equipment's, the utilization of these facilities in hospitals around the city is low, despite all recent efforts, the EMR adoption lag persists.

Even among those hospitals that have made efforts to implement EMR, there is a very high failure rate studies show that up to 80% of EMR implementations fail. For instance, a study conducted in the United States (Lorenzi *et al.,* 2008) found out that 19% of EMRs are uninstalled after implementation, and approximately 30% are not used to their full potential by the care staff. Sood *et al.,* (2008) established that adaptation of Electronic Medical and Personal Health Records in developing countries are scarce. Mulwa (2013) found out that in Nairobi hospitals, data is entered manually and bound to human error. There are cases of files being misplaced or lost altogether. Some patients may not remember their patient numbers and therefore tracing their files is an uphill task. There are also therefore cases of multiple entries of case files for patients when files cannot be found. Tracing files is time consuming and leads to loses in working man hours.

Prevalent knowledge gaps exist in the literature on the adoption of EMR technology. Several empirical studies have explored these relationships and did not come up with any conclusive statements. Since the questioning of hospital performances is becoming louder by the day, there is need to study this phenomenon in a more

detailed version; two key research questions will be raised. First, why is there increasing discontent with performance of health advancements in Kenya? Secondly, how can health agencies be made more adaptive to modern technology?

1.3 Purpose of the Study

The purpose of this study was to examine factors that influence the adoption of electronic medical records technology in public Health institutions in Kenya; hospitals in Nairobi County shall provide a test case.

1.4 Objectives of the Study

The study was guided by the following research objectives:

1. To verify the extent to which resource availability influence the adoption of electronic medical records technology in public Health institutions in Nairobi County
2. To establish the extent to which accessibility to network infrastructure influences the adoption of electronic medical records technology in public Health institutions in Nairobi County
3. To determine the extent to which capacity building influences the adoption of electronic medical records technology in public Health institutions in Nairobi County
4. To investigate the extent to which staff levels of education influence the adoption of electronic medical records technology in public Health institutions in Nairobi County.

1.5 Research Questions

The study sought to answer the following research questions:-

1. To what extent does resource availability influence the adoption of electronic medical records technology in public Health institutions in Nairobi County?
2. How does accessibility to network infrastructure influence the adoption of electronic medical records technology in public Health institutions in Nairobi County?
3. To what extent does capacity building influence the adoption of electronic medical records technology in public Health institutions in Nairobi County?

4. At what level does staff educational levels influence the adoption of electronic medical records technology in public Health institutions in Nairobi County?

1.6 Research Hypothesis

The study was guided by the following hypothesis tested at 95% significance Level:

H_1:1 There is a significant relationship between resource availability and adoption of electronic medical records technology in public health institutions in Nairobi County.

H_1:2 There is a significant relationship between accessibility to network infrastructure and the adoption of electronic medical records technology in public Health institutions in Nairobi County

H_1:3 There is a significant relationship between capacity building and the adoption of electronic medical records technology in public Health institutions in Nairobi County.

H_1:4 There is a significant relationship between staff educational levels and adoption of electronic medical records technology in public Health institutions in Nairobi County.

1.7 Significance of the Study

It is hoped that this study shall be a critical contribution to the practice, research and theory of health development and to the body of knowledge of professional medical operations. The study will also provide health practitioners, consultants and the academia with facts and data that will lead to scholarly publications and reference material. Scholars and researchers will therefore find information and data from this study as a basis for further research. This study shall also contribute immensely to the theory and body of knowledge of project planning and management discipline. It is also expected that this study will make insightful contribution to university teaching. In addition, new knowledge generated through this study may benefit funding agencies, hospital administrators, policy makers and health practitioners

1.8 Delimitations of the Study

This study was delimited to hospitals in Nairobi County. Only institutions with capacity and had been classified as hospitals by relevant government institutions formed part of the study. The scope of this study was informed by the fact that the Kenya government, bilateral and multilateral funding agencies would be interested in the findings from this research to improve on empowerment, behaviour change and poverty reduction programs. Although Barzilai (2011) suggested that there are many variables that influence adoption, this study shall only delimit itself to factors that are thought to be influential to adoption of electronic health records that include resource availability, accessibility to network, capacity building and staff educational levels

1.9 Limitations of the Study

This study faced a number of limitations: The targeted respondents for this research are people working in a hospital environment and they were always busy and the practicability of engaging all respondents to fill out the questionnaire was remote, this is due to time and cost constraints. To overcome this, the researcher undertook sampling from the target population and ensures the sample size to be used is large enough so as to be representative of the entire population. In addition, the sampling procedure used was scientific to the extent that the statistical principle of randomization was not compromised in the sampling frame. Secondly, the questionnaires were dropped and picked later which allowed the respondents to fill them out when they had time.

1.10 Assumptions of the Study

The researcher assumed that the targeted respondents would be available and responsive and that they would appreciate the significance and magnitude of this research and fully supports the process and that they gave honest responses. It was also the researcher's assumption that the targeted respondents were accessed easily and easily understood and appreciated items within the research instrument. This study was carried out on hospitals that are running different types of Electronic Medical Records on different platforms. It was assumed that the differences on the types of EMR systems did not affect the responses. Finally, the researcher assumed that competent research assistants with sufficient field experience were attracted to support data collection endeavour.

1.11 Definition of Significant Terms

Accessibility to Network: This is the ease of access or presence of network or internet or intranet connectivity to a health institution or hospital facility.

Adoption of EMRT: Is defined as the decision to make full use of a technology innovation as the best course of action.

Capacity Building: These are training related or empowerment based programs that are geared towards enhancing the inert capacity of communities or individuals become more enlightened or equipped with requisite skills

Electronic Medical Records (EMR): A computerized medical information systems that collect, store and display patient information, it allows family doctors and other health care providers to chart patient health information using a computer

Staff Levels of Education: These are academic levels of academic qualifications or competences that hospital staff poses. These competences help them to acquire jobs and necessitate performance. Academic levels could be post primary, post-secondary, certificate, diploma or degree qualifications.

Technology Acceptance Model (TAM): An information system theory that modelled how users came to accept and use a technology

1.12 Organization of the Study

This study is organized in five chapters. Chapter one discussed the background of the study where the highlights on conceptual analysis were done. The chapter gives direction for the study that covers the statement of the problem, objectives of the study, hypotheses related to the study topic, research questions, limitations, delimitations and definitions of significant terms. Chapter two covers empirical and theoretical literature upon which the study is hinged. The review gives a further elaboration on the context of the study where an increasing bundle of literature is shown. The chapter also gives theoretical framework upon which the study was anchored. Pertinent gaps in empirical studies were identified that informed the conceptual framework where interrelationships between study variables were depicted on a model.

Chapter three covered research methodology as applied in the study, the research design, target population, sampling procedure, description of research instruments, pilot testing, validity and reliability of research instruments, methods of data collection, procedures for data analysis, operational definition of variables and ethical considerations. Chapter Four entails data analysis, presentation, interpretation and discussion of study findings while chapter five cover summary of research findings, conclusions, recommendations and suggestions for further research.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter contains empirical review of pertinent literature on adoption of electronic medical records technology in public health institutions in Kenya. This review anchored the study on the theoretical framework and identified gaps in empirical studies from which the conceptual framework was formulated.

2.2 Adoption of Electronic Medical Records Technology in Health Institutions

Electronic medical records originate from paper-based patient records, are often considered a part of larger data management systems, and are designed to store, manage, and query various medical data (Kazley & Ozcan, 2007). EMRs are one of the foundational but nonetheless controversial technologies for digitization of health care (Angst *et al.,* 2010). Different terms are used to refer to these systems including electronic patient record (EPR), Electronic Health Records (EHR) electronic medical record (EMR), computer based patient record (CPR) and medical records system (MRS) (Kazley & Ozcan, 2007).

An EMR is a digital repository of patient data that is shareable across stakeholders, such as clinicians, insurance companies, employers, and within a hospital and/or health system (Siika, 2005). In South Korea an EMR system is defined as an electronic record of health-related information on an individual that can be created, gathered, managed and consulted by authorized clinicians and staff within one healthcare organization (Park & Lee, 2014). Typical EMR systems incorporate features such as a clinical data repository, computerized patient records, decision support applications, integration with other systems, and transaction processing capabilities.

The EMR has been characterized as one of the significant innovations to emerge in the health-care industry in recent years (Jha*et al.,* 2009). It offers the promise of unifying fragmented data and applications and allows the practice and administration of medicine to incorporate more evidence-based decision making (Elson & Connelly 1995 in Angst *et al.,* 2010). EMRs integrate various tools that could improve clinical

decisions and thus favors a safer, more effective and more efficient healthcare system (Flegel, 2008).

Since the 1990s many countries have experienced the implementation of EMRs in primary health care. Surprisingly, the diffusion of EMRs across the United States has been slow (Ash & Bates, 2005; Bower, 2005). Some European countries, such as the Netherlands, report over 90% use of EMRs by primary care physicians, the situation in Canada is very different (Sood *et al.,* 2008). Though the technology has been available commercially for over three decades, studies show that its adoption rates are consistently below 30%, with some estimates as low as 7.6% for a basic electronic health record (EHR) system (Jha *et al.,* 2009), underscoring the uncertainty hospitals confront in their decision to acquire the innovation (Greve, 2009).

EMR systems have various benefits and advantages in healthcare practice (Lorenzi *et al.,* 2008). They save costs by extracting a large number of clinical documents in a timely manner and sometimes prevent human error through techniques, such as alerts, and by providing additional information (Jha *et al.,* 2009). As a result, there is great potential for improvement of hospital practices. Although there are many merits to these clinical and managerial systems, their adoption rate has not been very high.

In India, Singh and Muthuswamy (2013) denoted that EMR has potential to improve patient care by managing patients' medical and personal information efficiently and effectively. The perceived benefits of EMR can be summarized as reduction in human errors, improving the security of medical data, making easier access to medical information, diminishing duplication of efforts and documents, optimizing the documentation of health data, reducing costs of information and communication technology, supporting decision making activities, improving the quality of care, forming data repository, and reduction of papers (Ventura *et al.,* 2011; Ayodele, 2011).

2.3 Resource Availability and Adoption of Electronic Medical Records Technology in Public Health Institutions

Organizational size is one of the most studied ICT adoption factors, since size is associated with more financial capability but also adequate human resources (Kazley & Ozcan 2007). 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 (Zhu *et al.,* 2003; Pan & Jang, 2008) since they have more finances compared to smaller institutions. It is expected that larger hospitals tend to adopt MRS.

Hospital ownership may also guide organizational strategy, based on hospital mission and values. Since EMR adoption is expressed in e-health 2005, as a European priority (European Union 2005), hospitals dependent of public funds may anticipate EMR adoption. In addition, general health care hospitals face a higher degree of competitiveness (Kazley & Ozcan, 2007). General hospitals often report higher occupancy rates and more financial and social pressures. A specialized hospital is only option for a specific target, thus not requiring the hospital to compete with others in the environment. In addition, the amount of inter-departmental information should be much lower comparing to a general hospital were the different services act as isolated islands. For these reasons, is expected that a general hospital would be more likely to take actions, such as EMR adoption to attract patients.

Park and Lee (2014) study in South Korean hospitals established that there was no difference in EMR system adoption between small public and private hospitals. Hospital status as a multihospital system and having contracts with other hospitals (group purchasing contracts) were not related to EMR adoption. However, hospitals located in urban areas had significantly higher EMR adoption rates than did hospitals in rural areas. Hospitals adopting EMR systems had higher task complexity than that of hospitals not adopting EMR systems, as measured by the number of medical specialties, but this was not statistically significant.

Small hospitals equipped with high levels of IT infrastructure and with organic managerial structures were more likely to adopt EMR systems than were other types of hospitals. Among hospital internal features, IT infrastructure and organic structural

form were factors critically affecting EMR adoption. Hospitals with greater IT infrastructure can more easily invest in EMR systems because they have an environment that is accepting of new and highly complex EMR technologies. Organic organizational structures with characteristics emphasizing horizontal communication are accepting of new ideas from employees, which might create an environment in which EMR systems could be easily installed (Park & Lee, 2014).

Burt and Sisk (2005) reported that department size substantially affected the probability of using EMR; a larger number of physicians in a department was associated with a higher probability of EMR use. Because different hospitals and ED units experience different rates of crowdedness, vary in terms of the number of physicians, and serve a variety of populations, it was important to control for possible effects of hospital on the level of EMR usage. Many EMR systems have ergonomic problems. For example, some health providers use CRT monitors which are really dark making the interface hard to read.

EMR systems should adjust in terms of brightness and contrast to be accessible in different lighting conditions in the healthcare. Finally, some healthcare environments need portable devices, but in some cases, EMR systems cannot run properly on these devices. Therefore, some subjects such as touch screen, memory and processor issues, navigation system impact on EMR adoption in healthcare environments which use portable devices (Rose et al., 2005). Many researchers state that these costs are significant and therefore should be regarded as a high barrier to physicians adopting EMRs, especially for those without large IT budgets (Boonstra & Broekhuis, 2010).

Kazley and Ozcan (2007) point the cost of implementation as the greatest barrier to ICT adoption. This factor is particular relevant for e-health adoption since, health care industry in Europe is still very dependent of public funds (Forum e-health, 2008). Hospitals in areas where the amount of financial resources are more abundant are more likely to have the support for high cost services and technology such as EMR. Balotsky (2005) reported that markets with greater per capita income supported higher hospital cost. Ouma and Herselman (2008) indicated that whereas the developed Western nations are at the forefront of implementation of electronic health, African countries are still at the rudimentary stages of adoption processes. Some of

the reasons attributed to this disparity include poverty, poor economic diversification, and lack of supportive infrastructure and inadequate use of natural resources. This study would check whether resources available influence adoption of EMR by hospitals in Nairobi.

Funding of the health sector determines adoption of EMR (Omary *et al.*, 2010; Abdullah, 2012). Due to low funding of health sector in Tanzania, Omary *et al.*, (2010) argued 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 EMR even in the case of developed countries and this should 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.

In a 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 EMR amongst hospitals in the rural areas (Ouma & Herselman, 2008).

2.4 Accessibility to Network and Adoption of Electronic Medical Records Technology in Public Health Institutions

The Internet, and in particular broadband, provides a foundation upon which various EMR applications are built. Applications and services such as telemedicine, data transfer, and access to health information are usually internet dependent (Muchangi & Nzuki, 2014). In Europe, Sweden, Denmark, Netherlands, Finland, United Kingdom, Norway, Germany, Switzerland, Belgium, and France perform well with over 70% of households with broadband connection (OECD, 2013). This indicates these countries' readiness towards embracing internet-based EMR solutions such as telemedicine, searching of health information online by patients and clinicians.

Effective application of EMR requires broadband Internet connectivity with high-speed capability for data retrieval and transfer (Ouma & Herselman, 2008). The low rate of internet penetration and low bandwidth are among the challenges to EMR adoption in developing countries (Muchangi & Nzuki, 2014). For instance, inadequate Internet bandwidth is a notable challenge in Africa. Internet connectivity problems abound in Nigeria with the few Internet service providers in the market offering very poor services because of bandwidth constraints (Ayo *et al.*, 2008). (Omary *et al.*, (2009) pointed 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 EMR adoption.

As long as internet penetration remains low in developing countries, adoption of EMR will continue to lag behind compared to countries with high adoption rates such as Denmark (broadband connection per household in Denmark stands at 83.9% according to OECD (2013)). However, to fully realize the importance of internet for accessing healthcare information there are some issues that must be addressed, for example, poor internet skills on the part of healthcare professionals prevent them to understand the difference between biased and unbiased information, to differentiate evidence-based claims, and to interpret the information which is meant for health professionals (Qureshi *et al.*, 2013). Systems complexities are also a factor influencing adoption of EMR.

Complexity of the system Miller and Sim (2004) argued that most physicians consider EMRs to be challenging to use because of the multiplicity of screens, options and navigational aids. The complexity and usability problem associated with EMRs results in physicians having to allocate time and effort if they are to master them. Physicians have to learn how to use the EMR system effectively and efficiently which they may see as a burden. It is also possible that a lack of skills leads the physicians to regard the EMR system as extremely complicated (Boonstra & Broekhuis 2010). Some physicians worry that EMRs are machine-based systems, made and programmed by IT companies (Boonstra & Broekhuis 2010). They are concerned that under certain circumstances, or as time passes, the systems will reach their limitations, become obsolete and will no longer be useful.

Reliability of EMR systems also is critical to its adoption and use in health institutions. Reliability is the dependability of the technology systems that comprise the EMRs (Randeree, 2007). High reliability is very important for a system dealing with patient information, and many physicians are concerned about the temporary loss of access to patient records if computers crash, viruses attack or the power fails. Moreover, some fear the possibility of record loss due to an unknown technical defect in the system. Further, reliability problems will lead to financial loss.

Moreover, EMR hardware and software cannot be used straight out of the box, it has to interconnect with other devices that complement the EMR system and help to generate benefits (Boonstra & Broekhuis, 2010). Among physicians in medical practices that have implemented EMRs, such interconnectivity problems are a well-recognized obstacle to the wide adoption of EMRs. In essence, EMRs are not compatible with the existing practice systems, and physicians are reluctant to get rid of functional systems in order to have an integrated system including EMRs. A survey, Valdes *et al.,* (2004) concluded that there were more than 264 unique types of EMR software implementations in use.

The format of data varies among the different software packages and systems, in large part due to the lack of consistent data standards within the industry, and this makes data exchange difficult if not impossible between systems (Randeree, 2007). This problem is more acute in smaller practices than in larger ones because of the relatively limited organizational resources such as expertise and experience. From the above review of literature, network connectivity seems to be a significant factor influencing adoption of EMR technology.

2.5 Capacity Building and Adoption of Electronic Medical Records Technology in Public Health Institutions

Technology adoption is about creating a context, an environment, in which change can be achieved and sustained over the long term. This involves two levels; organizational and individual. With an EMR implementation, the organization must create the supporting environment, provide needed training and resources, articulate a clear direction coupled with clear expectations, engage its people, include them in the process, and reinforce desired new behaviours. This is not about checking things off a

list, but rather about finding synergy among impacted groups, giving them what they need, and coordinating efforts to meet the end goal (McCarthy & Eastman, 2010).

The point in getting users to actively support the deployment of an EMR is about a lot more than a communication plan or feature/function training. Managing the people side of an EMR implementation requires a savvy technology adoption plan that ties sponsorship, training, communication, workflow harmonization, user support and reinforcement with the business priorities of the organization and effectively coordinates all of these activities with the user in mind in an environment that reinforces desired behavior changes (McCarthy & Eastman, 2010).

Whether the management level supports the use of EMRs, and believes in the benefits of EMRs, has been found to influence the rate of EMR adoption by physicians (Boonstra & Broekhuis, 2010). However, most researchers do not consider this issue, or take for granted that managers will be committed to EMR implementation.

ICT training among clinicians is cited as a key determinant of electronic medical technology implementation in organizations (Ochieng& Hosoi, 2005; Martins & Oliveira, 2008). Some health providers are interested in paper-based documents instead of using computer. If these providers cannot embrace computer technology in their workplaces, the adoption of EMR systems can rapidly decrease in the healthcare. Therefore, training in computer proficiency among health providers can be a key role to increase the adoption of EMR systems (Pinaire, 2009).

According to Ochieng and Hosoi (2005) on a study that sought to establish the factors influencing diffusion of electronic medical records in Japan, ICT skills are required to foster positive attitudes about electronic medical records that translate to greater adoption of electronic medical records. Therefore, developed countries in an effort to raise ICT skills amongst clinicians have incorporated ICT training in health courses offered at various academic levels. New courses such as medical informatics, bioinformatics, computational biology, and health informatics have been started (Muchangi & Nzuki, 2014). In Nigeria, Senamu and Ochiotu (2014) established that there is little or no awareness of the use of computers for record management. Much still needs to be done to create awareness of the application of ICT to this area of

healthcare. Hospitals that have embraced it have only implemented part functionality of the EMR system.

Moreover, customizability is an important factor to enhance EMR adoption. It is defined as the ability of the system to conform to specific needs of the end user. Physicians are reluctant to adopt static EMR systems that do not support their personal styles and workflow. For example, the doctors like to have their own letter format and adjust it based on their needs (Randeree, 2007). Some physicians may also use this lack of customizability as a way to avoid admitting to other reasons for avoiding EMRs. However, it does seem that more effort is required from the vendors of EMRs to increase their customizability. However, such customer services will increase the costs to practices of implementing EMRs; potentially erecting financial barriers (Boonstra & Broekhuis, 2010).

Lack of technical training and support many physicians complain of poor service from the vendor, such as poor follow-up with technical issues and a general lack of training and support for problems associated with the EMRs (Randeree 2007). Ludwick and Doucette (2009) similarly noted that physicians struggle to get appropriate technical training and support for the systems from the vendor. As physicians are not technical experts and the systems are inherently complicated, physicians perceive a need for proper technical training and support, and are reluctant to use EMRs without it. Simon et al. found that two-thirds of physicians indicated a lack of technical support as a barrier to them adopting EMRs, while Ludwick and Doucette (2009) noted that some physicians reported a lack of access to vendor technical support (Boonstra & Broekhuis 2010).

2.6 Staff Levels of Education and Adoption of Electronic Medical Records Technology in Public Health Institutions

Introduction of EMR systems can radically affect health care delivery. The trend to use digital medical equipment with the possibility for networking demands that medical staff possess a good knowledge of information technology applications and uses (Ayodele, 2011). Professionals need to adapt themselves to the use of this new technology adoption. This can found many obstacles, depending on individual level attributes as IT Knowledge and training, motivation and openness to new ways of

working (Ammenwerth *et al.,* 2006). Overall capacity to evaluate technologies opportunities depend primarily on human capital and organization knowledge. EMR implementation requires employees with higher education level (Martins & Oliveira, 2008).

Hospitals are formed by a specific group of professionals with specific training, that not necessary include ICT training and despite the mental image that hospital stands for doctor and nurses, this is not the reality (Lapão 2005). The majority of hospitals employees are medical auxiliary that do not have necessary a university degree. In India, Singh and Muthuswamy (2013) found that training and cost was one major barrier in the implementation of EMR.

According to Meinert (2005), the slow rate of adoption suggests that resistance among physicians must be strong because physicians are the main frontline user-group of EMRs. Whether or not they support and use EMRs will have a great influence on other user-groups in a medical practice, such as nurses and administrative staff. As a result, physicians have a great impact on the overall adoption level of EMRs. Physicians and staff lack computer skills many researchers, based on their surveys, have concluded that physicians have insufficient technical knowledge and skills to deal with EMRs, and that this results in resistance.

Meade *et al.,* (2009) observed in this context that most of the current generation of physicians in Ireland received their qualifications before IT programmes were introduced. EMR providers appear to underestimate the level of computer skills required from physicians, while the system is not only seen as but in practice actually is very complex to use by these physicians. Further, good typing skills are needed to enter patient medical information, notes and prescriptions into the EMRs, and some physicians lack them (Boonstra & Broekhuis 2010).

Hasanain, Vallmuur and Clark (2015) examined health personnel knowledge and acceptance of and preference for EMR systems in seven Saudi public hospitals in Jeddah, Makkah and Taif cities. Results indicate that there was a highly significant positive relationship between computer literacy and EMR literacy. There was a significant positive correlation between English language proficiency level and

computer literacy and EMR literacy levels. Additionally, the study results show that there is a significant correlation between education level and computer and EMR literacy levels. Thus use of and preference for EMR systems appears to be related to socio-economic determinants such as educational level, English language proficiency and computer literacy (Hasanain, *et al.,* 2015)

Omary *et al.,* (2010) attributed low adoption of EMR among developing countries to lack of computer skills amongst the clinicians. In countries that have assimilated ICT training for clinicians, acceptance of EMR and actual use is relatively high (Khan *et al.,* 2012). Training boost awareness and confidence level as users are able to overcome technophobia while relating usage to expected benefits (Sahay & Walsham, 2006). Abraham *et al.,* (2011) added their voice by arguing that optimal use of IT towards the transformation of health care requires IT knowledge in the medical communities. The correlation between ICT skills and adoption of EMR is also discussed by Juma *et al.,* (2012) who pointed out that inadequate ICT skills in the health sector in Kenya explains the low adoption of EMR.

Hogan and Palmer (2005) are of the opinion that those health care professionals who lack the ICT skills of processing the online health data end up spending too much time on the same. According to Malik *et al.,* (2008), sluggish internet use among doctors in Pakistan was due to unavailability of proper technology and lack of computer training. Mulwa (2013) study found that the staff at the private hospitals had a higher knowledge on computer than those from the public hospitals. A large proportion of the respondents had access to and knew how to use the EMR applications at a moderate level. Although Waithaka *et al.,* (2013) focused on establishing adoption of Inter-Organizational Information Systems (IOIS) in Kenyan Universities; their findings that users' ICT skills affect the adoption of IOIS can be extrapolated to cover health information technologies. Without adequate ICT skills, user involvement in selection and development of ICTs becomes difficult and if it happens, it is only to rubberstamp the experts' decisions (Muchangi & Nzuki, 2014). This might lead to having EMR technologies that are not widely accepted or used adequately.

2.7 Theoretical Framework

This study is grounded on two interrelated theories namely: diffusion theory and technology acceptance model.

2.7.1 Diffusion Theory

The first theory is Diffusion theory. The diffusion of innovations approach, as outlined by Rogers (2003), was used to expand understanding of reasons for adoption, usage patterns, and communication objectives that are and can be met by technology in a developing country. This includes how and why an innovation is adopted, and especially the unique reinvention of an innovation to the changing needs of the individual.

Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system (Rogers, 2003). An innovation is an idea, practice, or object that is perceived to be new by an individual or other unit of adoption. Communication is a process in which participants create and share information with one another to reach a mutual understanding (Rogers, 1995).This model suggests that there are three main sources influencing the adoption and diffusion of an innovation, namely perceptions of innovation characteristics, characteristics of the adopter, and contextual factors. Studying how innovation occurs. Rogers (1995) argued that it consists of four stages: invention, diffusion (or communication) through the social system, time and consequences. The information flows through networks. The nature of networks and the roles opinion leaders play in them determine the likelihood that the innovation will be adopted.

Innovation diffusion research has attempted to explain the variables that influence how and why users adopt a new information medium, such as the EMR. Opinion leaders exert influence on audience behaviour via their personal contact, but additional intermediaries called change agents and gatekeepers are also included in the process of diffusion. Five adopter categories are: (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards. This model has been applied to study the adoption of various information technologies in healthcare. However, the DoI does not provide information on how to assess innovation characteristics (Gagnon *et al.,* 2010).

2.7.2 Technology Acceptance Model

The second theory considered is Technology Acceptance Model (TAM) to evaluate the factors that influence adoption and use of electronic medical records in hospitals (Davis, 1989). This model appears to be particularly applicable in the health information technology field because it focuses on two specific variables believed to influence the use of information technology. Perceived usefulness (PU) is the factor that indicates the degree that the person believes the information system will assist them in the performance of their job (Davis *et al.,* 1989). Perceived ease of use (PEOU) is the second factor, which is used to indicate how difficult the person believes the proposed system would be to use. These constructs are based in the theory of reasoned action, which noted that a person's behavioural intention is determined by the person's attitude as well as a subjective norm as estimated by regression.

While the TAM has been utilized in a number of studies dealing with a wide array of information technologies, a review of the literature shows very few studies in the healthcare field and even fewer related to health information technology. A series of studies found that TAM is the best model in examining Physicians' acceptance of telemedicine technology because it is specialized in information technology, it is well-researched, it uses psychometric measurements, and it is a dominant model for investigating user technology acceptance (Mary 2008; Chau & Hu, 2001, 2002; Hu *et al.,* 1999).

2.8 Conceptual Framework

The interrelationships between study variables are conceptualized as shown below in Figure 1.

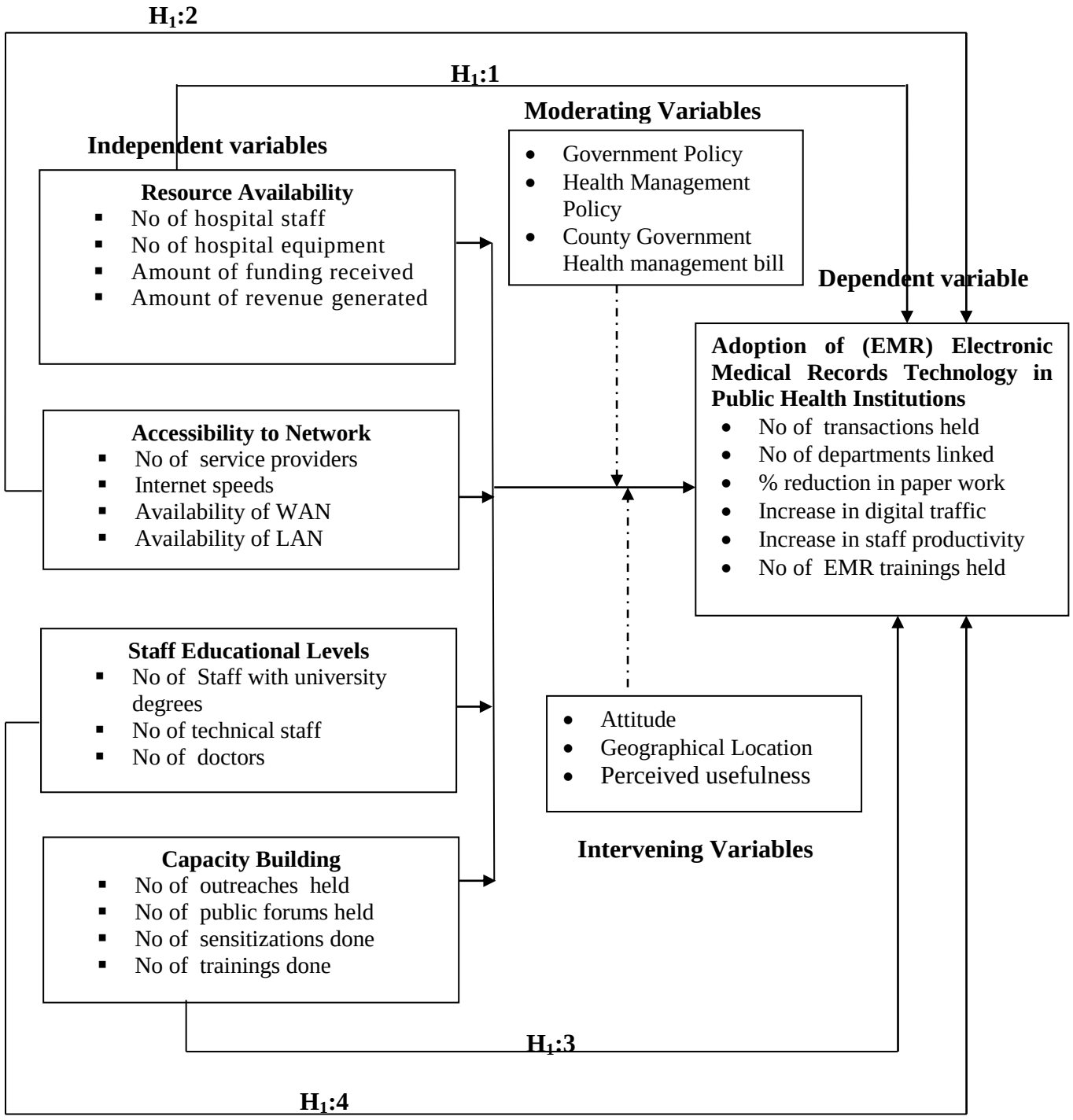

Figure 2.1: Conceptual Framework

As indicated in the conceptual model, there are four factors that influence adoption of (EMR) electronic medical records technology in public health institutions which include; Resource availability that comprise of number of hospital staff, hospital equipment, amount of funding received and revenue generated seem influential on adoption of (EMR) electronic medical records, the second is accessibility to network which includes number of service providers, internet speeds and availability of WAN and LAN, the third is capacity building which include number of outreaches held, numbers of public forums, number of sensitizations and number of trainings done and finally levels of staff education which include number of staff with degrees, number of technical staff and number of doctors, A gaps exist on the factors that influences adoption of electronic medical record technology in public health institutions in Kenya and the extent of the relationship of these four variables is not clear and need to be examine and will be tested in H_1:1, H_1:2, H_1:3 and H_1:4 respectively.

2.9 Knowledge gap

The knowledge gap identified after reviewing relevant literature is shown Table 2.1

Table 2.1: Summary of Knowledge Gap

Variable	Author and Year	Findings	Knowledge Gap
Resource availability and adoption of (EMR) electronic medical records technology in public health institutions	Boonstra & Broekhuis 2010	Established that internal and external factors influence adoption of electronic medical technology by health institutions	Research conducted in developed countries (EU)
Accessibility to network and adoption of (EMR) electronic medical records technology in public health institutions	Miller and Sim (2004)	Found out that EMR systems were complex for clinicians	The study looked at EMR systems with less emphasis on network accessibility
Staff educational levels and adoption of (EMR) electronic medical records technology in public health institutions	Senamu & Ochiotu (2014)	little or no awareness of the use of computers for record management	Looked at computers but not EMR technology in Lagos
	Ochieng& Hosoi, 2005	ICT skills are required to foster positive attitudes about electronic medical records	The study was conducted in Japan which is a developed country
Capacity building and adoption of (EMR) electronic medical records technology in public health institutions	Hasanain *et al.*, (2015)	User acceptance is one of the key factors for success in EMR implementation	Mixed training, proficiency and language in determining EMR adoption in Saudi Arabia

2.10 Summary of Literature Reviewed

The literature review comprised the theoretical framework, empirical review and conceptual framework. The chapter has looked at the literature on the various factors that influence adoption of EMR which included; resource availability, accessibility to network, capacity building and staff educational levels factors. The chapter has also reviewed the theories that have been used in the past studies of EMR systems adoption. They included the Diffusion of innovation (DoI) and Technology Acceptance Model theory. A conceptual framework of the study was also shown.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methods used to provide answers to the research questions. It focuses on research design, target population, sampling procedure, data collection methods, validity, reliability, methods of data analysis, operational definition of variables and ethical issues.

3.2 Research Design

This research study utilised a cross-sectional survey design. This particular design was ideal since the research entailed collecting and comparing data from the phenomena at the same time of study. According to Mugenda and Mugenda (2003), the purpose of descriptive research is to determine and report the way things are and it helps in establishing the status of the population under study. Cross sectional surveys employ qualitative or quantitative data. This combination that is known as triangulation is the means of having superior predictions based on both data sets. Triangulation in this research was therefore useful not only as a means to seek corroboration but also helped expand the understanding of phenomena. This design was chosen for this study due to its ability to ensure minimization of bias and maximization of reliability of evidence collected.

3.3 Target Population

The target population in this study were 200 individuals working in the 5 public (government) hospitals in Nairobi county classified as category A according to NHIF accredited hospitals (appendix vi). The respondents in this study were administrators, doctors, nurses and ICT staff.

Table 3.1: Target Population

Target Groups	**Total**
Administrators	35
Doctors	32
Nurses	108
ICT staff	25
Total	**200**

3.4 Sample Size and Sampling Procedure

This involves the method of selecting respondents to be representative of a whole population.

3.4.1 Sample Size

The target population for this study were 200 respondents. Sample size determination for programs studied followed procedure determined by Krejcie and Morgan (1970). As indicated from this table, a population of 200 respondents corresponded to a sample size of 127. Therefore 127 respondents were sampled for this study. The determination of sample size was important to the researcher since it was useful to bringing out credible representation of the population

Table 3:2: Sampling Size

Group	Target Population	Sample Size
Administrators	35	22
Doctors	32	20
Nurses	108	69
ICT staff	25	16
Total	**200**	**127**

3.4.2 Sampling Procedure

Sampling is the selection of some part of totality on the basis of which a judgement or inference about the totality is made (Kothari, 2005). It is the process of obtaining information about an entire population by examining only a part of it because it is not plausible to obtain information from the whole universe to accurately accomplish study objectives.

Both stratified sampling and simple random sampling were used for this study. Every spectrum therefore constituted a stratum. Members within strata were picked randomly. These sampling methodologies were deemed appropriate to represent the target population and to provide the same results at the lowest possible cost and time. Within each stratum, a simple random sampling to derive study respondents was undertaken. This process was done to ensure that each member in strata had an equal opportunity of being selected.

3.5 Research Instruments

This study utilized a questionnaire as a tool for data collection. The questionnaire contained six sections containing structured and unstructured questions which involved use of close and open-ended questions. Section A captured questions on demographic characteristics of respondents; Section B had questions on resource availability. Section C of the questionnaire captured questions on accessibility to network, while section D contained questions on staff educational levels. Section E captured questions on capacity building. Lastly, section F entailed questions on adoption of (EMR) electronic medical records technology in public health institutions. For closed-ended questions, a five-point Likert scale were used with meanings as shown: (1) Strongly Agree (SA), (2) Agree (A), (3) Uncertain (U) (4) Disagree (DA) and (5) Strongly Disagree (SD). The strongly agreed responses were scored at 5 for direct positive responses while those of strongly disagreed responses were scored at 1.

3.5.1 Pilot Testing

The questionnaire was pre-tested first to make appropriate modifications before embarking on the main study. This was carried out two weeks prior to the main study. Pilot testing shall entail picking 10 respondents and administering the questionnaire to them to help determine its mechanics and point out any problems with test instructions, instances where items are not clear, help format the questionnaire and remove any noted typographical errors or inconsistencies (Mugenda & Mugenda, 2003). During piloting, the study familiarized itself with the respondents. Due diligence was taken to ensure that the questions asked in the questionnaires were not too lengthy or so worded that would make respondents unable to follow them. Information from the pilot study was cross checked to establish deficiencies. Corrections and modifications were therefore undertaken to correct any anomalies noted on the instrument before it was administered.

3.5.2 Validity of Research Instrument

Validity is the accuracy and meaning of inferences which are based on the research results (Patton, 2002). Validity of the research instruments was determined through content and construct validity. Content related validity is ideal for this study since it is consistent with the objectives of the study.

Kothari (2002) argued that constructs are abstractions that are deliberately created by researchers in order to conceptualize the latent variable, which is the cause of scores on a given measure. Research supervisor from Department of Extra Mural Studies scrutinized and checked whether research questionnaire measured what they are supposed to measure. Amendments done by research supervisor on the research instrument were made prior to field study

3.5.3 Reliability of Research Instrument

To measure the reliability coefficient of the research instrument, Cronbach's Alpha reliability coefficient was obtained for all the variables in the study. Cronbach's alpha coefficient is like probability and therefore ranges between zero and one. A coefficient of zero implies that the instrument had no internal consistency while that of one implied a complete internal consistency. Donald and Delno (2006), Creswell (1994) indicated that a reliable research instrument should have a composite Cronbach Alpha Reliability coefficient of at least 0.7 for all items under study. If the composite reliability coefficient is less than 0.7, then the instrument will have to be revised before administration. Larry (2013) observed that Cronbach coefficient is used to test internal consistencies of samples of a given population with research instruments having Likert scales with multiple responses. Cronbach Alpha coefficient has been viewed by scholars as an improvement of Kuder-Richardson Formula 20 (KR-20) which is an equivalent measure of dichotomous test items. The study obtained a reliability index of 0.723 for the research questionnaire making it to be reliable.

3.6 Data Collection Procedure

To implement the general objectives plans of a research study, methods of data collection must always be used. Kerlinger, (1978) further says that problems dictate methods to a considerate extent, but methods, their availability, feasibility and relevance influenced problems. After successfully defending the proposal the research clearance was obtained from Department of Extra Mural Studies. This enabled the study to seek permission from National Commission for Science, Technology and Innovation (NACOSTI). Thereafter, the researcher sought approval from the hospitals to conduct research in their institutions. Thereafter, respondents consent to participate

in the research was sought prior to administration of questionnaires. The respondents were given three days to fill and then the researcher came and collected them.

3.7 Data Analysis Techniques

Data analysis was done following the four phases normally used in research, these include: data clean up, reduction, differentiation and explanation. Data clean up involved editing, coding and tabulation in order to detect anomalies. Data was then keyed using (SPSS) version 20.0 with appropriate codes and variable specifications and counter-checked for possible erroneous entries.

Data were then analyzed based on the themes of research objectives. The specific effects of independent variables vis-à-vis dependent variable were tested through multivariate analysis. The test of hypotheses to determine the level of significance of an independent variable against the dependent variable were tested through multiple regression analysis and correlation. The significance level was set at probability $p< 0.05$ for every statistical set. For the parametric data, Pearson's product Moment Correlation Coefficient (r) and regression R^2 analysis was used. Pearson Product Moment Correlation is a measure of correlation between two variables (Huber, 2004). The influence of moderating variable on the relationship between the independent and dependent variables were derived by using Regression R^2. This regression model involves mathematical modelling, as postulated by Larry (2013) that such models are used where variables are deliberately chosen without necessarily being backed by theory. Since the influence on the moderating variable was deliberate for this study, then the requirement for the use of Regression R^2 to analyze parametric data is justified

3.8 Ethical Considerations

Ethics has been defined as that branch of philosophy which deals with one's conduct and serves as a guide to one's behaviour (Mugenda & Mugenda, 2003). The researcher shall obtain a research permit from the National Commission of Science, Technology and Innovation and wrote an introductory letter to respondents informing them that the research is purely for academic purposes. The purpose of the study was explained to the participants so that they could make their own informed choices.

Volunteer participation was clearly explained to the participants before they sign in their consent forms.

Participants had the freedom to withdraw from the study at any stage. The study promised full disclosure of the findings of the study to the participants. Additionally, the study guaranteed confidentiality and anonymity to the participants. Finally, since the respondents were aware of the cultural norms of my study arena, the study made sure that words and language that seemed sensitive to religion, disability, marriage status or tribe were avoided.

3.9 Operationalization of variables

Operational definition of study variables is as shown on Table 3.2 below:

Table 3.3: Operationalization of Variables

Research Objectives	Indicators	Measurement Scale	Analysis Tool
Independent Variables			
Resource availability and adoption of (EMR) electronic medical records technology in public health institutions	No of hospital staff No of hospital equipment Amount of funding received Amount of revenue generated	Ordinal	Correlation Regression
Accessibility to network and adoption of (EMR) electronic medical records technology in public health institutions	No of service providers Internet speeds Availability of WAN Availability of LAN	Ordinal	Correlation Regression
Staff educational levels and adoption of (EMR) electronic medical records technology in public health institutions	No of Staff with university degrees No of technical staff No of doctors	Ordinal	Correlation Regression
Capacity building and adoption of (EMR) electronic medical records technology in public health institutions	No of outreaches held No of public forums held No of sensitizations done No of trainings done	Ordinal	Correlation Regression
Dependent Variables			
	No of transactions held No of departments linked % reduction in paper work Increase in digital traffic Increase in staff productivity No of EMR trainings held	Ordinal Nominal	Correlation Regression

CHAPTER FOUR
DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents the findings of the study collected from public health institutions in Nairobi, Kenya on factors influencing the adoption of electronic medical records technology. The data for this study was collected through questionnaires from employee working in public health facilities.

4.2 Questionnaire Response Rate

The following table 4.1 shows the response rate for the study

Table 4.1 Questionnaire Response Rate

Respondents	Sample Size	Response Rate
Administrators	22	16
Doctors	20	14
Nurses	69	49
ICT staff	16	12
Total	**127**	**91**

This study targeted a sample size of 127 respondents out of which 91 filled in and returned the questionnaires, making a total response rate of 71.65% as shown on table 4.1 which was considered adequate considering that majority of health workers are always busy at their workstations and therefore have minimal time to answer research questions. The analysis of data collected was done using descriptive and inferential statistics.

4.3 Demographic Characteristics of Respondents

The study asked the respondents to indicate their background characteristics based on the position they held at the hospital, gender, highest education level, age bracket and working experience. The summary of their responses are given in Table 4.2.

Table 4.2 Background characteristics of respondents

		Frequency	Percent
Position in the health facility	Doctor	24	26.3
	Administrators	17	18.7
	Nurse	40	44.0
	ICT Staff	10	11.0
	Total	**91**	**100.0**
Gender	Male	30	33.0
	Female	61	67.0
	Total	**91**	**100.0**
Highest education level	Certificate	12	13.2
	Diploma	47	51.6
	Degree	21	23.1
	Masters	11	12.1
	Total	**91**	**100.0**
Age bracket	20-25 years	19	20.9
	26-30 years	30	33.0
	31-35 years	22	24.2
	36-40 years	10	11.0
	41 years and above	10	11.0
	Total	**91**	**100.0**

Findings in Table 4.2 reveals that doctors, administrators, ICT staff and nurses participated in the research study. With regard to their gender profiles, most 61 (67.0 %) were females while 30 (33.0) were male. This implied that majority of health workers in public institutions are female as opposed to male. Results on their highest level of education revealed that 47 (51.6%) were diploma holders, 21 (23.1%) were degree holders, 11 (12.1%) were masters holders and only 12 (13.2%) reported that they were certificate holders.

Distribution of age bracket showed that 30 (33.0%) were aged 26-30 years, 22 (24.2) were 31-35 years, 19 (20.9%) were 20-25 years, 10 (11.0%) were 36-40 years and 10 (11.0%) were 41 years and above. The working experience statistics showed that

some had worked for three months to 29 years with an average working experience of 6 years. This showed that most of them tended to have understanding on the adoption of electronic medical records technology in public health institutions in Kenya.

4.4 Resource Availability Influence on the Adoption of EMR Technology in Public Health Institutions in Nairobi County

The first objective of the study was to determine the degree to which resource availability influenced the adoption of EMR technology in public health institutions in Nairobi County. Firstly, the respondents were asked to state on the adequacy of staff working at their institutions. Their responses are given in Table 4.3.

Table 4.3 Adequacy of Staff Working in Public Health Institutions

Adequacy	Frequency	Percent
Very low	10	11.0
Low	16	17.6
Fair / average	44	48.4
High	21	23.1
Total	**91**	**100.0**

From the responses 44 (48.4%) said that the staff adequacy was fair in their health facilities, 21 (23.1%) indicated that it was high, 16 (17.6%) said that it low and 10 (11.0%) said that it was very low. Since the study was concerned on determining the resource availability, the respondents were asked to state the adequacy of institutional facilities required for better health care services. Their responses are illustrated in Table 4.3.

Table 4.4 Adequacy of Institutional Facilities Required for Better Healthcare services

Adequacy	Frequency	Percent
Inadequate	17	18.7
Slightly inadequate	31	34.1
Moderately enough	28	30.8
Enough	10	11.0
More than enough	5	5.5
Total	**91**	**100.0**

Results show that 17 (18.7%) said that their facilities were inadequate, 31 (34.1%) said that they were slightly inadequate, 28 (30.8%) indicated that they were moderately enough and only 15 (16.5%) said that the facilities in their institutions are enough. This shows that more than 52.8% of public health facilities in Nairobi County have inadequate facilities thereby affecting quality health service delivery. The unavailability of facilities could be linked to the funding agency. Therefore, the respondents were asked to state the sources of funding for their health institutions. Their responses are illustrated in Table 4.5.

Table 4.5 Sources of Funding for Health Institutions

Sources	Frequency	Percent
Patient fees	7	7.7
Government	32	35.2
Patient fees and county government	11	12.1
Insurers, government and patient fees	16	17.6
Cost sharing (among different parties)	10	11.0
Government and charities (NGOs)	15	16.5
Total	**91**	**100.0**

It is seen that various public health facilities receive monetary and resource support from government, patient fees, insurers, and charity organisations. For charities organisation, they mainly funded health facilities that were located in informal settlement but the county and national government funding was the key source

enhancing operations in most public health institutions. With regard to adequacy of funding, only 39 (42.9%) said that the money they received was adequate while 52 (57.1%) said that the funding was not adequate to run hospital operations.

This could be one of the challenges that public health facilities are facing towards provision of better healthcare services. Moreover, the respondents were asked to state their perceptions on the degree to which resource availability in their health facilities influenced adoption of EMR technology. Their responses ranged from 1-Strongly disagree to 5-Strongly Agree. The results are presented in Table 4.6.

Table 4.6 Descriptive Statistics on Influence of Resource Availability on Adoption of EMR Technology

Perceptions	N	Mean	Std. Deviation
Lack of technical personnel to install and operate EMR technology resources is an impediment to its adoption	91	3.2527	1.41102
Cost of EMR resources and facilities purchase is the greatest barrier to its adoption	91	2.9780	1.37419
Lack of adequate infrastructure affects the hospital adoption of EMR	91	2.7802	1.51145
Maintenance costs of EMR technology facilities hinder its adoption and utilisation in our institution	91	2.7033	1.26046
Inadequate sources of funding inhibit EMR technology adoption in our organisation	91	2.4396	1.08739
Valid N (Listwise)	**91**	**2.8308**	**1.32890**

The descriptive statistics results show that the respondents seemed to have divided opinion (M=2.83; SD=1.32) on the influence of resource availability on adoption of EMR technology in public health institutions. The standard deviation scores are more than one suggesting that resource availability in some health facilities influence EMR technology usage while in others it does not. However, the respondents ranked high (M=3.25; SD=1.41) that lack of personnel to install and operate EMR technology applications was a challenge. This shows that a significant number of health facilities

fail to use EMR technology for lack of expertise knowledge on how to operate them among their employees.

Secondly, the respondents also said that in some cases (M=2.97; SD=1.37), cost of EMR technology was a barrier while some said it was not. This could be explained with the fact that hospitals rely on government funding which is usually delayed and this affect acquisition, repair and maintenance of EMR facilities. Thirdly, they also seemed to be undivided (M=2.78; SD=1.51) that lack of infrastructure affects the hospital adoption of EMR technology. They also tended to be undecided (M=2.70; SD=1.26) on the statement that EMR technology facilities hinder its adoption and utilisation in our institution. Lastly, the respondents disagreed (M=2.43 and SD=1.08) that inadequate sources of funding inhibit EMR technology adoption.

The first hypothesis stated that:

H_1:1 There is a significant relationship between resource availability and adoption of electronic medical records technology in public Health institutions in Nairobi County.

To test the hypothesis, scores for resource availability were correlated against scores for electronic medical records utilisation at 0.05 significant level. The results are presented in Table 4.7.

Table 4.7 Test of Hypothesis 1

		RA	**EMR**
RA	Pearson Correlation	1	.314**
	Sig. (2-tailed)		.002
	N	91	91
EMR	Pearson Correlation	.314**	1
	Sig. (2-tailed)	.002	
	N	91	91

**. Correlation is significant at the 0.01 level (2-tailed).

Key: RA-Resource Availability and EMR-Electronic Medical Records

The first hypothesis is accepted (p>0.05) leading to the conclusion that there exist significant positive relationship between resource availability and adoption of

electronic medical records technology in public health institutions in Nairobi County, Kenya.

4.5 Accessibility to Network Infrastructure Influence on Adoption of EMR Technology in Public Health Institutions in Nairobi County

This was the second objective of the study that sought to determine the influence of accessibility to network infrastructure on adoption of EMR technology in government owned health facilities. EMR technology cannot function when network and internet connection are not provided. Therefore, the respondents were asked to indicate how many internet providers their facilities had. Their responses are given in Table 4.8.

Table 4.8 Internet Services Providers (ISP) in Health Public Institutions

Number	Frequency	Percent
One	20	22.0
Two	12	13.2
Three	10	11.0
Four and above	6	6.6
Do not know	43	47.3
Total	**91**	**100.0**

Most 43 (47.3%) of the respondents were not sure the number of internet service providers their institutions had, 20 (22.0%) mentioned they had one, 12 (13.2%) had two, 10 (11.0%) had three while 6 (6.6%) had more than four ISPs. They were asked to indicate the speed through which they accessed information from their hospital database or other sections within their hospital. The results are given Table 4.9.

Table 4.9 Speed of Accessing Information from Hospital Database

Speed	Frequency	Percent
Very slow	5	5.5
Slow	25	27.5
Moderate	32	35.2
High	24	26.4
Very high	5	5.5
Total	**91**	**100.0**

According to 32 (35.2%) of respondents, the speed of accessing information are usually moderate, 25 (27.5%) said that it is low, 24 (26.45) said that it is high, 5 (5.5%) said it was very high and 5 (5.55) said that is very slow. From the findings, it is evident that the speed of accessing hospital database is moderate. This points that connectivity issues still persist in most government health facilities. When asked to indicate the consistency rate of internet connection (bandwidth) in their health facilities, 35 (38.5%) said it is occasionally high, 35 (38.5%) said it is sometimes high, 16 (17.6%) said it is always high and 5 (5.5%) said that it is rarely high.

Moreover, the respondents were asked to indicate the degree to which network accessibility influence adoption of EMR technology in health facilities through several statements measured on a five point Likert scale; 1-Strongly Disagree to Strongly Agree-5. The results are given in Table 4.10.

Table 4.10 Respondents Perception on Influence of Network Accessibility on Adoption of EMR

Perception	N	Mean	Std. Deviation
Security issues, including confidentiality, integrity and availability, are the major concerns in EMR adoption at our facility	91	2.9780	.95427
Legal concept such as security and privacy concerns affect the implementation of EMR	91	2.9121	.92674
Inadequate Internet bandwidth is a notable challenge to adopt of EMR	91	2.7473	1.16040
Lack of EMR software packages hinders adoption in health facilities	91	2.6923	1.26221
Poor communication between various players affect the adoption of EMR	91	2.1209	1.11390
Valid N (Listwise)	**91**	**2.6901**	**1.08350**

Composite scores shows that respondents remained neutral (M=2.69; SD=1.08) on the contribution of network access on adoption of EMR technology. EMR system cannot fully function without network access. The network involves inter-linkage of

computers to the main servers and providing internet services to different workstations. Since respondents tended to agree that network access and internet connection was on average, it is seen that it has average degree of influence on adoption of EMR technology. Findings made on the table above shows that respondents ranked security issues (confidentiality, integrity and availability) was the major concern in EMR adoption in public health facilities in Nairobi Kenya. This is due to the fact that without proper protection, unauthorized person can hack and access organizations database thereby putting patients and financial records of the health facilities at risk.

The second ranked item was the legal concept (M=2.91; SD=0.92) due to security and privacy concerns affected EMR implementation. This is due to the fact that the introduction and implementation of policies on technology usage has not been done in Kenya. There are many legal loopholes that put majority of ICT users at risk. Thirdly, the respondents were unsure (M=2.74; SD=1.16) that inadequate bandwidth was a notable challenge to the adoption and use of EMR technology. The higher standard deviation values suggest that some respondents agreed while others disagreed with the statement. Respondents had earlier stated that the internet connection reliability was moderate. Results further revealed that to some respondents, they remained undecided (M=2.69; SD=1.26) that lack of EMR software packages hindered its adoption in health facilities. However, the respondents totally disagreed (M=2.12; SD=1.11) that poor communication between various players affected the adoption of EMR technology.

The second hypothesis stated that:

H_1:2 There is a significant relationship between accessibility to network infrastructure and the adoption of electronic medical records technology in public Health institutions in Nairobi County

To confirm whether the hypothesis was true or false, a correlation analysis was computed at 0.05 significance level. The results are presented in Table 4.11.

Table 4.11 Test of Hypothesis 2

		AN	EMR
AN	Pearson Correlation	1	.045
	Sig. (2-tailed)		.673
	N	91	91
EMR	Pearson Correlation	.045	1
	Sig. (2-tailed)	.673	
	N	91	91

Key: AN-Access to Network and EMR-Electronic Medical Records

At 0.05 significance level, the second hypothesis is rejected (p>0.05). This led to the conclusion that there is no significant relationship between accessibility to network infrastructure and adoption of electronic medical records technology in public health institutions in Nairobi County.

4.6 Capacity Building Influence on Adoption of EMR technology in Public Health Institutions in Nairobi County

The third objective was to determine the influence of capacity building approaches on the adoption of EMR technology in Nairobi county hospitals. To ascertain this, the respondents were asked to state the frequency to which various capacity building programmes and support services were provided during adoption, implementation and usage of EMR technology on the following scale; never (1), rarely (2), sometimes (3), often (4) and always (5). The results are given Table 4.12.

Table 4.12 Capacity Building Influence on the Adoption of EMR Technology in Health Institutions

Statement	N	Mean	Std. Deviation
Management commitment to EMR implementation	91	3.0769	1.13755
Follow up by EMR vendors on the usage of the resources and facilities	91	2.9560	.91787
Training for hospital staff on EMR usage & operations	91	2.7363	1.04174
Awareness forums on EMR adoption	91	2.4505	.90999
Outreach programmes for EMR	91	2.2967	1.01647
Valid N (Listwise)	**91**	**2.7033**	**1.00472**

The results show that the respondents also remained undecided (M=2.70; SD=1.01) on the influence of capacity building programmes on the adoption and use of EMR technology in public health facilities in Nairobi. This showed that capacity building programmes on installation and usage of EMR were occasionally or sometimes provided to health workers. Despite that, the respondents ranked management commitment to EMR implementation (M=3.07; SD=1.13) was sometimes an obstacle to its full adoption. This shows that some employees felt that some of their senior directors were not committed to ensure the usage of EMR while others supported it although it was not always.

Secondly, the respondents said that follow up by EMR vendors on the usage of resources and facilities was occasionally (M=2.95; SD=0.92) done in their organisation. The lack of regular follow up on the progress of EMR usage by its suppliers hindered its effective utilisation in public health facilities. It was also revealed that training for hospital staff on EMR usage and operations was occasionally provided for (M=2.73; SD=1.04). This could be as a result of non-commitment by management and members of staff to work with EMR technological equipments. However the respondents tended to agree that awareness forums (M=2.45; SD=0.9) were rarely provided to members of staff on how to operate and use EMR system. In addition, they also said that outreach programmes for EMR were rarely provided in their health institutions (M=2.29; SD=1.01).

The third hypothesis stated that:

H_1:3 There is a significant relationship between capacity building and the adoption of electronic medical records technology in public Health institutions in Nairobi County

A bivariate correlation was computed at 0.05 significance level involving variables for capacity building (CB) against rate of electronic medical records utilisation (EMR). The results are given in Table 4.13.

Table 4.13 Test of Hypothesis 3

		CB	EMR
CB	Pearson Correlation	1	.541*
	Sig. (2-tailed)		.000
	N	91	91
EMR	Pearson Correlation	.541*	1
	Sig. (2-tailed)	.000	
	N	91	91

*. Correlation is significant at the 0.05 level (2-tailed).

Key: CB=Capacity building and EMR-Electronic Medical Records

Results show the third hypothesis is accepted ($p<0.05$) leading to the conclusion that there exist significant positive relationship between capacity building and the adoption of electronic medical records technology in public health institutions in Nairobi County.

4.7 Staff Level of Education Influence the Adoption of EMR in Public Health Institutions in Nairobi County

EMR technology adoption requires that its users and operators possess required competencies to ensure their effective operations in improving health care services. Therefore, the fourth research questions sought to find out if staff level of education influenced the adoption of EMR technology in health institutions in Nairobi County. So, the respondents were asked about their computer literacy level. Their responses are given in Table 4.14.

Table 4.14 Respondents computer proficiency level

	Frequency	Percent
Low	5	5.5
Average /Moderate	32	35.2
High	38	41.8
Very high	16	17.6
Total	**91**	**100.0**

A significant 38 (41.8%) of respondents said that their computer proficiency level was high, 32 (35.25) said that it was moderate, 16 (17.6%) was high and 5 (5.5%) said that their proficiency level was low. This therefore shows that majority (more than 50%) of employees had at least computer literacy knowledge and this was an added advantage towards the utilisation of EMR technology in health operations. When asked to indicate the competency of technical staff in operation of EMR systems, most 66 (72.5%) said that the number was moderate, 20 (22.0%) said the number in their facilities was higher and 5 (5.5%) said the competency of their technical staff in handling EMR technology was low. This implies that majority of health facilities in the cities have number of technical personnel able to operate and maintain EMR systems. On their part, they were asked to indicate their understanding on working using EMR system. Their responses are given in Table 4.15.

Table 4.15 Level of Respondents Understanding on Working under EMR system

	Frequency	**Percent**
Low	5	5.5
Moderate	44	48.4
High	32	35.2
Very high	10	11.0
Total	**91**	**100.0**

Close to half 44 (48.4%) said that they have a moderate understanding on working under EMR system, 33 (35.4%) said they had higher understanding, 10 (11.0%) said they had very high understanding and only 5 (5.5%) reported that they had low understanding on working under an EMR system. This shows that respondents appear to have adequate understanding on how to operate and use EMR technology. With this, the respondents were further asked to indicate the frequency to which they used; email, internet, word processing, dbase management and calculations in their operations. Their responses are illustrated in Table 4.16.

Table 4.16 Descriptive Statistics

	N	Mean	Std. Deviation
Internet browsing	91	3.4835	1.17722
Calculations	91	3.0110	1.13033
Word processing application	91	2.8791	.96419
Email	91	2.4835	1.22350
Database management	91	2.3516	1.12915
Valid N (Listwise)	**91**	**2.8417**	**1.12488**

Results show that majority of respondents' occasionally utilised internet browsing in their operations. Secondly the respondents said that sometimes used the following methods in their operations; calculations (M=3.01; SD=1.13), word processing application (M=2.87; SD=0.96) and email (M=2.48; SD=1.22). However, they said that they rarely use database applications (M=2.35; SD=1.12). This shows that the employees of health institutions sometimes used ICT applications in their day to day jobs. Furthermore, the respondents were asked to indicate their level of agreement on the extent to which staff education level and competencies influenced adoption of EMR technology. The following scale was used: 5-Strongly Agree, 4-Agree, 3-Uncertain, 2-Disagree and 1-Strongly Disagree. The responses are given in Table 4.17.

Table 4.17 Respondents Perceptions on the Influence of Staff Level of Education and Competencies on Adoption of EMR

Perceptions	N	Mean	Std. Deviation
Health professionals would prefer not to use computers directly but would rather someone else do the computer-related work for them	91	3.2088	1.28683
The fear of using technology is a barrier to the adoption of EMR systems by health care professionals.	91	2.9341	1.05201
Lack of use of EMR technology hinders its usage and adoption	91	2.6044	1.06332
Lack of knowledge about EMR influence its	91	2.4176	1.07565

adoption and utilisation			
General computer competence amongst us affect our utilisation of EMR in our hospital	91	2.4176	1.07565
Valid N (Listwise)	**91**	**2.7165**	**1.11069**

Composite scores reveal that majority of respondents were undecided (M=2.71; SD=1.11) on the influence of their level of education and competencies on the adoption of EMR technology. This means that some respondents agree while others disagree with the statement on the contribution of staff education and competence on adoption of EMR. They ranked first that health professionals would prefer not to use computers directly sometimes (M=3.20 and SD=1.28) but rather look for someone else to do the computer related work for them. This shows inadequacy in the provision of change management training to employees before the introduction of EMR technology system.

Secondly they were undecided (M=2.93 and SD=1.05) on the notion that fear of using technology is a barrier to the adoption of EMR technology by health workers. Thirdly, they were also neutral (M=2.60 and SD=1.06) on the statement that lack of use of EMR technology have hindered its usage and adoption in public health facilities in Nairobi. The respondents also appeared to disagree with the statement that lack of knowledge about EMR (M=2.41 and SD=1.07) has influenced adoption and use of EMR and general computer competence (M=2.41 and SD=1.07) has affected their utilisation of EMR in public hospitals in Nairobi. The fourth hypothesis for the study stated that:

H_1:4 There is a significant relationship between staff educational levels and adoption of electronic medical records technology in public Health institutions in Nairobi County

To test the hypothesis, a correlation analysis using ordinal scores from staff education level and competency were compared with electronic medical records usage. The results of the analysis are presented in Table 4.18

Table 4.18 Test of Hypothesis 4

		SEC	EMR
SEC	Pearson Correlation	1	.116
	Sig. (2-tailed)		.275
	N	91	91
EMR	Pearson Correlation	.116	1
	Sig. (2-tailed)	.275	
	N	91	91

Key: SEC – Staff Education and Capacity and EMR-Electronic Medical Records

The fourth hypothesis is rejected ($p>0.05$) leading to the conclusion that there exist no significant relationship between staff educational level and adoption of electronic medical records in public health institutions.

4.8 Utilisation of Electronic Medical Records Technology in Health Facilities

To test the level of utilisation of EMR in public health facilities, the respondents were asked to indicate the extent to which the services related to it were conducted in their organisations as; very high (5), high (4), average (3), low (2) and very low (1). Their responses are given in Table 4.19.

Table 4.19 Utilisation of EMR Technology in Health Facilities

EMR systems use	N	Mean	Std. Deviation
Patient financial data report release	91	3.6374	.94888
Paper materials usage	91	3.5824	.83088
Transactions done using EMR daily	91	3.5495	.98052
Number of departments linked with EMR technology	91	3.4725	.95848
Medical records/images retrieval	91	3.3077	.96255
Electronic discharge summaries	91	2.9560	1.03185
Appointment and scheduling reports	91	2.9231	1.06699
Review/sign-off of inpatient observation charts	91	2.5934	.95427
Valid N (Listwise)	**91**	**3.2528**	**0.9668**

Results show that EMR technology was moderately used by public health facilities in Nairobi, Kenya (M=3.25; SD=0.96). The most commonly used EMR technology services were related to; patient financial data report release (M=3.63; SD=0.94), paper materials usage (M=3.58; SD=0.83), transactions using EMR (M=3.54; SD=0.98) and the number of departments linked with EMR technology (M=3.47; SD=0.95). Those services were highly used in the public health hospitals in the city. However, statistics reveal that the following activities related to EMR were averagely used; medical records/images retrieval (M=3.31; SD=0.96), electronic discharge summaries (M=2.95; SD=1.03), appointment and scheduling reports (M=2.92; SD=1.07) and review/sign-off of inpatient observation charts (M=2.59; SD=0.95). Therefore the study sought to determine among the four factors, which ones were responsible for adoption of EMR technology in public health facilities. A multiple linear regression analysis was computed at 0.05 significance level and the results are given in Table 4.20, 21 and 22.

Table 4.20 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.594[a]	.352	.322	.51777

a. Predictors: (Constant), CB, SEC, RA, AN

Key: CB-Capacity building, SEC-Staff Education and Competencies, RA-Resource Availability and AN-Access to Network

The model summary shows that the correlation coefficient for the four predictors is average (R=0.594) which suggest that there exist an average degree of relationship between the predictors and indicators. Moreover, the adjusted R square is 0.322 which suggests that 32.2% of variation in EMR technology adoption and usage is explained by the four independent variables studied. To check the linearity of the quotation, an ANOVA goodness of fit test was computed. The results are given in Table 4.21.

Table 4.21 ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.549	4	3.137	11.703	.000[a]
	Residual	23.055	86	.268		
	Total	35.604	90			

a. Predictors: (Constant), CB, SEC, RA, AN

b. Dependent Variable: EMR

Key: CB-Capacity building, SEC-Staff Education and Competencies, RA-Resource Availability, AN-Access to Network and EMR – Electronic Medical Records.

The ANOVA statistics that there exist a significant regression equation, F (4, 86) =11.703, $p<0.05$. This implies that there is likely a linear relationship between EMR and factors influencing its adoption and usage in public health facilities. This means that at least one of the population partial regression coefficients of the predictors is not 0 and the population value for the multiple R squared is no. the coefficients of the analysis are given in Table 4.22.

Table 4.22 Coefficients[a]

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**95.0% Confidence Interval for B**	
		B	**Std. Error**	**Beta**			**Lower Bound**	**Upper Bound**
1	(Constant)	2.314	.300		7.713	.000	1.718	2.911
	RA	.156	.069	.220	2.255	.027	.018	.293
	AN	-.017	.083	-.024	-.208	.836	-.183	.148
	SEC	-.152	.105	-.158	-1.448	.151	-.361	.057
	CB	.342	.063	.492	5.446	.000	.217	.467

a. Dependent Variable: EMR

Key: CB-Capacity building, SEC-Staff Education and Competencies, RA-Resource Availability, AN-Access to Network and EMR – Electronic Medical Records.

Using the constant and β coefficients of resource availability (x_1), access to network (x_2), staff education level and competencies (x_3) and capacity building (x_4), an estimated prediction (regression) equation for the model can be written as:

$$y = 2.314 + 0.156\beta_1 + 0.017\beta_2 - 0.152\beta_3 + 0.342\beta_4$$

Two of the predictors, resource availability (β=0.156) and capacity building (β=0.342) have positive influence on the adoption of EMR technology in public health facilities in Nairobi, Kenya. However, network access (β=-0.017) and staff education level and competencies (β=-0.152) had negative coefficients. Moreover the statistics reveal that resource availability and capacity building factor had significant ($p<0.05$) effect on adoption of EMR technology in public health facilities in Nairobi.

CHAPTER FIVE
SUMMARY OF FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the findings of the study, conclusion, recommendations, suggestions and implication of the study results. These are aimed at providing answers to the main research questions and making suggestions on how various systems can be improved in adoption of EMR technology in public health facilities.

5.2 Summary of Findings

The purpose of conducting this research was to determine the factors influencing the adoption of EMR technology by public health institutions in Kenya. The respondents for the study involved doctors, nurses, ICT staff, and hospital administrators working in selected public health facilities in Nairobi Kenya. The study relied on questionnaires administered to the respondents to determine their perceptions on probable factors likely to influence the adoption of EMR in public health facilities. Data collected was analysed using descriptive and inferential statistics. Comparisons were made with previous empirical studies that were related to the study topic.

Significant findings that were established from the study on the factors influencing the adoption of electronic medical records technology in public health institutions were:
Influence of resource availability on adoption of EMR: The study established that there exists a significant positive relationship ($r=0.314$ and $p=0.002$) between resource availability and adoption of EMR in public health institutions in Nairobi county.

Influence of accessibility to network on adoption of EMR: The study established that there exists no significant relationship ($r=0.673$ and $p=0.045$) between accessibility to network access and adoption of EMR in public health facilities in Nairobi county.

Influence of capacity building on adoption of EMR: The study established that there exists a significant positive relationship ($r=0.541$ and $p=0.001$) between capacity building and adoption of EMR in public health institutions.

Influence of staff level of education on adoption of EMR: The study established that there existed no significant relationship (r=0.116 and p=0.275) between staff level of education on and adoption of EMR.

5.3 Discussion of Findings

Study results showed that the usage of EMR technology in majority of public health facilities in the cities were on average (M=3.25 and SD=0.96). the EMR systems was mostly being used to keep financial data, report results, conduct transactions, keying in patient information and linking departments and sections of hospitals together as one platform. However, it was established that EMR was sometimes used for images retrieval, medical records retrieval, electronic discharge summaries, appointment and scheduling of reports and signing off of inpatient observation charts. This finding is supported by Jha *et al.*, (2009) who found out that adoption rate of EMR in hospitals has not been very high due to costs associated with its installation. However, Sing and Muthuswamy (2014) research in India that showed that the uptake and adoption of EMR technology was high. The difference between Kenya and India could be due to prioritisation of health sector by government budget that seems to be higher in India than in developing countries including Kenya.

5.3.1 Influence of Resource Availability on Adoption of EMR

On the influence of resources on the adoption of EMR, study results showed that the government has invested a lot in providing health professionals to provide services in health facilities. However, the respondents reported that the funding they received from national government was inadequate to help them purchase, maintain and report infrastructural facilities that support EMR usage. This was reported to affect the adoption and of EMR technology. The finding contradicts Gatero (2010) who established that insufficient ICT resources limit doctors in performing online searches. The reliance on patient fees and insurers was not enough to sustain operations in the public health facilities and this was cited to be one of the factors influencing better health care services delivery.

The lack of technical expertise to install and operate EMR technology, cost of EMR technology and inadequate infrastructure were mentioned to be critical factors influencing their use in providing healthcare services to citizens. The findings

coincides with Boonstra and Broekhuis (2010) research study that showed that startup costs for EMR system in purchase of hardware and software, selecting and contracting costs and installation expenses were major hindrance towards adoption.

Randeree (2007) established that high start-up costs were a primary and major barrier to EMR adoption. In addition to the start-up costs, according to the result of the study, implementing an EMR system required extensive commitment to system administration, control, maintenance, and support in order to keep it working effectively and efficiently. These costs include the long-term expenditures incurred in monitoring, modifying, upgrading and maintaining EMRs, which will be significant. The study obtained positive coefficient (β=0.156). This therefore implied that increase in the adequate provision of resources (human, material and financial) support to public health facilities would improve the adoption and usage of EMR. Therefore the inadequacy of basic facilities needed to support EMR implementation blocks the widespread adoption of EMR in public health institutions.

5.3.2 Influence of Accessibility to Network on Adoption of EMR

Results of the study showed that more than 50% of public health facilities were connected through network (LAN and WAN). However, study results revealed that in some stations, the network access and internet connection were unreliable and fluctuated regularly. This would have significant effects on data transmission. Muchangi and Nzioka (2014) established that transmission of health information between health institutions, health institutions and patients, health institution and third parties such as insurance companies, patients and health institutions is negatively affected if telecommunication and internet penetration is low.

Study findings revealed that the respondents said that security issues related to confidentiality, integrity and availability were the major concerns in EMR adoption in their work stations. In addition legal issues pertaining to security and privacy concerns were found to influence their utilisation. The obtained coefficient result was negative (β=-0.017) which suggests that the organisations had not made much progress in ensuring connection through internet and even linkage of departments and sections within their hospitals. The findings are in agreement with OECD (2013) findings that' showed that in developing countries, high internet penetration and

bandwidth is still a challenge that is limiting the adoption of telemedicine and other internet based application.

5.3.3 Influence of Capacity Building on Adoption of EMR

The study results showed that capacity building and creation of awareness of staff on the benefits of adoption of EMR technology in health facilities was crucial. A certain level of computer skills by both suppliers and users is required. Most of the respondents indicated that they were aware on EMR technology utilisation. The findings is inconsistent with Senamu and Ochiotu (2014) study from Nigeria that showed that there was no awareness of the use of computers for record management in hospitals and this affected EMR technology adoption. Moreover, the respondents perceived that management commitment to EMR implementation; follow up by EMR vendors and training for health facilities staff on EMR technology usage was crucial for their function in hospitals.

Coefficient results showed that among the four independent predictors studied, capacity building had significant positive effect (β=0.342, t=5.446 and p=0.001) on the adoption and utilisation of EMR technology in public health facilities. Research results further revealed that continuous training of employees on change management was crucial to employees' compliance and attitude change on systems use. This is because people who are asked to use the new technology of an EMR will also need to be trained and supported to do so; if they are not, the system will fail. The training need to individualised to respond to varied learning styles and clinical schedules; for example, a person's qualifications, past computer experiences and computer skills may serve as barriers or facilitators to technology use, so training should respond to these capabilities. Randeree (2007) emphasised that when people become customised to new systems, they would adopt EMR in hospitals. Randeree suggested the vendors to continuously provide support programmes to health workers on EMR use.

5.3.4 Influence of Staff Level of Education on Adoption of EMR

User acceptance is one of the key factors for success in EMR implementation. Study findings revealed that more than half 59.4% of respondents reported that they were proficient in the use of computers. This is because one of the requirements of using EMR is to be able to use and work with computers nowadays. The system combines

both medical and administrative tasks under one common platform. Therefore, staff or health workers have to possess required competencies to work with the systems. Both English literacy and education levels were significantly correlated with computer literacy and EMR literacy.

Statistics computed revealed that staff education and competencies had negative coefficient (β=-0.152) on the adoption of EMR technology. This was because, the respondents reported that majority of staff preferred not to use computers directly but would rather use somebody else do the EMR related work on their behalf. Also, they mentioned that fear of using technology was also a barrier to the adoption of EMR system in public health facilities. The result corresponds with Omary *et al.,* (2010) who found out that lack of computer skills amongst the clinicians affected EMR adoption. However, findings are different from what Hasanain *et al.,* (2015) established in Saudi Arabia that both English literacy and education levels were significantly correlated with computer literacy and EMR literacy.

5.4 Conclusions

The study has established that the obtained regression coefficient was R=0.563 which suggests that there exist an average degree of relationship between the four factors studied; resource availability, network access, staff education level and competencies and capacity building on adoption and use of EMR technology in health facilities in Nairobi County. The projects initiated by county government and other stakeholders had improved the delivery of health care services to the benefit of patients. The adjusted R square was 0.285 which indicated that at least 32.2% of adoption of EMR technology systems in Nairobi county health facilities was related to the four predictors.

Two hypothesis were accepted on resource availability and capacity building while the hypothesis on network access and staff education level were rejected. The study results showed that for the EMR technology to be fully used, there is need for more personnel to be employed, health facilities should be adequately funded, infrastructure facilities need to be upgraded and regular training and awareness is needed to ensure that employees accepts the change. Capacity building and access to infrastructure had

positive beta coefficients while resource availability and staff level of education had negative beta coefficient.

5.5 Recommendations

Generally, the findings from this study have raised a range of issues which need to be considered by various stakeholders in the health sector; suppliers, government and even employees. Therefore, the following recommendations are made for policy and practice.

1. To improve on resource availability in public health institutions, there is need for government to provide monetary and human resource support to supplement the existing ones. This will ensure that funds are available for purchase of required resources and technical personnel available to ensure the EMR system is fully utilised.
2. To improve on network access, there is need for the public health institutions to source competitively for firms that assure uninterruptible network supply during procurement process. This will ensure that one can readily access or key in any medical information without delays or slowness.
3. To address employee competencies in usage of EMR technology, the researcher suggests that there is need for government to support health workers to undergo training on EMR usage. This should improve their competencies and therefore minimise situations where some other people worked on their behalf and who could compromise health information data in some situation.
4. To improve on capacity building activities, there is need for EMR technology suppliers to constantly retrain health workers on the changes and operational procedures of the system. This ensures that majority of employees are able to work with minimal challenges.

5.6 Suggestions for Future Research

From the findings of this study the researcher suggests future research to be done on the following areas:

1. The same study can be extended to cover all public health facilities in the country (Kenya)
2. Influence of government policy on adoption and use of EMR technology

3. A comparative study on the same title and variables can be conducted between public, private and mission (charity) funded institutions in Nairobi Kenya.

5.7 Contributions to the Body of Knowledge

The following table explains the contribution of knowledge generated from this study to the body of knowledge.

Table 5.1 Contributions to the Body of Knowledge

Objective	Contribution
Resource availability influence on the adoption of EMR technology	Material and human resource provision are critical to utilisation of EMR technology. They all need to be considered before installation of EMR machines
Accessibility to network infrastructure influences on the adoption of EMR technology	Network provision that is reliable and dependent throughout is key to the effective utilisation of EMR. Hospitals have a responsibility of looking out for an effective network service provider.
Capacity building influence on the adoption of EMR technology	Regular employee know-how to operate and maintain EMR technology is important.
Staff level of education influence on the adoption of EMR technology	Medical institutions staff needs to be conversant on how to operate EMR systems as it will improve on their work rate and reliability in providing effective health services.

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APPENDICES

APPENDIX I: LETTER OF TRANSMITTAL

Monica Chepkwony,
P.O Box 68273-00200
Nairobi,
7th Sep, 2015

Dear Respondent,

RE: FACTORS INFLUENCING THE ADOPTION OF ELECTRONIC MEDICAL RECORDS TECHNOLOGY IN PUBLIC HEALTH INSTITUTIONS IN KENYA: A CASE OF HOSPITALS IN NAIROBI COUNTY

I am a Master of Arts in Project Planning and Management student at the University of Nairobi currently conducting a research study entitled as above.

You have been selected as one of the respondents to assist in providing the requisite data and information for this research. I kindly request you to spare a few minutes and answer the attached questionnaire. The information you shall give will be used for academic purposes only, will be treated with utmost confidentiality and will not be shared with anyone whatsoever. Do not write your name anywhere on the questionnaire.

On this basis I request you to respond to all questions with utmost honesty.

Thank you for your participation and effort in completing the questionnaire.

Yours Sincerely,

Monica Chepkwony
University of Nairobi
Department of Extra Mural Studies

APPENDIX II: QUESTIONNAIRE

This questionnaire is designed to gather research information regarding factors influencing the adoption of electronic medical records technology in public health institutions in Kenya: a case of hospitals in Nairobi County. The questionnaire has six sections. For each section, kindly respond to all items using a tick [ ] or filling in the blanks where appropriate.

SECTION A: DEMOGRAPHIC CHARACTERISTICS

1. Your position in this health facility

Doctor [ ] Hospital administrator [ ] Hospital IT staff [ ]

Clinician [ ] Nurse [ ] Any other _____

2. Your gender

Male [ ] Female [ ]

3. What is your level of formal education?

Certificate **[ ]** Diploma **[ ]** Degree **[ ]**

Master's Degree **[ ]** PhD**[ ]**

4. Specify your age bracket

Below 20 [ ] 20-25 yrs. [ ] 26-30 yrs. [ ]

31-35 yrs. [ ] 36-40 yrs. [ ] 41 years and above [ ]

5. How long have you worked here in this facility? _____

SECTION B: RESOURCE AVAILABILITY

6. What can you say on the adequacy of staff working in your institution?

Very High [ ] High [ ] Fair [ ] Low [ ] Very low [ ]

7. What about the adequacy of institutional facilities required for better health care services

More than Enough [ ] Enough [ ] Moderately Enough [ ]

Slightly inadequate [ ] Inadequate [ ]

8. What are the sources of funding for your health institution? (Tick more than one if applicable)

Patients fees [ ] Government [ ]

Insurers (NHIF Included) [ ] NGOs [ ] Charities [ ]

Any other (Specify) _____

9. Is funding received adequate to provide healthcare services as per the standards?

Always adequate [ ] Sometimes adequate [ ] Inadequate [ ]

Always inadequate [ ]

10. To what extent do you agree on the following statements regarding the influence of resource availability on adoption of electronic medical records (EMR) technology at your health facility? Scale: (1) Strongly agree (SA), (2) agree (A), (3) uncertain (4) Disagree (DA) and (5) Strongly Disagree (SD).

	Factor	**1**	**2**	**3**	**4**	**5**
1	Lack of adequate infrastructure affects the hospital adoption of EMR					
2	Cost of EMR resources and facilities purchase is the greatest barrier to its adoption					
3	Lack of technical personnel to install and operate EMR technology resources is an impediment to its adoption					
4	Maintenance costs of EMR technology facilities hinder its adoption and utilisation in our institution					
5	Inadequate sources of funding inhibit EMR technology adoption in our organisation					

Any other comments about resource availability?----------

SECTION C: ACCESSIBILITY TO NETWORK

11. How many internet services providers (ISP) does your organisation has contract with? E.g. Safaricom, I Way Africa, Jamii Telkom, Orange, KDN, Access Kenya among others?

One [ ] Two [ ] Three [ ] 4 and Above [ ]

Do not know [ ]

12. What can you say on the speed through which you can access information from your hospital database or other sections within your hospital?

Very high [ ] High [ ] Moderate [ ] Slow [ ] Very slow [ ]

13. What is the consistency rate of internet connection (bandwidth) at your hospital?

Always high [ ] Occasionally high [ ] Sometimes high [ ]

Rarely high [ ] Never high [ ]

14. What can you say on the operations of wide area network (WAN) and local area network (LAN) when operating within and outside your institution?

Always reliable [ ] Occasionally reliable [ ] Sometimes reliable [ ]

Rarely reliable [ ] Unreliable [ ]

15. To what extent you agree with the following statements on the influence of network accessibility towards adoption of EMR technology at your health facility. Use the key: (1) Strongly agree (SA), (2) agree (A), (3) uncertain (4) Disagree (DA) and (5) Strongly Disagree (SD).

	Factor	**1**	**2**	**3**	**4**	**5**
1	Inadequate Internet bandwidth is a notable challenge to adopt of EMR					
2	Legal concept such as security and privacy concerns affect the implementation of EMR					
3	Security issues, including confidentiality, integrity and availability, are the major concerns in EMR adoption at our facility					
4	Poor communication between various players affect the adoption of EMR					
5	Lack of EMR software packages hinders adoption in health facilities					

Any other comments about accessibility to network?----------

SECTION D: STAFF EDUCATIONAL LEVELS

16. What can you say on your computer literacy level?

Very High [ ] High [ ] Fair [ ] Low [ ] Very low [ ]

17. What is the adequacy of technical staffs who have knowledge on operating information technology systems in your hospital?

Very High [ ] High [ ] Average [ ] Low [ ] Very low [ ]

18. What is your level of understanding on working under EMR system?

Very High [ ] High [ ] Average [ ] Low [ ] Very low [ ]

19. Indicate the frequency to which you use the following methods when working at your hospital

	Never	**Rarely**	**Sometimes**	**Often**	**Always**
Email					
Internet browsing					
Word processing application					
Database management					
Calculations					

20. The following statements seek your response on the extent to which staff education level and competences influence adoption of EMR by hospitals. Use the following scale: (1) Strongly agree (SA), (2) agree (A), (3) uncertain (4) disagree (DA) and (5) Strongly Disagree (SD) to indicate your response

	Factor	**1**	**2**	**3**	**4**	**5**
1	General computer competence amongst us affect our utilisation of EMR in our hospital					
2	Lack of knowledge about EMR influence its adoption and utilisation					
3	Lack of use of EMR technology hinders its usage and adoption					
4	Health professionals would prefer not to use computers directly but would rather someone else do the computer-related work for them					
5	The fear of using technology is a barrier to the adoption of EMR systems by health care professionals.					

Any other comments about staff education level?----------

SECTION E: CAPACITY BUILDING

21. Indicate the extent to which the following programmes and support is provided during adoption, implementation and usage of electronic medical records technology in your health facility

	Capacity building	**Never**	**Rarely**	**Sometimes**	**Often**	**Always**
1	Outreach programmes for EMR					
2	Training for hospital staff on EMR usage & operations					
3	Management commitment to EMR implementation					
4	Follow up by EMR vendors on the usage of the resources and facilities					
5	Awareness forums on EMR adoption					

Any other comments about capacity building?----------

SECTION F: ADOPTION OF EMR IN PUBLIC HEALTH INSTITUTIONS IN KENYA

22. Indicate the extent to which the following services under electronic medical records technology are conducted in your organisation.

	Rate of adoption	**Very high**	**High**	**Average**	**Low**	**Very low**
1	Transactions done using EMR daily					
2	Number of departments linked with EMR technology					
3	Paper materials usage					
4	Electronic discharge summaries					
5	Appointment and scheduling reports					
6	Patient financial data report release					
7	Medical records/images retrieval					
8	Review/sign-off of inpatient observation charts					

Any other comments about adoption of electronic medical records?----------
---

The end

Thank you for your Participation

APPENDIX III: LIST OF HOSPITALS IN NAIROBI

	Hospital	Beds	Dealing Branch	Cat.
1.	AVENUE HEALTHCARE LTD	60	WESTLANDS	C
2.	BLESSED LOUIS PALAZZOLO HEALTH CENTER	24	WESTLANDS	B
3.	CARE HOSPITAL LIMITED	20	EASTLEIGH	C
4.	CHIROMO LANE MEDICAL CENTRE	15	WESTLANDS	C
5.	COPTIC HOSPITAL	37	NAIROBI	C
6.	DIVINE WORD PARISH HEALTH CENTER	32	BURUBURU	B
7.	DORKCARE NURSING HOME LTD	15	EASTLEIGH	C
8.	EDELVALE TRUST JAMAA H$M HOSPITAL	46	BURUBURU	C
9.	EDIANA NURSING HOME	15	RUARAKA	C
10	EMMAUS INNERCORE NURSING HOME	16	BURUBURU	C
11	FAMILY HEALTH OPTIONS	20	INDUSTRIAL AREA	C
12	GERTRUDES GARDEN CHILDREN'S HOSPITAL NBI	72	WESTLANDS	C
13	GURU NANAK RAMGARHIA SIKH HOSPITAL	85	WESTLANDS	C
14	H.H. AGAKHAN HOSPITAL (NAIROBI)	165	WESTLANDS	C
15	HURUMA NURSING & MATERNITY HOME	26	RUARAKA	B
16	KASARANI NURSING & MAT. HOME	60	RUARAKA	C
17	KAYOLE HOSPITAL	40	BURUBURU	C
18	KENYATTA NATIONAL HOSPITAL (AMENITY WING	225	NAIROBI	C
19	**KENYATTA NATIONAL HOSPITAL (GENERAL WARD**	**1804**	**NAIROBI**	**A**
20	LADNAN HOSPITAL LIMITED	50	EASTLEIGH	C
21	LIONS SIGHT FIRST EYE HOSPITAL	52	WESTLANDS	C
22	MADINA HOSPITAL LIMITED	18	EASTLEIGH	C
23	MARIA IMMACULATE HOSPITAL	28	WESTLANDS	C
24	MARIA MAT. & NURSING HOME	20	BURUBURU	B
25	MARIAKANI COTTAGE HOSPITAL	21	INDUSTRIAL AREA	C

26	MARIE STOPES KENYA LIMITED	19	EASTLEIGH	C
27	MARURA NURSING HOME	13	RUARAKA	B
28	MATER MISERICORDIAE HOSPITAL NAIROBI	135	INDUSTRIAL AREA	C
29	**MATHARE MENTAL HOSPITAL (GENERAL WARD)**	**1138**	**RUARAKA**	**A**
30	**MBAGATHI DISTRICT HOSPITAL**	**250**	**NAIROBI**	**A**
31	MELCHIZEDEK HOSPITAL	19	NAIROBI	C
32	MENELIK MEDICAL CENTER	13	NAIROBI	C
33	METROPOLITAN HOSPITAL	35	BURUBURU	C
34	MIDHILL MATERNITY & NURSING HOME	28	NAIROBI	C
35	MOTHER & CHILD HOSPITAL	23	EASTLEIGH	C
36	NAIROBI EQUATOR HOSPITAL	40	INDUSTRIAL AREA	C
37	NAIROBI HOSPITAL NAIROBI	220	NAIROBI	C
38	NAIROBI SOUTH MEDICAL CENTRE	15	INDUSTRIAL AREA	C
39	NAIROBI WEST HOSPITAL	66	INDUSTRIAL AREA	C
40	NAIROBI WOMEN'S HOSPITAL	50	NAIROBI	C
41	**NATIONAL SPINAL INJURY HOSPITAL**	**30**	**NAIROBI**	**A**
42	NGUMBA CENTER AND LABORATORY SERVICES	12	RUARAKA	C
43	PARKROAD NURSING HOME (NAIROBI)	57	RUARAKA	C
44	**PUMWANI HOSPITAL MANAGEMENT BOARD**	**350**	**EASTLEIGH**	**A**
45	RADIANT GROUP OF HOSPITALS	20	EASTLEIGH	C
46	RUARAKA UHAI NEEMA HOSPITAL	28	RUARAKA	C
47	S.S. LEAGUE M.P SHAH HOSPITAL NAIROBI	108	WESTLANDS	C
48	SAMARITAN MEDICAL SERVICES	32	RUARAKA	C
49	SCION HEALTH CARE LTD	10	INDUSTRIAL AREA	B
50	SOUTH 'B' HOSPITAL	12	INDUSTRIAL AREA	C
51	ST. JOHN'S HOSPITAL LTD	17	RUARAKA	C

52	ST.FRANCIS COMMUNITY HOSPITAL	100	RUARAKA	C
53	UMOJA HOSPITAL	13	BURUBURU	C
54	UNIVERSITY OF NAIROBI HEALTH SERVICES	12	NAIROBI	C
55	UZIMA DISPENSARY AND MATERNITY	11	RUARAKA	B

APPENDIX IV: KREJCIE AND MORGAN TABLE

For Determining Sample Size For A Given Population

Table for Determining Sample Size for a Given Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Note: "N" is population size
"S" is sample size.

Source: Krejcie & Morgan, 1970

APPENDIX V: RESEARCH AUTHORIZATION LETTER

UNIVERSITY OF NAIROBI
COLLEGE OF EDUCATION AND EXTERNAL STUDIES
SCHOOL OF CONTINUING AND DISTANCE EDUCATION
DEPARTMENT OF EXTRA-MURAL STUDIES
NAIROBI EXTRA-MURAL CENTRE

Your Ref:

Our Ref:

Telephone: 318262 Ext. 120

Main Campus
Gandhi Wing, Ground Floor
P.O. Box 30197
N A I R O B I

16TH October, 2015

REF: UON/CEES//NEMC/22/319

TO WHOM IT MAY CONCERN

RE: MONICA CHERONO CHEPKWONY –L50/61375/2013

This is to confirm that the above named is a student at the University of Nairobi, College of Education and External Studies, School of Continuing and Distance Education, Department of Extra- Mural Studies pursuing Master of Arts in Project Planning and Management.

She is proceeding for research entitled **"factors influencing the adoption of electronic medical records technology in public health institutions in Kenya"** A case of Hospitals in Nairobi county.

Any assistance given to her will be appreciated.

UNIVERSITY OF NAIROBI CEES P O Box 30197 15 OCT 2015 NAIROBI NAIROBI EXTRA MURAL CENTRE

DR. JOHN MBUGUA.
RESIDENT LETURER
NAIROBI EXTRA MURAL CENTRE

APPENDIX VI: RESEARCH PERMIT

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/15/53460/8454**

Date: **12th November, 2015**

Monica Cherono Chepkwony
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Factors influencing the adoption of Electronic Medical Records Technology in public health institutions in Kenya: A case of hospitals in Nairobi County,"*** I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for a period ending **12th November, 2016.**

You are advised to report to **the County Commissioner, the County Director of Education and the County Coordinator of Health, Nairobi County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

SAID HUSSEIN
FOR: DIRECTOR GENERAL/CEO

Copy to:

The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.