IMPLEMENTATION OF HOSPITAL MANAGEMENT INFORMATION SYSTEMS ON SERVICE DELIVERY: A CASE OF MOI TEACHING AND REFERRAL HOSPITAL

BETHWEL CHERUIYOT

A THESIS SUBMITTED IN PARTIAL FULLFILLMENT FOR THE CONFERMENT OF THE DEGREE OF MASTER OF SCIENCE IN HEALTH SYSTEMS MANAGEMENT OF KENYA METHODIST UNIVERSITY

SEPTEMBER, 2019

DECLARATION

This thesis is my original work and has not been presented for a degree in any other University

Signature …… Date …….

Bethwel Kipkorir Cheruiyot

HSM-3-1930-1/2013

Supervisors' Recommendation

We confirm that the work reported in this thesis was carried out by the candidate under our supervision.

Signature…… Date …….

Ms. Lillian Muiruri

Department of Health Systems Management

Kenya Methodist University

Signature. …… Date …….

Roseline Susan Njuguna

Department of Health Systems Management

Kenya Methodist University

COPYRIGHT

©Bethwel Kipkorir Cheruiyot

All rights reserved. No part of this thesis may be reproduced, stored in any retrieval system or transmitted in any form or by any means, electronically, mechanically, by photocopying or otherwise, without prior written permission of the author or Kenya Methodist University on that behalf

DEDICATION

This study is dedicated to the friendship, advice and memory of James Tuwei. He was a strict believer in education and quality healthcare: a driving force for the research towards enhancement of Healthcare Service Delivery.

ACKNOWLEDGEMENT

I sincerely appreciate the support provided by my supervisors Ms. Lillian Muiruri and Roseline Susan Njuguna in providing very vital advice and corrections. I also acknowledge Dr. Wilson Aruasa Chief Executive Officer of Moi Teaching and Referral Hospital for providing enabling environment to conduct the study and being supportive on the research.

ABSTRACT

Hospital Management Information Systems (HMIS) has the potential of improving the quality of services delivered as well as the efficiency and effectiveness of healthcare providers through integration of various hospital functional units. However, the benefits of this implementation in service delivery have not been adequately addressed. This study sought to appraise the impact of implementation of Hospital Management Information Systems, on service delivery in Moi Teaching and Referral Hospital, (MTRH). The objectives of the study were: To examine the level of implementation of Hospital Management Information Systems in MTRH, to establish the strategies motivating implementation and utilization of Hospital Management Information Systems, to assess benefits that have been realized in utilizing Hospital Management Information Systems, and to assess the effect of HMIS on service delivery in MTRH. Cross sectional descriptive research design was utilized in the study where sample size formula proposed by Cooper and Schildler formula was used to obtain 240 respondents from a target population of 587 users of HMIS. The researcher employed stratified sampling technique. A structured closed end questionnaire was administered for data collection, as well as interviews. Quantitative data was obtained, coded and entered into the computer using Statistical Package for Social Sciences version 25 software for analysis. A pilot testing was carried out at Rift Valley Hospital, Nakuru. Data was analyzed using descriptive statistics, i.e. mean and standard deviations and inferential statistics i.e. Pearson Correlation Analysis and Multiple Regression Analysis. A total of 240 questionnaires were distributed to the respondents and 192 were filled and returned, a response rate of 80%. With respect to familiarity with Hospital Management Information System results indicated that majority of the respondents 37.8% were familiar with the system. For the extent of implementation on the modules the Hospital Records module had the highest implementation level mean (4.0) with a while consulting doctor module posted the lowest mean (2.1). On the level of utilization of HMIS result indicates that the mean values were above average on a five point Likert scale. Further records module had the highest utilization level, mean (3.8) while consulting doctor module posted the lowest utilization level mean (2.0). On the strategies motivating the utilization of HMIS results indicate that the presence of information strategy is the leading motivator of utilization of HMIS mean (3.73). Results indicated that the anticipated benefits of HMIS were all in above the average. The results of the regression analysis suggested that HMIS implementation ($\beta= .215$, $p<0.05$), HMIS utilization ($\beta= ..697$, $p<0.05$), motivation strategy ($\beta= .193$, $p<0.05$), and HMIS benefits ($\beta= .045$, $p<0.05$) had a positive significant effect on Service Delivery, therefore the null hypothesis is rejected. The value of the F-statistic is ($F=172.917$, $p<0.05$) is robust to indicate the variable relationships. The coefficient of determination value of $R^2= .787$ means that 78.7% of the variation in service delivery at the hospital can be explained by HMIS. The study recommends that a policy be drafted to entrench HMIS implementation and utilization in the Country.

ABBREVIATIONS AND ACRONYMS

AMPATH	-	Academic Model Providing Access to Healthcare
AMRS	-	AMPATH Management Records System
E- Health	-	Electronic Health.
HMIS	-	Hospital Management Information System
HMN	-	Health Metrics Network
HoDs	-	Heads of Departments
ICT	-	Information Communication Technology
IHMIS		Integrated Health Management Information System
KNBS	-	Kenya National Bureau of Statistics
LAN	-	Local Area Network
MoH	-	Ministry of Health
MoMS	-	Ministry of Medical Services
MoPH	-	Ministry of Public Health and Sanitation
MTRH	-	Moi Teaching and Referral Hospital
ORC	-	Organization Readiness for Change
AMPATH	-	Academic Model Providing Access to Healthcare
TAM	-	Technology Acceptance Model
TAM 2	-	Technology Acceptance Model Two

UNESCO - United Nations Educational, Scientific and Cultural Organization

UTAUT - Unified theory of acceptance and use of technology

WSIS - World Symposium on Information Society

WTO - World Trade Organization

TABLE OF CONTENTS

DECLARATION ..... **ii**

COPYRIGHT ..... **iii**

DEDICATION ..... **iv**

ACKNOWLEDGEMENT ..... **v**

ABSTRACT ..... **vi**

ABBREVIATIONS AND ACRONYMS ..... **vii**

LIST OF TABLES ..... **xii**

LIST OF FIGURES ..... **xiii**

CHAPTER ONE: INTRODUCTION **1**

1.1 Background to the Study 1

1.2 Statement of the Problem 3

1.3 Purpose of the Study 4

1.4 Objectives of the Study 5

1.5 Hypothesis 5

1.6 Justification of the Study 6

1.7 Limitations of the Study 6

1.8 Delimitation of the study 7

1.9 Significance of the study 7

1.10 Assumptions of the Study 9

1.11 Operational definition of terms 9

CHAPTER TWO: LITERATURE REVIEW **11**

2.1 Introduction 11

2.2 HMIS Implementation extent 13

2.3 Level of Utilization of Hospital Management Information System 16

2.4 Utilization of HMIS motivating strategies 19

2.5 HMIS implementation benefits 23

2.6 Service Delivery in Health Sector 25

2.6 Theoretical Framework 29

2.7 Conceptual Framework 31
CHAPTER THREE: RESEARCH METHODOLOGY 33
3.1 Introduction 33
3.2 Research Design 33
3.3 Study Variables 33
3.4 Location of the Study 34
3.5 Target Population 34
3.6 Sampling Techniques and Sample Size 36
3.7 Construction of Research Instruments 38
3.8 Data analysis and Presentation 41
3.9 Ethical considerations 42
CHAPTER FOUR: RESEARCH FINDINGS AND DISCUSSION 44
4.1 Introduction 44
4.2 Response Level 44
4.3 Profile of Respondents 44
4.4 Descriptive Statistics of the Study Variables 46
4.5 Effect of HMIS on service delivery 74
4.6 Discussion of Results 75
CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 80
5.1 Introduction 80
5.2 Summary 80
5.3 Conclusions 83
5.4 Recommendation 84
5.5 Areas for further Research 84
REFERENCES 86
APPENDICES 90
APPENDIX I: INFORMED CONSENT 90
APPENDIX II: QUESTIONNAIRE FOR HMIS USERS IN MTRH 93
APPENDIX III: INTERVIEW GUIDE 106

APPENDIX IV: ETHICAL CLEARANCE LETTER..... 108

APPENDIX V: NACOSTI LETTER OF AUTHORIZATION 110

LIST OF TABLES

Table 3.1: Target Population Sampling Frame..... 30

Table 3.2: Sample Size Table..... 31

Table 4.3: Designation of Respondent…… 36

Table 4.4: Education Level of Respondents…… 37

Table 4.5. Role in the Organization…… 37

Table 4.6: Familiarity with HMIS…… 38

Table 4.7: Work Experience in the Health Sector …… 39

Table 4.8: Fields of operation …….. 39

Table 4.9 Experience with Hospital Management Information System…..… 40

Table 4.10: Extent Implementation of Hospital Management Information System. 41

Table 4.11: Implementation of Hospital Management Information System Modules ….... 42

Table 4.12: Utilization Level of Hospital Management Information System……. 43

Table 4.13: Utilization of Hospital Management Information System Modules.. …44

Table 4.14: Benefits of HMIS ……..…. 46

Table 4.15: Service Delivery …… …. …… 47

Table 4.16: Cronbach's alpha reliability Coefficient ……. 49

Table 4.17: Normality test results …… 50

Table 4.18: One-Sample Kolmogorov-Smirnov Test Results…… 51

Table 4.19: Collinearity Statistic for variables ……. 52

Table 4.20: Correlation Coefficients …… 53

Table 4.21: Regression Results …… 53

LIST OF FIGURES

Figure 2.1 Technology Acceptance Model 2.....20

Figure 2.3 UTAUT Model 21

Figure 2.3 Conceptual Framework.....27

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Developing countries face different challenges in their health sector. This has been immensely captured by the annual World Health Organization (WHO) reports. In the reports, developing countries such as Kenya faced similar healthcare challenges in the year 2001 and 2014; however, investment in the health sector has rather remained stagnant with the 2011 statistics showing Total expenditure on health per capita at 77 United States Dollar (USD) and Total expenditure on health as a percentage of Gross Domestic Product (GDP) declining to 4.5 %. WHO reports further show that there has been decline or stagnation in the main health impact indicators, such as maternal mortality and under-5 mortality has stagnated. According to Communication Authority of Kenya Report (CAK), (2014) there have been many liberalization efforts which have resulted in a vibrant communications market in the country, such that in the period 2001 to 2014 internet penetration and mobile computing utilization went up from approximately three hundred thousand users to more than nine million users currently.

With access to internet, Integrated systems, mobile computing and cyberspace have been utilized to solve a number of challenges in other sectors in the country such as finance, communication, education, aviation, agriculture, mining, transport and manufacturing, which has resulted to betterment of the aforementioned sectors: While, the healthcare sector is still facing the same challenges faced before widespread adoption of computers such management of funds, retrieval and accessing medical data, management of medical supplies, connectivity of various hospital units and availability of data for prompt decision making. In the global context, a number of hospitals have

slowly adopted the utilization of Hospital Management Information Systems (World Health Organization [WHO], 2014).

In Kenya, Moi Teaching and Referral Hospital (MTRH) among other hospitals, has implemented Hospital Management Information System, with the intention of having dynamic health information solution that synchronizes workflow across MTRH entire enterprise.

MTRH is a level 6 Public Hospital located three hundred and ten Kilometers Northwest of Nairobi, in Uasin Gishu County, Eldoret town. The Hospital's mission is to offer multispecialty healthcare services in a cost effective, timely and compassionate manner. The Hospital begun in 1917 and became National Teaching and Referral Hospital in 1998, currently serving an average of 1500 outpatients and 1200 inpatients daily. The Hospital also serves Moi University and other institutions in training Postgraduate, undergraduate and Diploma students. MTRH has various Centres of Excellence and offers various specialized services. MTRH offers various specialized services which have seen the advance over the years, the specialized services include Postpartum Intrauterine Devices (PPIUD), 24 hours Training Surgeries, Arthroscopic (Shoulder and Knee) Surgeries, corneal transplants, open heart surgery, Cardiothoracic services, Cardiology, Spine and Neurosurgical operations, Kidney transplants, Intensive Care Unit, oncology services as well as primary healthcare services.

The implementation of HMIS in MTRH encompasses several modules including Medical Records, Outpatient Module, Inpatient Module, Pharmacy Module, Laboratory Module, Radiology Module, Consulting Doctor, Financial management and Supply chain management. It was envisioned that the system enhances patient care through integrating clinical, financial, therapeutic and diagnostic information. Furthermore, the

hospital anticipated that in implementing HMIS, would enhance making faster and better decisions, enhance patient, staff and stakeholders satisfaction, control costs, reduce regulatory snarls, avoid medical errors. In addition the expectation of the hospital was to have a system that improves operational efficiency, clinical workflow and electronic patient documentation, increase quality of patient care as well as sound strategic and tactical planning (Al-Assaf & June, 2003).

Whereas a number of researchers have celebrated Hospital Management Systems as the panacea of the varied challenges facing hospitals globally, and the ultimate solution to effective, timely and efficient service delivery, others have dismissed Hospital Management Information System as unnecessary, capital intensive, fad that has no real ascribed benefits to the health sector (Gregory, 2008). This study therefore assessed the implementation of hospital management information systems on service delivery in MTRH

1.2 Statement of the Problem

Moi Teaching and Referral Hospitals' 2017-2012 strategic plan envisions the most of the operations should be automated. However, whereas the hospital has put in immense resources, total automation has not been achieved, while the hospital has not realized tremendous benefits in Service Delivery commensurate with the resources used, therefore a problem exists which requires understanding.

MTRH faced diverse challenges in utilization of Manual based systems such as delay in decision making, forgeries of financial records, loss of pharmaceuticals, dressings and sutures, delay in patient service delivery, among other challenges, (Kenya National Audit Office Report, 2011). In 2012, the hospital implemented an HMIS system –

(Funsoft) which was touted as the panacea of the challenges, however still diverse challenges exists in the hospital, hence the need to understand the level of HMIS utilization.

The hospital has deployed a number of HMIS modules in different operational areas including electronics medical records, in-patient and outpatient modules, pharmacy, laboratory and radiology management modules, nursing modules, accounts/finance management and supply chain management modules. Hypothetically, the areas where the system has been implemented should be efficient with patients' medical records being retrieved as and when needed without duplication of data, past medical and referral data being available at the click of a mouse, there should be comprehensive follow-up of both inpatient and outpatient. In the pharmacy ideally, there should be no loss of drugs, while drugs should be traced to the patient and complete drug reports available, while in the laboratory and radiology, specimens should be traced to the patient while results should be transmitted to the doctor requesting the tests as soon as they are available, payment of creditors and billing of patients should be prompt and accurate, while nursing should triage patients and doctors clerk in patients electronically. It is therefore important to examine if the aforementioned objectives has been completely achieved with the adoption, implementation of HMIS in the hospital.

1.3 Purpose of the Study

To investigate how implementation of hospital management information systems is linked to service delivery at of Moi Teaching and Referral Hospital

1.4 Objectives of the Study

1.4.1 General Objective

To assess the influence of implementation of Hospital Management Information Systems in MTRH on service delivery.

1.4.2 Specific objectives

1. To assess the extent to which HMIS has been implemented in MTRH.
2. To examine the levels of utilization of Hospital Management Information Systems in MTRH.
3. To establish the strategies motivating the utilization of Hospital Management Information Systems in MTRH.
4. To determine the benefits of Hospital Management Information Systems in MTRH.
5. To assess the influence of HMIS on service delivery in MTRH, Kenya

1.5 Hypothesis

The study tested the hypothesis below:

H_0: HMIS has no significant effect on service delivery in MTRH, Kenya.

The alternate hypothesis is :-

H_1:HMIS significantly impacts on service delivery in MTRH, Kenya.

1.6 Justification of the Study

In Kenya, a number of public and private hospitals have been utilizing HMIS, Moi Teaching and Referral in 2012 implemented a Hospital Management Information System, which has been utilized in a number of clinical and Administrative departments for day to day operations. The definition on the level of HMIS utilization has been fuzzy, with different hospitals with varied departments defining level of HMIS utilization differently as presented by Reinhold, Alfred, Elske and Birgit (2013); the fact that MTRH has more than fifty departments provides a wider scope for evaluating level of HMIS utilization. Moreover, the hospital has been utilizing HMIS from 2012 hence having sufficient data on the strategies motivating HMIS utilization. MTRH is a National Referral Hospital, however it continues to offer both primary and specialized healthcare services, the outcome of the research in terms of benefits of HMIS utilization shall be of benefit to a wide array of hospitals in Kenya, those providing primary healthcare, as well as the hospitals offering specialized treatment.

The implementation of HMIS if does not function as expected impacts negatively on service delivery through delay in patient service process, as well as the impacting on the reliability of data as well as loss of finance, pharmaceuticals and non-pharmaceuticals (Gilad, Reed, & Allan 2013). The research findings are expected to advice in order to enhance implementation of HMIS to foster service delivery.

1.7 Limitations of the Study

The research may be limited by the obtain ability of data and information from hospitals due to the sensitivity of the research matter on the hospital systems and stringent laws on storage and utilization of medical information. Moreover, the application of integrated and comprehensive hospital management information systems has been limited in Kenya and the respondents may therefore have limited knowledge on the

subject matter. This was handled through purposive sampling to focus on knowledgeable respondents.

1.8 Delimitation of the study

There are several characteristics that limit the scope and define the boundaries of the study. The research is constrained to Kenyan public Hospitals, geographically; the research was be limited to Moi Teaching and Referral Hospital, which was selected since it serves both primary healthcare patients and specialized referral cases, offering a good basis for duplication of research findings in a wide array of hospitals. Whereas there are various software systems in the hospital, the study focused on the utilization of HMIS, which was installed in 2012 in MTRH, and did not examine several other software which are in use in the hospital such as Ampath Medical Research System and Clocking Time Management System. Furthermore, the study focused on how HMIS had been utilized, what motivates the utilization and the benefits of HMIS leaving out other dimensions of HMIS such as the programming complexities and types of Database of the HMIS.

The inclusion criteria for the respondents are senior managers and the employees of the hospital, who directly utilize HMIS,in their day to day operations. Staffs those who do not interact with the system and those who did not consent for the study were excluded.

1.9 Significance of the study

The study is important in order to understand level of utilization, motivation strategies and benefits of HMIS. The findings of the study will be of benefit to the hospitals; the conceptions and theories presented will be utilized to effectively enhance the management of hospitals in order to attain the desired health outcomes for the country.

It will also make the management understand the strengths and weaknesses of the existing ICT infrastructure currently utilized the features the systems should have in order to achieve organizational objectives. The study is significant to government agencies, international health organizations and policy makers; to understand consequences of emerging technologies and proactively respond to health sector challenges.

The results of the research are significant in increasing the knowledge available on Health Information System technologies in healthcare which is beneficial to researchers as well as offer solutions towards realization of the Kenya Health Sector Strategic Plan in general and more specifically Moi Teaching and Referral Hospital 2012-2017 strategic plan, from optimizing service delivery using the research findings.

The study has diverse significance towards contributing to extension of knowledge on the application of Information Communication Technology based techniques in the management of hospitals in Kenya. The study findings will contribute to foster knowledge available on level of utilization of Hospital Management Information Systems medicine in Kenya, as well has highlight strategies motivating implementation of Hospital Management Information Systems. The results shall be used in informing MTRH management on the future investments on Healthcare Information Systems as well as the maximize HMIS benefits. Furthermore, the study findings are envisioned to add knowledge available on the benefits of implementing Hospital Management Information System.

1.10 Assumptions of the Study

Assumptions that were made in the research were predisposed by sensitivity and veracity. Keith (2005) defines sensitivity as the propensity or perception to prevailing circumstances while veracity is the compliance to set facts; it is an opinion about the aptness of a theory. The research has made several assumptions; the first assumption is that the decline or stagnation in the health status in the country is a direct consequent of ineffective technologies utilized in the management of public hospitals. It is also assumed that the sample studied represents the population, i.e. the staffs that were chosen as respondents' represents the opinions of all the staff in MTRH. In the research, it is also assumed that the respondents answered questions truthfully, accurately and genuinely.

1.11 Operational definition of terms

Health Sector - All the segments concerned with in the diagnosis, treatment, and prevention of disease, illness, injury, and other physical and mental impairments in human beings.

Healthcare Efficiency and Effectiveness - Measures of outpatient time spent per visit, Service availability per 100 cases, inpatient average length of stay, percentage of drug available in drug formulary and patient satisfaction percentage

Hospital Management Information System - Computer based software system used in the management of hospital functions

Implementation - Refers to the execution or the installation of HMIS in the hospitals

Motivating Strategies

Service Delivery - Factors which work to enhance the utilization of Hospital Management Information System. Meeting the health needs and expectations of people and communities, in a manner satisfactory to them

Software Module - A software component which with other components make up the entire hospital system, that contains everything necessary to execute only one aspect of the desired functionality

Utilization - Refers to the use of the HMIS in the treatment of patients in the diagnosis, prescription and maintaining patients' data and information.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature related to Hospital Management Information System, Implementation, utilization, motivating strategies, benefits and service delivery and studies after the thorough and in-depth search by the researchers. This will also present the combination of the studies, theoretical and conceptual framework to fully understand the HMIS implementation globally, regionally and locally. The chapter will conclude with the presentation of a theoretical and conceptual framework against which provides a basis for the subsequent evidence gathering and analysis.

Literature review serves a very important purpose of establishing the theoretical framework for the area under research, aiding the researcher to gain a comprehensive understanding into the study concepts, defining and establishing the area of study,, as well as identifying case studies in the same area of research ,models and previous studies which support the research area. Literature review also serves the purpose of identifying the areas that the research anticipates to fill through identifying the missing gap, while offering a synopsis of the pertinent and noteworthy literature on the research field. Furthermore, the literature review undertaking on re-evaluates the imperative opinions of prevailing knowledge on the topic under consideration through survey of theses, conference papers, books and articles, which serves as the groundwork of producing the foundation of the study.

The adoption, implementation and benefits of Hospital Management System in several literatures have been captured in most literature based on the more generic term, Health Information System (Hanafizadeh & Saghaei, 2009). According to the authors, Health

Information System is a more wide term which incorporates any system that transmits, manages, stores or captures data and information that relates to all activities in organizations involved in the health sector or the health of individuals. This is supported by WHO Health Metrics Network (2005), which presents that Hospital Management Information system, can be viewed from the wider context as part of Health Information System which is an integrated endeavor to collect, process, report send and use health information and knowledge for individual and public health outcomes, programme action, research and to influence policy and decision-making.

According to Kenya National Audit office report (2011) to MTRH management, the utilization of manual based methodologies in the management of hospital operations, and service delivery has been riddled with a myriad of challenges including high operational and human resource costs, ineffective and compromised service delivery and delayed decision making, furthermore this has negatively affected the level of inter-facility patient referral, medical history follow up, and data retrieval. Continued usage of manual systems is detrimental therefore to the wellbeing of the hospital.

In recognition that healthcare institutions in an attempt to solve the challenges have had reactive responses which entails automation of the various activities, these has however created more challenges with some institutions recording total failure on implementing hospital management information systems, others have partially implemented, while other hospitals still face the same problems before Hospital Management Information System installation (Bernstein, Mccreless, & Côté, 2007). Hospitals' managements have been at crossroads on whether to continue investing the limited available resources on implementing Hospital Management Information System whose outcome is

unpredictable, or to continue using manual based methodologies in their operations, resulting to compromising on service delivery.

Whereas there have been a number of steps and strategies adopted to overcome the aforementioned challenges, the hospital has not realized tremendous benefits commensurate with the resources, which have been utilized in the implementation of HMIS. Furthermore, whereas implementation of the system was publicized as an integrated system to automate all functions of the hospital within a short time, four years later, a number of functionalities are still manual based. There is also the problem of the expected beneficiaries of the system, the users, whose system implementation was expected to foster their work, being behind sabotaging the implementation of the system.

2.2 HMIS Implementation extent

The actual definition of implementation of Hospital Management Information System differs from various studies, due to differing philosophical approaches of what constitutes complete HMIS Implementation, considering the various levels of healthcare. According to Oboth, (2011) there is no global definition or defined standards of what entails HMIS, unlike Health Level-7 which is a collection of international standards which is meant for diverse healthcare providers for transfer of clinical and administrative data between software applications. Accordingly, a generally agreed definition of HMIS implementation is an integrated, comprehensive information system intended to accomplish entirely the facets of a health sector operation, including administrative, clinical, records, academic, corporate communications, financial, supply chain, and medical issues and the subsequent processing of services.

The modules constituting a successful HMIS implementation varies. Important basic implementations are the Electronic Health Record (EHR), which is systematized collection of various patient and population data such as radiology images, personal statistics, medical history, immunization status, vital signs, laboratory test results, demographics and medication which are electronically-stored in a digital format. The implementation of the Electronic Health Record as function of HMIS was bolstered with Health Information Technology for Economic and Clinical Health (HITECH) ACT legislation in United States of America as part of American Recovery and Reinvestment Act of 2009, where the use of HMIS is profoundly supported by medium and large healthcare institutions, insurance companied as well as state and federal governments. The United States Congress encompassed a formula of fostering inducements for using Electronic Health Records and penalties for utilizing paper based records, with the vision of improving the overall efficiency , increased accessibility and portability of patient medical records, reduce medical errors, and reduce costs.

In Europe, the implementation of HMIS is supported by the European Commission, with need to expedite e-health systems cross-border interoperability within Europe and globally. This is driven by the European Union Directive 2011/24/EU, which put in place the basis and the principles for the rights of the patients in cross-border healthcare, which is intended to ensure that all the member countries are able to access online patient records anyplace in Europe by 2020. In United Kingdom, the implementation of EHR systems by the National Health Service (NHS) which begun in 2005 with the objective of centralized electronic health record of patients was dismantled as there was no national healthcare information exchange. With the active implementation of

PCEHR - the Personally Controlled Electronic Health Record, Australia aims to achieve a lifetime electronic patient records for all inhabitants.

Kenya as a country while it has made various attempts to implement a countrywide Hospital Management Information System has not been successful. Several healthcare institutions such as national referral hospitals, private hospitals, county hospital and primary healthcare providers have implemented differentiated healthcare systems utilizing varied platforms and databases, such that interoperability does not exist. An attempt to standardize the HMIS was with the implementation of District Health Information System (DHIS2) which was approved by the Ministry of Health in 2010, this is however more of a reporting tool typically used to monitor health indicators for a national health system.

The system supports diverse aspects of the information cycle such as data collection, reporting and analysis, quality assurance, dissemination. Authors such as Staggers & Snyder, (2011) hold it that HMIS implementation cannot be perceived to be successful without the implementation of various functions of healthcare, meant to foster strategic decision making. Accordingly, HMIS implementation should include aspects of Electronics medicine, focusing on aspects of Emergency telemedicine such as Teletrauma care, Telenursing, Telerehabilitation and Telepharmacy. HMIS implementation according to the authors, should also include Specialist care delivery such as Teleophthalmology, Teleaudiology, Teledentistry, Teledermatology, Teleradiology Telecardiology, Telepathology and Telepsychiatry. A comprehensive implementation of HMIS should also include a function of automating basic nursing functions such as clerking of patients, patient-nurse communication and clinical functions, comparatively with medical equipment, Laboratory, Radiology and

Pharmacy Information System Capability, as well as patient billing, patient supplies and finance management. DHIS therefore offers limited capability, to be regarded as HMIS.

Karen, Frances, Glaser (2013) are of the contrary opinion, vouching that any healthcare delivery institution, regardless of its size, whether specialized of offering primary healthcare, which can successfully automate its provision of services for effective decision making and timely reporting, while enhancing healthcare, can be gauged to have successfully implemented Hospital Management Information System.

2.3 Level of Utilization of Hospital Management Information System

The application of Hospital Management Information System techniques in the management of healthcare has been a controversial topic, with successful implementation of a system, not necessarily suggesting successful utilization. Whereas a number of researchers hold that HMIS is of paramount importance in healthcare, others have been of contradictory opinion, holding that diverse factors influence healthcare including access, cost and quality and all the factors cannot be achieved, but there exists tradeoff between the factors.

In the global contexts, HMIS have been applied successfully to achieve the desired objectives in the developed countries, where manual based systems health systems delivery have been reduced to negligible percentage. In the developing countries, which involve several countries in Africa, Kenya included the adoption, level utilization and achieving the benefits of HMIS has been in formative stages for a long time, where defined status on adoption cannot be exactly pinpointed, as such countries that have the highest health problems commonly portray the frailest systems for gathering, using and managing information (Chetley, 2006).

The growth of utilization of Hospital Management Information System has developed in other countries, which can be used to gauge Kenya's level of utilization towards enhancing healthcare service delivery. In India, the government has been in the forefront in the implementation of a comprehensive an integrated Health Management Information System (HMIS) which serves in receiving, processing, analysis and reporting various important healthcare data and information. The web based platform HMIS systems in India have been important in the presentation of timely and accurate information, as and when needed, linking most of the health facilities in the country. The HMIS integrates several functionalities including Member Enrolment and Identification, Monitoring and Evaluation, Healthcare extension workers technology assistance, Managed Cash Management and Care delivery, Diagnostics, Electronic Medical Records, inventory management and Supplies chain management. The utilization of several modules in a number of hospitals in India has enhanced the level of HMIS utilization, hence driving the attainment of service delivery (Leung, 2001).

The impacts of level of HMIS utilization in service delivery is further presented by Staggers & Snyder, (2011). The author argues that regardless of the level of utilization of HMIS in hospital, this does not necessarily translate to fostering and driving the healthcare service delivery if convincing and operational framework does not exist. The researcher argues that in countries such as of Uganda, Zambia, Mali and Tanzania, information systems were presented in hospitals in the form of healthcare management information systems with diverse modules including Cash Collection/Finance Management system, Inpatient registration, outpatient registration, Stock and inventory control, Human Resource management system as well as communication system. The lack of relevant application, customization and relevant programming of the modules

to suit the environment as well as poor system support has resulted to compromised healthcare service delivery (Ministry of Medical Services, 2012).

A number of studies including Eysenbach, (2002) and Alvarez, (2002) have proposed various important modules that make up a successful Hospital Management Information System. According to the researcher, the studies are in agreement that every hospital has unique challenges and characteristics, therefore a global standard defining the system modules may not be explicitly stated. An important component which defines utilization success is the Patient Registration Module, which is integrated management system which is a source of information through capturing complete and relevant patient information and allows simplified retrieval of medical records on patients that are required. The system captures Patient Registration Details including demographics, Appointment Scheduling (Patient/Doctor wise), such as In/outpatient Registration, Doctor's Schedule Summary, Patient Visit slips and History and The system also facilitates digitalization of manual records and generates statistical data as well as storing the different patient notes such as Discharge, Medical, Diagnosis, and incorporate Medical codes.

According to Adebiyi, (2011) an important gauge in the level of utilization of HMIS is the usage of HMIS in Finance management. This entails various financial tools in the HMIS including Cash Collection, Shifts management, automation of user fee manual and charge sheets as well as Shift reports, daily, monthly and annually cash analysis. The use of HMIS in Supplies Chain management is an important undertaking with the required functionalities including management of hospital's procurement plan, sourcing of hospital items, Product development and commercialization, Supplier relationship management, pharmaceutical and non-pharmaceutical stock control and Order

fulfillment. Joydeep (2009), presents that utilization of HMIS is gauged on how effective the system performs Stock issues, transfers & losses, Stock re-order levels, Stock return to suppliers, Stock requisitions and purchases, Prescription adjustments as well as Stock reconciliations and Requisition analysis

In addition, Joydeep (2009), argues a comprehensive HMIS should provide an automated way of managing hospital commodities including drugs, dressings and sutures. HMIS being an important implementation in the healthcare sector has to be used in the clinical areas such as Automate patient registration, Integrated view to Patients for Billing, Collection, Discharge Details, Patient Medical History, patient Bed Allocation and provide effective search facility to retrieve any type of information related to Patient history, while Facilitating On-line prescription, ordering and diagnosis requests. To offer complete digitized medical records the HMIS should be utilized in computerized treatment sheets for doctors and nurses

2.4 Utilization of HMIS motivating strategies

Utilization of hospital management information systems is simpler said than done (Macnee& McCabe, 2008). The hospitals have a unique set up such that patient care is of paramount importance. Considering that HMIS adoption is not without challenges, which may impair service delivery to the patient, adoption immensely challenging. However, the author further notes that HMIS adoption is paradoxical considering that patients need better service delivery, which should be achieved through adoption of HMIS, while challenges experienced in HMIS adoption may compromise service delivery to the patient.

According to Dobbs (2004), Adoption theory scrutinizes the individual and the selections that the person has to make on order to reject or accept a given innovation. It contemplates factors like social pressured and time to explain the process of how a population adapts to, adopts or rejects a given innovation. Adoption theory is a micro perspective on change, focusing on the pieces that make up the whole, but not on the whole. In some models, adoption is a vital alternative to accept an innovation as well as the degree to which that innovation is integrated into the appropriate context. In contrast, diffusion theory describes how an innovation spreads through a population.. This is further highlighted by the diffusion theory takes a macro perspective on the spread of an innovation across time.

A number of studies including Al-Mamary, Shamsuddin, & Nor (2014), have proposed that user satisfaction is paramount to motivating information system, features such as response times, flexibility, sophistication, intuitiveness, system reliability, ease of learning, system flexibility as well as ease of use work to motivate or otherwise impact on the system. Research done by Petter, DeLone, & McLean (2008) adds that organizational dimension is a motivating factor. Management support, resource allocation and stakeholder involvement are important organizational dimensions, with organizations where the management are involved in system implementation most likely achieving successful implementation, the inverse is true. Stakeholders play a critical role and may jeopardize the success of the system, involving the critical stakeholders' works as a motivating factor, which works towards availing more resources.

Adoption of Hospital Management Information Systems does not follow a predefined format considering as presented by Ndubisi (2006) that a universal model for

understanding the processes in which an individual engages before adopting a new innovation does not exist, but rather, adoption is understood in terms of some kind of behavior change. Various models exists, including technology acceptance model which is based on specifying the causal relationships between system design features, actual usage behavior, perceived ease of use, perceived usefulness, attitude toward using, so as to provide an informative representation.

The adoption of HMIS according to Seth (2010) is dependent on the perceived usefulness, where persons perceive the envisioned benefits on performance in the organization impacts on how the persons will accept the system. The model further presumes that perceived ease of use, influences perceived usefulness considering that, other factors being constant, the easier is a technology to use, the more useful it can be, this is supported by Rockwell & Alton (2003), who are of the opinion that Management Support, Resource availability, Stakeholder involvement and customer focus are important motivating strategies. Technology Acceptance Model, (TAM), considers the impacts of external variables such as characteristics of system design, training, documentation and characteristics of the decision –maker may also influence technology adoption.

Adoption of HMIS is also motivated by various factors according to Venkatesh and Davis (2000), who presents Technology Acceptance Model 2 which two main motivating strategies, namely Social influence processes and Cognitive instrumental processes. The social influence processes influence a person's decision to accept or reject a system is image, voluntariness and subjective norm. The authors further argued that four cognitive instrumental processes that motivate or otherwise the application of

a system are perceived ease of use, result demonstrability, output quality and job relevance.

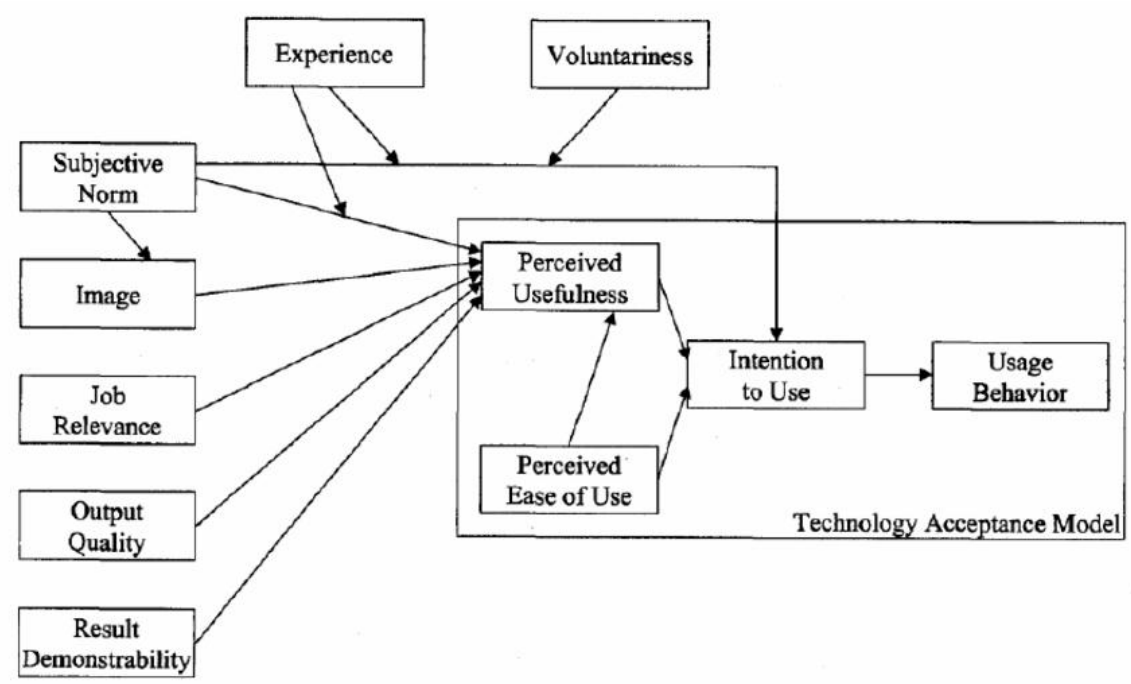


Figure 2.1 Technology Acceptance Model 2

Source: Venkatesh and Davis 2000

Unified Theory of Acceptance and Use of Technology (UTAUT) introduced by Venkatesh and Davis (2003) presented a new model for analyzing the acceptance of technology motivating strategies. The model constitutes of four core determinants of intention and usage: Facilitating Conditions, Social Influence, Effort Expectancy and Performance Expectancy and also of four moderators of key relationships: Voluntariness, Experience, Age and Gender, and as presented by Venkatesh and Davis (2003). The core constructs are the key factors, which directly impact on Behavioral intention Moderators are factors, which reinforce or weaken the influence of the key factors, where acceptance and use of target technology by the users impacts of productivity gains of technology.

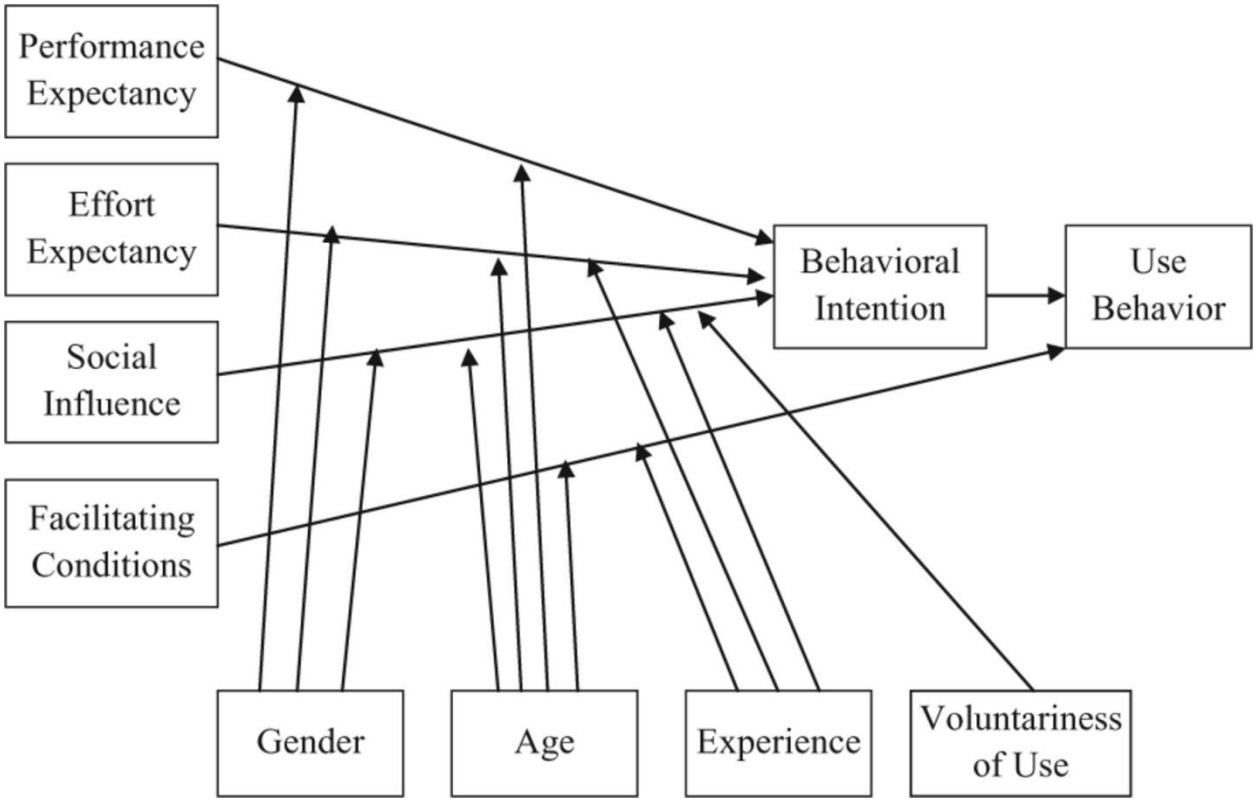


Figure 2.2 UTAUT Model 1

Source : Venkatesh and Davis 2000

2.5 HMIS implementation benefits

The benefits of implementation of HMIS are a contentious topic with various studies, researches and presentations having diverse understandings of what actually constitute HMIS. In a number of studies, HMIS is viewed from the general perspective, that it is an important component of Electronic Health; in that all the modules of HMIS is what actually constitutes E-health. There is no definite consensus on what constitutes E-Health with diverse definitions existing. Eysenbach,(2001) defines E-Health as developing area where diverse areas including public health, business health, health services, medical informatics converge and are heightened through the Internet and related technologies.

The benefits of HMIS as an ingredient of e-health is viewed through understanding "e" in E-Health apart from standing for electronic health also stands for other paramount factors including Efficiency. HMIS offers efficiency in healthcare delivery timely clinical interventions and costs reduction whereby utilizing HMIS in telemedicine reduces the demand to refer or travel to a tertiary or secondary hospital. Electronic Health increases health care efficiency through reduction of the required time to perform health processes and tasks as presented by Seth, (2010),who opines that appointments and 24 hour emergency consultations can be offered from any geographical area by utilizing faster medical data handling, objective and well informed decisions can be made faster. In addition, in the European Commission report, there is justifiable evidence that Electronic health was providing reasonable benefits to the populace.

Furthermore, electronic health gives the patients the flexibility and empowers the patients to have access to their medical information regardless of the geographical location. With enhanced empowerment, the clients are involved in the decision making process as presented by Avedis (2002). They can access the information fast and for free. Gregory & Linda, (2008) suggests that in the United States, approximately fifty percent of the adult population have searched for health information on the internet, hence being ranked number three in terms of popular online activity.

The benefits of HMIS is further expounded by Dobbs, (2004) who presents that HMIS fosters cost reduction in terms of administrative and clinical transactions planning while encouraging, better service to the patients, through improving operational control and streamlining operations. This is further highlighted through indirect benefits such as corporate image of the hospital and increased competitive advantage, and direct benefits

reduced waiting time, reduced wastage, minimal inventory levels, reliable and timely information, greater organizational flexibility, reduced paperwork and simplification of patient record management as presented by (Leung, 2001).

Furthermore, Gregory and Linda (2008) are in agreement that HMIS implementation fosters better revenue management, since it is impractical to utilize age-old manual systems, considering the magnitude of revenue transactions. HMIS offers fast and accurate transactional and management reports that provide real-time required financial and performance status of the hospital.

On the contrary however, Rockwell and Alton (2003), holds that whereas there are various benefits of HMIS, the potential benefits of HMIS have rather been exaggerated in paper, with actual benefits not actually realized on HMIS implementations globally. The author is of the opinion that there are various challenges that impair successful implementation of such systems to enable health institutions claim to have achieved all the envisioned benefits at the beginning of the implementation. As such the intensive capital requirements, the need to totally alter the policies and the structure of the hospital, the frequent need to train and retrain the staff of the new system, incidences of system failures, intrusion and viruses as well as system inconsistencies have so much negative impacts to the extent that by the time the acclaimed benefits are documented so much shall have gone to the implementation such that the net effect is zero as presented by (Donald & Douglas, 2000).

2.6 Service Delivery in Health Sector

The metric of determining Service delivery is as adverse as the fields. According to Appari and Eric (2010) service delivery transverses all the sectors beginning with the

government, where citizens expect service delivery in terms of distribution and utilization of resources which are required for best attainable and achievable lives of the citizens including housing, land, infrastructure, sanitation, education, communication infrastructure , water and electricity.

In the service industry such as healthcare, various constructs constitute service delivery as pointed out by Bansal (2004), where customer experience is the leading determinant of service delivery. These include continuous improvements, account management and customer experience. In customer experience, service delivery is mainly driven by perception where long term engagement between the service provider, the client and the end user is driven by perception on the extent to which the services provider met the expectations of the client. Long term engagement is premised on the philosophy that the client, in this case in health sector, the patients is part and parcel of the creation and services provision and anchored on that philosophy.

Human resource processes, purpose driven leadership, employee attitude activities constitute employee engagement which ultimately affect service delivery. Service excellence model is anchored on the employee engagement which impacts on the execution of the service design. The effectiveness of the designed processes and systems will attain better efficiency when executed by personnel with higher engagement.

According to Oboth (2011) Service Quality is also an important aspect of service delivery. These are the inputs, processes, strategies and performance management systems. The output of a service management model is a consequence of the inputs, process design and strategy. Service quality also entails enabling the customers to

achieve their core functions and missions and fostering them in the pursuit of their organizational objectives.

Service Culture is also a determinant towards service delivery. This is anchored on values, mission and vision, leadership principles, norms and work habits of the organization. Service culture is defined as the basic tenet to which the organization is managed, which area the social process through which management maintains and controls the organization for service delivery giving value to the clients. Organizational culture is therefore geared towards offering superior services so as to entrench continuous service improvement as part of the culture as presented by Peprah (2014).

In the health sector, various researches present diverse opinions, according to World Health Organization, the achievement of health-related Millennium Development Goals (MDGs), is anchored on strengthening service delivery. Inputs into the health system including healthcare financing, procurement and supplies, health workforce and related technologies drive the outputs of service delivery or provision. Key functions of health system which leads to improved service delivery are guaranteeing availability of health service that prescribe to the minimum quality standards and ensuring that there is access to such services.

Appari and Eric (2010) opines that there are various characteristics which defines health sector service delivery, whereby an health system could be accorded strong healthcare rating based on attainment of the underlying factors. These includes accountability and efficiency, where achievement of primary elements of healthcare with minimum resources, personnel managing health systems are empowered to drive the attainment of the objectives and are responsible for the results and performance. Another aspect of healthcare service delivery is coordination where health service provision is actively

coordinated for tertiary, primary and emergency cases within all levels of service offering, types of care and types of provider. Another aspect of service delivery is the health sector is the person centeredness where healthcare services are not organized as per diseases or resource availability bust around the person. In cases where health provision is centred on the persons, people believe that they are partners in the service delivery hence perceive it to be more acceptable and responsive.

Quality of healthcare is also an aspect of service delivery where healthcare services are perceived to be of better quality when they are provided in a timely fashion, centered on patient needs, effective and safe. Bansal (2004) further opines that coverage is an aspect of healthcare service delivery where healthcare services are designed in a manner that all persons in a given target population get the services. In this case, the healthcare services should cover all the strata such as the educated and the uneducated, the healthy and those with terminal diseases, all social groups and all persons with different financial capabilities. Service delivery is also defined by the accessibility of the services, which refers to the lack of unwarranted barriers of geography, culture, language and costs. Healthcare services should be provided at the basic level with primary healthcare being close to the people, and services should be offered to the convenience and appropriateness of the people.

Service delivery is also measured by the comprehensiveness, where a widespread quantum of health services are offered to the suitable demands of the targeted communities, these included health promotion activities, rehabilitative services, palliative services, curative as well as preventative services. Furthermore, Service delivery is dictated upon by the continuity of services, where a patient is provided with

continuous services across wide spectrum such as different levels of care, different ages, health conditions and transcending different network of services.

In the study, a number of metrics where highlighted to constitute service delivery, these includes, outpatient time spend per visit, service availability per 100 cases, inpatient average length of stay, percentage of drug availability in the drug formulary and patient satisfaction percentage (Gilad, Reed, & Allan, 2013).

2.6 Theoretical Framework

The research was based on the HMN framework developed by Health Metrics Network (HMN), an initiative hosted by the World Health Organization (WHO), in 2006. According to HMN (2006), Public Health Grid Services Ecosystem, healthcare service delivery is a consequent of the integration of the various facets of healthcare functions through systems including Public Health Event Detection Services, Alerting Communication Services, Hospital Information Systems, Surveillance Data Service and analysis services. Success of healthcare service delivery in entirety depends on the success of the integrated systems. Service delivery in hospital is impacted upon by Hospital Management Information System in place. The Health Metrics Network further presents that Hospital information system consists of various modules which when disjoint impairs service delivery, while when well integrated fosters service delivery accordingly. The study was founded on understanding what MTRH has deployed in relation to HMN metrics as well as the factors that motivate HMIS utilization as well as the benefits in service delivery in relation to HMN Metrics.

The theoretical framework underlying the research is based on WHO report (2012) on challenges in healthcare and integration of hospital functions to enhance service delivery, through computer systems. Hospitals such as MTRH are faced with various

demands and challenges including need for better service delivery, optimum utilization of human resource, fostering decision making in leadership, better utilization of information, and need for most favorable utilization of pharmaceutical and medical supplies in consideration of limited health financing, these constitute the independent variables of the study. The Kenya Health Sector Strategic Plan (2012-2017) proposes holistic automation of Health Information System as an ultimate solution. Holistic automation is realized through automation of core and non-core functions of health institutions through HMIS, core functions include HMIS modules for in/out patient management, laboratory, pharmacy, Supply chain management, patient registration, radiology, and clinical management and finance modules, which are expected to enhance service delivery. Utilization and implementation of HMIS system to realize service delivery is influenced by motivating strategies, while the envisioned benefits in HMIS utilization and implementation affects on the service delivery.

The hospital's service delivery depends on the level of utilization of HMIS in several areas of the hospital such as clinical management, supply chain Management, finance, patient management, pharmacy, radiology, laboratory and patient management. This is motivated or stifled by hospitals conditions and objectives through motivating strategies such as limited financing, human resource capabilities, utilization of information, need to improve service delivery, leadership and the need to optimally utilize pharmaceuticals and other supplies. Moreover, level of service delivery depends on the envisaged benefits to the hospital, with the realization of the envisaged benefits most likely enhancing the level of service delivery (Demiris, Oliver, Porock & Courtney 2004).

2.7 Conceptual Framework

The study was premised on three independent variables, Level of HMIS Utilization, Strategies motivating HMIS utilization and Benefits realized in using HMIS, these influences the dependent variable, hospital service delivery in terms of efficiency and effectiveness which are measured through outpatient time spent per visit, Service availability per 100 cases, inpatient average length of stay, percentage of drug available in drug formulary and patient satisfaction percentage

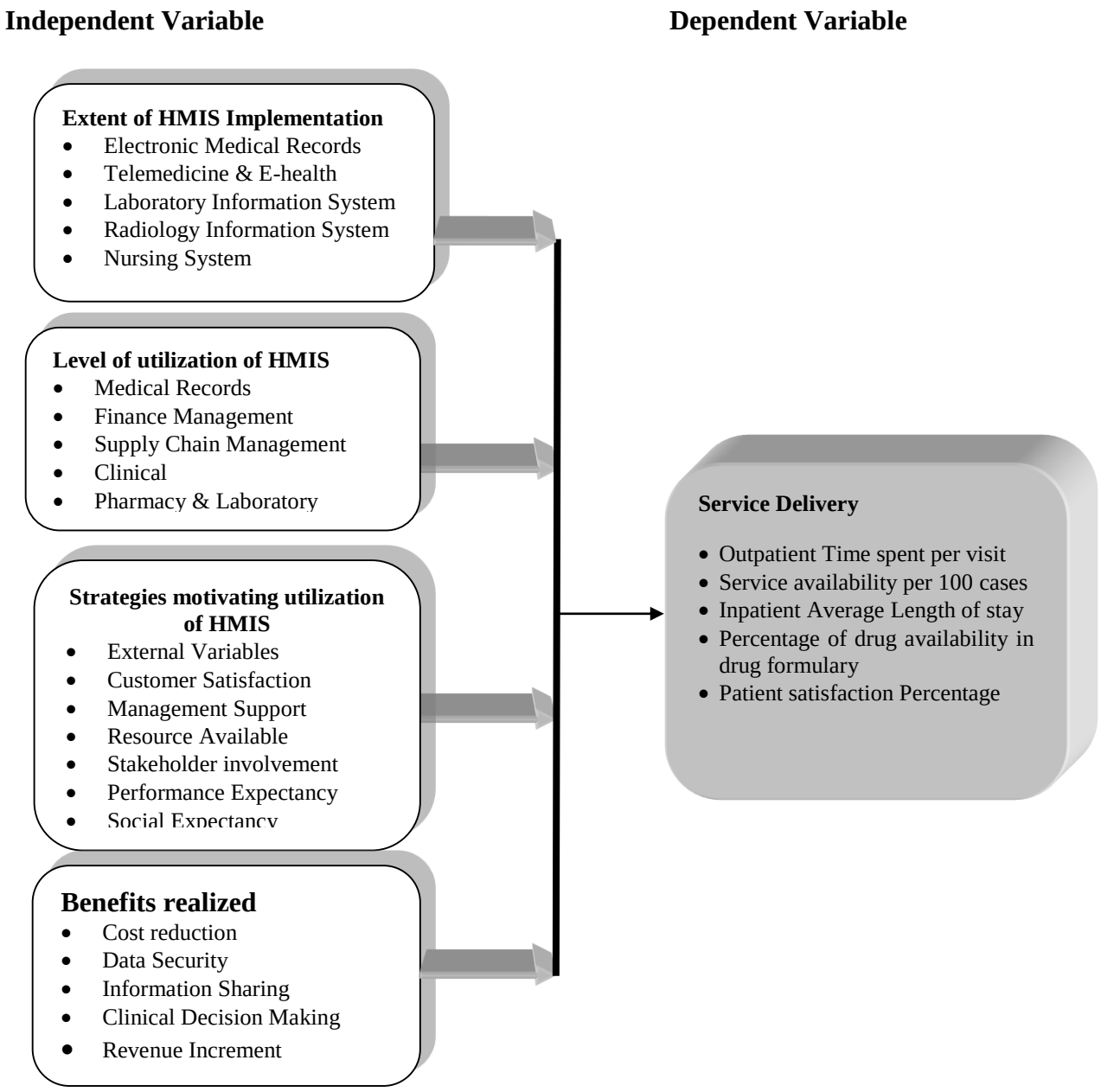


Figure 2.3 Conceptual Framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

In the chapter, the research methods and approach are reviewed considering their most appropriateness for the research, and were used in attaining the research objectives. The chapter developed the foundation of the collection of the imperative study content which is important in the development theoretical and conceptual framework. The chapter contains research design, study variables, target population, sampling techniques, preparation of data collection instruments/instrumentation, data collection procedures and methods of data analysis. In addition, the chapter presents the approach used in selecting the organization for the case study, therefore being vital towards laying out indispensable foundation for the analysis plan.

3.2 Research Design

Descriptive cross section- study design was adopted in the study with quantitative and qualitative approach. This is a research design that made it easy to obtain information of the current phenomena on HMIS for simplified analysis, presentation and interpretation through collecting information from a sample that is ultimately representative of the population, Keith (2005). The use of both qualitative and quantitative methods is to provide diverse views of the same phenomenon, and give an holistic exploration of service delivery in the health sector.

3.3 Study Variables

The dependent variable of the study was Improved Hospital Service Delivery in terms of efficiency and effectiveness, in MTRH, which was measured through Outpatient Time spent per visit, Service availability per 100 cases, Inpatient Average Length of

stay, Percentage of drug availability in drug formulary and Patient satisfaction Percentage. The independent variables were the strategies motivating utilization of Hospital Management Information Systems and the benefits that has been realized in utilizing Hospital Management Information Systems, and the level at which MTRH has been utilizing HMIS

3.4 Location of the Study

The study was conducted at Moi Teaching and Referral Hospital, which is located in The North Rift Region, Kenya, Uasin Gishu County. It is a Level Six public National Teaching and Referral Hospital at which level within the Kenyan health systems with a bed capacity of 1000 patients, mainly serving Western Kenya, Rift Valley, parts of Nyanza as well as Eastern Uganda and Southern Sudan, (MOH, 2015). The total population of the catchment area is approximately eighteen million, with the core activity of most residents being farming.

3.5 Target Population

Kothari (2008), presents that a large population from which a sample population is selected is defined as the target population. From the Hospital staff, the target population comprised of 587 staff from management and the twelve Departments in the Hospital which directly interact with the HMIS, these include; Accident & Emergency, Health Records, Public Relations, Information Communication Technology, Finance, Surgery, Medicine, Pediatrics, Laboratory, Pharmacy, Radiology, and Supply Chain Management. The staff included in the research are those staff who directly interact with the HMIS, Staff who do not directly utilize HMIS are excluded from the study.

Table 3.1: Target Population Sampling Frame

Department	Targeted Population
Management	15
Accident & Emergency	45
Health Records	124
Public Relations	60
Information Communication Technology	72
Finance	62
Surgery	16
Medicine	18
Pediatrics	24
Laboratory	35
Pharmacy	46
Supply Chain Management	58
Radiology	12
Total	**587**

Source: HRM Department

3.6 Sampling Techniques and Sample Size

Sampling means selecting a given number of subjects to represent the population. Any statements made about the sample should also be true of the population (Orodho 2008). Stratified sampling technique was used whereby the target population was divided into strata according to functional departments, thereafter sample size was determined by applying Cooper and Schindler (2011) formula. Simple random method was used to select respondents for the study from respective strata.

Below is the sample size calculation.

$n= N/(1 + N(e)^2))$

Where: n= Sample size, N= Population size e= Level of Precision.

At 95% level of confidence and P=5%, $n= 587/(1+587(0.05)^2)$ n= 240

The number of respondents apportioned to a department, was proportional to their targeted population.

Table 3.2: Sample Size Table

Department	Targeted Population	Sample Size
Management	15	6
Accident & Emergency	45	18
Health Records	124	51
Public Relations	60	25
Information Communication Technology	72	30
Finance	62	25
Surgery	16	6
Medicine	18	7
Pediatrics	24	10
Laboratory	35	14
Pharmacy	46	19
Supply Chain Management	58	24
Radiology	12	5
Total	**587**	**240**

3.7 Construction of Research Instruments

The research used questionnaires, which were administered physically, to the respondents, as well as check-list where HMIS modules were checked on implementation and utilization status. The researcher reached out to the respondents in their areas of work. The Questionnaires were used for the purpose of collecting primary quantitative data. Questionnaires were preferred since provides objectivity with limited bias resulting from the personal characteristics as explained by Earl (2010), they present some form of confidentiality to the respondent, potentials to reach out to a large number of respondents within a short time, being able to give the respondents adequate time to respond to the items.

The demographic characteristics of the respondents were captured in the first part of the questionnaire, which was added unto the questionnaire to offer the study pertinent information about the respondent's experiences and understanding of Hospital Management Information Systems.

The subsequent parts of the research instruments where structured as per the main areas of investigation, guided by the major research objectives, in that encapsulated the three dimensions of the study namely; the level of utilization of Hospital Management Information Systems medicine in Kenya, strategies motivating implementation and utilization of Hospital Management Information Systems and the benefits that have been realized in utilizing Hospital Management Information Systems. The questions were structured in a manner which enables data analysis while providing a framework for coding, so as to address research objectives. The final part of the questionnaire collected data on the service delivery using probing questions related to HMIS

implementation and utilization. Individual Interviews were also contacted where the respondents responded to structured and unstructured interviews.

3.7.1 Pilot Testing

A pilot test was carried out at the former Rift Valley Provincial General Hospital, Nakuru in June, 2017. This is due to the fact that the hospital and MTRH utilize similar HMIS software, called Funsoft, which integrates all hospital functions; both administrative and clinical, hence challenges and deficiencies in the proposed research instruments can be noted and considered early enough.

During pilot testing, the objectives were :- to assess the extent to which HMIS has been implemented in Rift Valley PGH Hospital, to examine the levels of utilization of Hospital Management Information Systems in Rift Valley PGH Hospital, to establish the strategies motivating the utilization of Hospital Management Information Systems, to determine the benefits of Hospital Management Information Systems in Rift Valley PGH Hospital and to assess the influence of HMIS on service delivery in Rift Valley PGH Hospital, Kenya.

The respondents were purposively picked from Nursing, Medical Records, Information Communication Technology, Clinical and Finance departments, which were included in the research since they directly utilize the HMIS. 10 respondents and three in-charges were randomly picked from the aforementioned departments and filled the structured questionnaire, which was hand delivered to them. The data was coded and fed into the system and analyzed in SPSS version 25. During the pilot study, irrelevant, confusing or ambiguous questions were identified and the questions rephrased without losing

meaning. The in-charges were interviewed, and the responses informed the way the actual research interview was conducted.

The challenges experienced in collecting the data, coding and analyzing the data, were used as the basis for refining and improving the final questionnaire used in the study and the pertinent issues required to explore to research problem.

3.7.2 Validity of the Instruments

Ranjit (2005), defined validity of the research instruments as the refers to the degree to which a measuring device or a test is truly measuring what it is intended to measure or measure what it purports to measure Cooper and Schinder, (2011).Validity of the research instruments highlights the relationship between the data and the variable being measured. The study collected evidence for demonstrating external validity, which is the extent to which the results of a study can be generalized from a sample to a population, by ensuring that respondents sampled are an accurate representation of a population. Content validity which refers to the appropriateness of the content of an instrument, in that the data that was collected, represents accurately what the researcher would like to know, was ensured through pilot testing. The theoretical relationships between the independent and dependent variables and comparing with the outcome of the relationships in the pilot testing determined the construct validity

3.7.3 Reliability

According to Cooper and Schindler (2011) study reliability is determining whether the research will truly measure that which it was intended to measure or how truthful the research results will be. Cronbach's alpha reliability test was used to determine the internal consistency of the question items that measured the variables of interest for this

study. Benchmark of Cronbach's coefficient value of greater than 0.7 indicates the tool was reliable to measure the variable.

3.8 Data analysis and Presentation

The data collected was encoded and entered into SPSS v25 a computerized data analysis software, Each dimension had various items measured on a 5-point Likert scale. Data analysis entailed inspecting, cleaning, transforming, and modeling the collected data with the aim of highlighting useful information, suggesting conclusions, and supporting decision-making. The relationship between the independent variables and dependent variables was determined through Regressions and Analysis of Variance (ANOVA). The regression equation is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where:

Y= Hospital Service Delivery

X_1= Level of HMIS Utilization

X_2= Motivating Strategies

X_3= HMIS Benefits

X_4 = HMIS Implementation extent

β_1, β_2, and β_3 are coefficients of determination

ε is the error term.

Qualitative data was organized into themes and analysed into descriptive thematic narratives. To convey important research findings and experience to the readers, a

written report of the research was prepared, while analyzed data was presented in terms of tables.

Quantitative data was collected through physical interview with the in-charges on the departments. 12 In-charges were identified, and face to face interview was contacted, guided by the interview guide. The informants were identified and contacted earlier before the interview through telephone, and informed of the research. The interview was contacted on the informants' physical offices during working hours, where they were informed of the objectives of the research. Informants were assured of the confidentiality. Interviews lasted for approximately 70 minutes.

The questions in the interview were clearly worded, one question was asked at ta time and the questions were neutral and open ended. In cases where responses were not clear, the informants were asked the same questions in a rephrased manner.

3.9 Ethical considerations

In order to meet the logical and ethical requirements, permission to carry out the research was sought from KeMU directorate of Scientific Ethics and Research Committee (SERC) and National Commission for Science, Technology and Innovation (NACOSTI). The researcher undertook to maintain privacy and not share any data or information provided by the respondents that might touch on or their private life or their persons. The researcher gave assurance to the respondents that no third party shall gain access to any private information. The respondents were also assured that their individual identities were not revealed whatsoever. To gain the confidence and support as well as willingness to participate by the respondents, the procedure to be followed

during data collection as well as the purpose and the nature of the research was explained to them. The researcher also sought permission from the place of work.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

This chapter describes the main results obtained by analyzing the questionnaire data. Subsequently, the research results are presented in tabular form using a variety of descriptive and inferential statistics that sets out the key characteristics of the data. Finally, the set hypotheses are tested and the results are discussed in details.

4.2 Response Level

According to the study population, there was a response rate of 80 % since data was successfully collected and coded from 192 respondents from the 240 respondents who were given the questionnaires. This gives a sufficient sample size considering the total number of staff who utilizes the HMIS system at Moi Teaching and Referral Hospital as recommended by Anderson, Sweeney and Williams (2003) who opine that a relatively large response rate gives better precision and provides a smaller margin of error.

4.3 Profile of Respondents

The study collected the demographic profile of the respondents including designation, education, and organizational role, familiarity with hospital management information system, experience working with HMIS and experience in the health sector. The profile of respondents was important towards understanding the suitability of the respondents considering their experiences and interaction with Hospital Management Information System. The results are presented in this section.

The respondents were asked to state their designation in the organization. The study found that majority of the respondents, 52.6 %(103) were staff of low cadre, while the

lowest percentage 0.5 % were top management. From the study findings, most of the respondents were designated as staff who are the persons who interact with the system directly. Heads of sections are charged with the responsibility of ensuring data integrity on their areas of coverage and overseeing the implementation and utilization of the system, hence have important data as regards influence on service delivery.

The respondents indicated the roles they played in the organization as per the organogram of the hospital. The results are as depicted in Table 4.3. It was found that majority of the respondents (55.1%) were employees with no responsibility positions in the hospital. While 31.6 are at supervisory level, management role had 31.6% of the respondents, and only 0.5% were at executive level. From the study findings, most of the respondents are employees, however the study also collected data from supervisors, managers and the senior management.

The level of familiarity with hospital management information system by the respondents was determined. The results are summarized in Table 4.4. The results indicated that 22.4% were very familiar with the HMIS, 37.8% were familiar, 21.4% had modest familiarity, 10.2% were unfamiliar, while 10.2% were very unfamiliar with the information system. It was therefore concluded that majority of the respondents were familiar with the system, hence their responses on the implementation, utilization, motivating strategies, benefits and impact on service delivery is from a familiar perspective.

Table 4.3 Familiarity with HMIS

	Frequency	Percent	Valid Percent	Cumulative %
Very Familiar	44	22.4	22.9	22.9
Familiar	74	37.8	38.5	61.5
Average	42	21.4	21.9	83.3
Unfamiliar	20	10.2	10.4	93.8
Very Unfamiliar	12	6.1	6.3	100.0
Total	192	98.0	100.0	

The study asked the respondents to indicate the length of time they have been working in the health sector. Table 4.5 summarizes the results. Results indicated that 14.8% had below five years experience, 37.0% had 6-10 years, 30.7% had 11 to 15 years experience, 10.4% had 16 to 20 years' experience in the health sector, while 6.8% had over 20 years experience. Hence majority had over 6 years experience in the health sector.

The respondents were required to respond to an item on the number of years that have worked with the Hospital Management Information System. 4.7% indicated that they had below one year experience with the Hospital Management Information System, 8.3% had 1 to 2 years, 9.9% had 3 to 4 years, majority, 71.9% had between 4-5 years' experience, while 5.2% had above 5 years' experience with the Hospital Management Information System. The fact that most respondents have 4-5 years' experience with HMIS can be related to the duration to which the system has been progressively used in the Hospital.

4.4 Descriptive Statistics of the Study Variables

Descriptive statistics of standard deviation, standard errors and means were obtained for the variables implementation of Hospital Management Information System, Utilization of Hospital Management Information System, and Strategies for

Implementation of Hospital Management Information System, Benefits of Hospital Management Information System, and Service Delivery. The results are presented in this section.

4.4.1 Extent of Implementation of Hospital Management Information System

As per the first objective, data was collected to determine the extent of implementation of Hospital Management Information System in MTRH. A number of factors which impact on the extent of implementation were tested.

The research tested to understand the involvement of stakeholders in the HMIS implementation, respondents were asked to indicate whether they strongly agreed, agreed, neutral, disagreed or strongly disagreed with the statement on stakeholder involvement. 48.4 Percent of the respondents were uncertain if all the stakeholders were involved as presented in Table 4.4. None of the respondents strongly agreed nor strongly disagreed on the involvement of all stakeholders.

Table 4.4: Involvement of all stakeholders in HMIS implementation

		Percent	Cumulative Percent
Valid	Disagree	12.5	12.5
	Uncertain	48.4	60.9
	Agree	39.1	100.0
	Total	100.0	

In HMIS implementation, stakeholders are varied including the patients, patient caretakers, the community served by the Hospital, Hospital staff, the vendors of the system, the management, the Board, government agencies including ministry of Health, Ministry of ICT and Ministry of Health as well as regulatory bodies such as Pharmacy

and Poisons Board, Communications Authority or Kenya, Office of the Auditor General, County Governments and collaborating institutions and Hospitals. Various stakeholders have differing needs and expectations, HMIS implementation had to balance the competing stakeholder demands to have a common strategic direction for HMIS success. According to Kumar and Aldrich (2011), stakeholder involvement is an important undertaking where, systems implementation tends to achieve better outcomes when all the stakeholders are appropriately involved, fostering user satisfaction; failure to involve all stakeholders results to higher resistance to the change, therefore impeding the implementation of the system.

The study sought to understand the regulatory environment existing on HMIS implementation. The respondents were asked to indicate their perceptions on how the regulatory environment fosters the implementation of HMIS. Most of the respondents 41.7 % agreed that there is optimum regulatory environment to foster HMIS implementation. A substantial proportion of 40.6 % were uncertain.

Table 4.5: Optimum regulatory environment to foster HMIS implementation

		Frequency	Percent	Cumulative Percent
Valid	Disagree	23	12.0	12.0
	Uncertain	78	40.6	52.6
	Agree	80	41.7	94.3
	Strongly Agree	11	5.7	100.0
	Total	192	100.0	

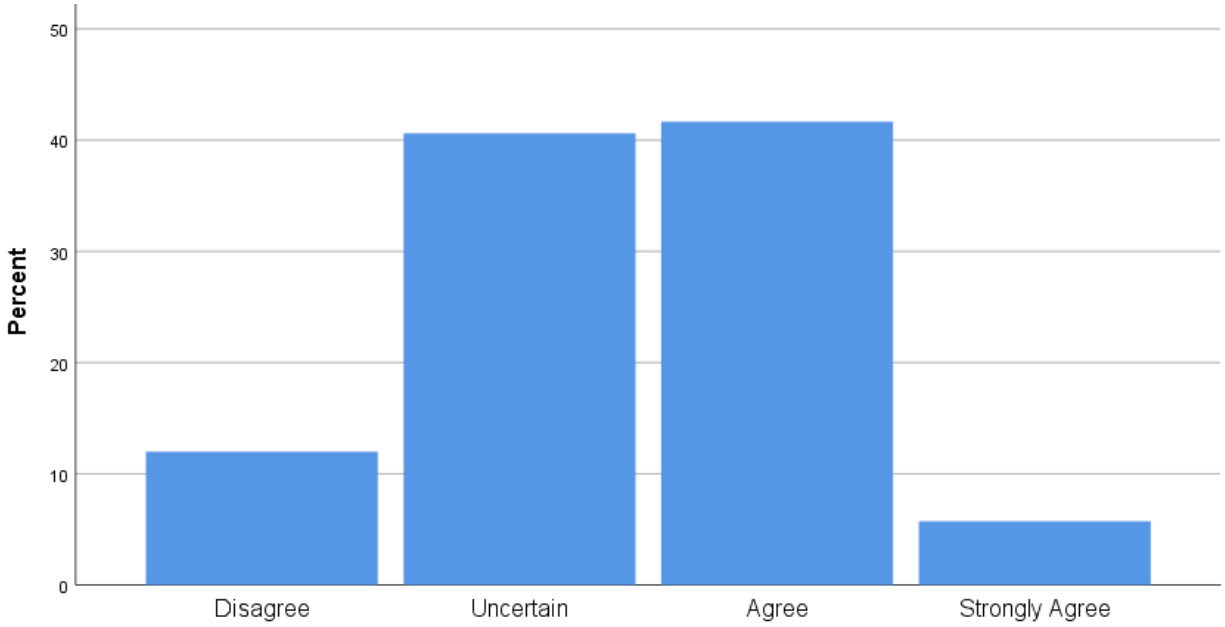


Figure 4.1 Optimum regulatory environment

Systems implementation is affected by the existing laws, policies and regulations. There are various laws impacting on HMIS implementation including Access to Information Act, 2016, Health Act No. 21 of 2017, Computer Misuse and CyberCrimes Act No 5 of 2018, which all foster utilization of technology in service delivery while ensuring that health service providers take sufficient technical and organizational steps to prevent misuse of the data. Various government policies including Kenya National eHealth Policy 2016-2030, Kenya Health Policy 2014- 2030, Kenya National eHealth strategy 2011-2017 and Kenya Standards and Guidelines on mHealth Systems of April, 2017. The policies are geared towards utilizing existing and emerging technologies to deliver health services to Kenyans. The research findings are in agreement with the objectives of the policies that the existing regulatory environment fosters HMIS implementation. A number of respondents may be unaware of the aforementioned laws and policies as attested by the significant number of respondents who were uncertain of the regulatory environment.

The study sought to establish the extent of HMIS implementation in MTRH through establishing the compatibility of MTRH HMIS with other HMIS of referring/collaborating Hospitals. Respondents were asked to indicate whether they strongly agreed, agreed, neutral, disagreed or strongly disagreed compatibility of MTRH HMIS with other HMIS of referring/collaborating Hospitals. 39.6 % of the respondents were uncertain of the compatibility while 0.5 % strongly disagreed that the HMIS were compatible. Cumulatively, 53.6 % of the respondents affirmed that the systems are compatible.

Table 4.6: HMIS Implementation in MTRH is compatible with other referring/collaborating Hospitals

		Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	.5	.5	.5
	Disagree	6.3	6.3	6.8
	Uncertain	39.6	39.6	46.4
	Agree	30.7	30.7	77.1
	Strongly Agree	22.9	22.9	100.0
	Total	100.0	100.0	

Compatibility of HMIS software is important considering that patients can be referred from one facility to another. With compatibility, patient data, can be transferred effectively. The research findings are in support of the global direction of HMIS compatibility where In Europe, the implementation of HMIS is supported by the European Commission, with need to expedite e-health systems cross-border interoperability within Europe and globally. This is driven by the European Union Directive 2011/24/EU, which put in place the basis and the principles for the rights of

the patients in cross-border healthcare, which is intended to ensure that all the member countries are able to access online patient records anyplace in Europe by 2020. In Kenya, HMIS interoperability and compatibility is bolstered by policy documents including including Kenya National eHealth Policy 2016-2030, Kenya Health Policy 2014- 2030, Kenya National eHealth strategy 2011-2017 and Kenya Standards and Guidelines on mHealth Systems of April, 2017.

The study sought to establish if the HMIS Implementation was in agreement with the Hospital's strategic plan. 49 % of the respondents agreed that HMIS implementation agreed with the hospital's vision and strategic plan, while 5.7 % strongly agreed.

Table 4.7: HMIS implementation agreed with the hospital's vision and strategic plan

		Percent	Valid Percent	Cumulative Percent
Valid	Disagree	12.5	12.5	12.5
	Uncertain	32.8	32.8	45.3
	Agree	49.0	49.0	94.3
	Strongly Agree	5.7	5.7	100.0
	Total	100.0	100.0	

In order to understand the extent of HMIS implementation, and important basis to gauge is the implementation in relation to organizational goals, vision and vision. This is presented in the strategic plan, strategic plan is a management tool which dictates organizational direction in a given time period and ensure stakeholders work towards the common goal. MTRH has a five year strategic plan 2017-2022 and automation is a core component of the plan, HMIS implementation is therefore vital towards

achievement of the set objectives and is in agreement with the strategic plan. The research outcome, agree with the findings that the success of implementation of information systems is better realized when the implementation is in synch with the organizational goals, vision, objectives and values.

In order to determine the most pronounced aspect in the implementation of HMIS, descriptive, specifically mean and standard deviation, were used. Since 'Strongly agree 'was coded as 5, it meant that mean was calculated out of 5. The descriptive statistics are as shown in Table 4.8. The mean values were in the range 3.3 to 3.8, on a five point likert scale was slightly above average.

Table 4.8: Extent Implementation of Hospital Management Information System

The Implementation of HMIS Information:	Mean	SD
Involved all the stakeholders	3.3	.67
Covered all the core areas in the hospital	3.5.	.74
Had optimum environment to foster its implementation	3.5	.77
Was fostered by the current Kenyan laws	3.5	.84
Meets global standards	3.3	.80
Is compatible with other referring/collaborating Hospitals	3.7	.89
Has Timely provision of information at each stage	3.8	.73
Agreed with the hospital's vision and strategic plan	3.5	.79
Effectively automated all the hospital's functions	3.4	.78

The involvement of all stakeholders during implementation and has HMIS meeting global standards had the lowest mean (3.3) of all the implementation concepts. This provides room for stakeholder involvement as well as the systems meeting global

standards so as to foster the implementation extent. The timely provision of information at every stage had the highest mean of (3.8) respondents moderately agreed that the implementation of Hospital Management Information System in MTRH was implemented with timely provision at every stage, which is a driving force.

The low standard error values compared to the mean meant that the mean was reliable, (Víctor, 2006).

Extend of Implementation of HMIS Modules

Further, as per the first objective, the study examined into the extent of implementation on the modules in various service points in the hospital. The results are captured in Table 4.9. Records module had the highest implementation level with a mean of 4.0 on a five point likert scale and majority agreed that the module had been implemented. On the other hand consulting doctor module posted the lowest mean of 2.1.

Table 4.9: Implementation of Hospital Management Information System Modules

Module	Not Implemented	Partially Implemented	Moderately Implemented	Implemented	Completely Implemented	Totals	Mean	SD
Records	2.1%(4)	7.8%(15)	19.8%(38)	37.5%(72)	32.8%(63)	100%(192)	4.0	.96
Inpatient	1%(2)	31.8%(61)	37%(71)	21.9(42)	8.3%(16)	100%(192)	3.0	.95
Pharmacy	0%(0)	18.8%(36)	17.7%(34)	33.3%(64)	30.2%(58)	100%(192)	3.8	1.1
Laboratory	19.8%(38)	15.1%(29)	36.5%(70)	17.2%(33)	11.5%(22)	100%(192)	2.9	1.2
Radiology	17.2%(33)	14.1%(27)	31.8%(61)	19.8%(38)	17.2%(33)	100%(192)	3.1	1.3
Consultation	33.9%(65)	32.8%(63)	22.9%(44)	7.3%(14)	3.1%(6)	100%(192)	2.1	1.1
Finance Mgt	1.6%(3)	9.9%(19)	12.0%(23)	53%(101)	24.0%(46)	100%(192)	3.9	.94
Supply Chain	7.3%(14)	18.8%(36)	24.0%(46)	33.9(65)	16.1%(31)	100%(192)	3.3	1.2

Key: Figures in parentheses indicates the frequency or number of respondents

Records module is a core component of HMIS which encompasses several functions such as Patient Registry, attendance reports, patient bookings, clinic attendance reports, Morbidity and mortality tracking and patient statistics as and when needed. The

Inpatient module offers several functionalities including Patient billing/invoicing, Ward procedures, Bed management, and In-Patient ward occupancy/load reports. Pharmacy module is utilized in pharmacy management and has drug inventory, drugs stock level adjustments, prescription adjustments, drugs requisition and purchase analysis, Order generation and printing, drug dispensing and consumption reports.

The finance module provides for Full Accounting and Financial Management Information system, Cash Collection, Billing/Invoicing and General Ledger, Treasury, Banking, revenue and expenditure reporting, Petty cash/Imprest management, Votebook management, audit reports, income statements, trial balances, Budgeting and finance reporting. The Consultation module provides core clinical functionalities including patient triage, patient clerking, ward procedures, telemedicine, patient follow up and doctors' consultation.

Interview with the respondents highlighted that HMIS implementation in Kenya and more specifically MTRH has experienced fundamental growth. The extent of HMIS implementation impacts on service delivery with the areas where HMIS implementation has progressed reporting better service delivery has captured by informant "*with enhanced implementation of the electronic medical records module in the HMIS, there is enhanced service delivery, since patients' information can be availed as and when required, from the system, without the need to go through several physical files, therefore reducing Outpatient Time spent per visit"* Informant 6 (Records Officer)

The level of implementation was further highlighted by informants who perceived that the HMIS implementation is a driver towards reduced average length of stay by the patients. The participants highlighted that with HMIS, there is a complete view of the

patient from any connected terminal hence clinicians are empowered to make more informed decisions.

This is further highlighted in areas where there was limited implementation of HMIS, where a participant heighted that "*Our service to the patients is still limited by the fact that we cannot effectively collaborate with the counties on referrals since Telemedicine has not been implemented fully, limiting the services available on referrals*" Informant 17, (Clinician)

Whereas there are various modules that constitute successful HMIS implementation as pointed out by Staggers & Snyder, (2011), the perception of most respondents that Records Module is the leading module among other modules, points out to a common implementation path, where the core modules which are paramount for patient data are first of all implemented before subsidiary modules. It also points out that aspects that are considered clinical in nature are least implemented in the Hospital. In MTRH, the consultation module has the least implementation mean, followed by laboratory and the inpatient module, suggesting that the functions which are clinical in nature area given less consideration in regards to automation.

The research findings highlight that implementation of HMIS in MTRH has adopted a progressive approach where some modules have been comprehensively implemented, while other modules have basic functionalities implemented. Core modules which are directly related to the interaction between the patient and the clinician have a low percentage of implementation. The findings support Alvarez, (2002) who points out that effective and efficient service delivery is achieved when all the information system modules are in synch, therefore to achieve ascribed benefits, MTRH has to foster the

percentage of the implementation all the modules, and being an healthcare institution, there is need to focus on clinical modules.

4.4.2 Utilization of Hospital Management Information System

As per the second objective of this study, the level of utilization of HMIS was determined and the results are depicted in Table 4.10.

The study sought to understand the extent of HMIS utilization through understanding if adequate measures were put in place to monitor and control the progress of the implementation and utilization of HMIS. Respondents were requested to respond through 5 point likert scale on their perceptions on monitoring and control on the implementation and utilization progress. 41.7 % of the respondents agreed that there were adequate measures in place to monitor and control the progress while none of the respondents strongly disagreed.

Table 4.10: Adequate measures were put in place to monitor and control the progress of the implementation and utilization of HMIS

		Frequency	Percent	Cumulative Percent
Valid	Disagree	23	12.0	12.0
	Uncertain	78	40.6	52.6
	Agree	80	41.7	94.3
	Strongly Agree	11	5.7	100.0
	Total	192	100.0	

The response is graphically presented in Figure 4.2

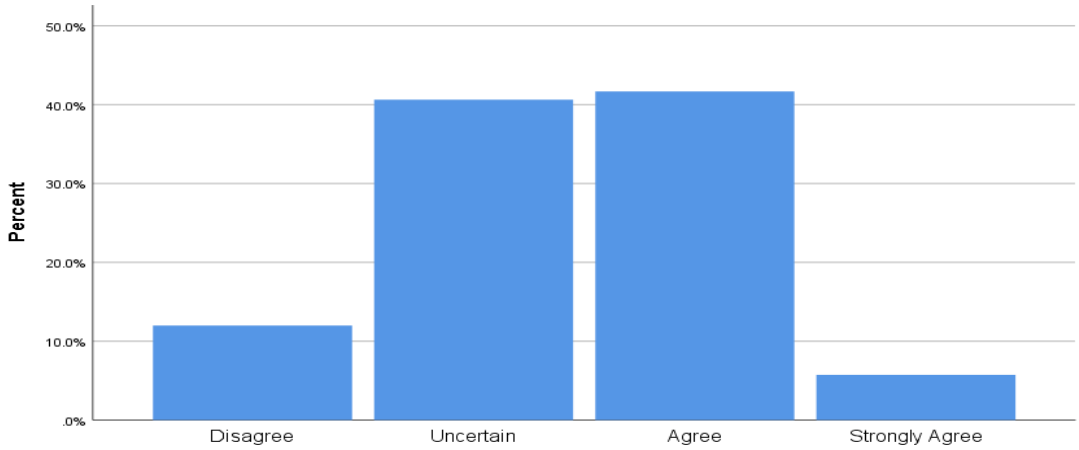


Figure 4.2: Measures were put in place to monitor and control the progress of the implementation and utilization of HMIS

The findings show that the management put in place sufficient processes, to monitor and control the progress of the utilization of HMIS. Monitoring and control is vital to enable making of informed decisions on the current and future status of the Information System, having accountability on the resources utilized, learning from experiences and continual improvement. Monitoring and control enabled the institution to check the progress of the utilization of the systems against plans.

To understand the HMIS utilization level, respondents were asked to rank their agreement on whether effective and sufficient training programs were drawn for the users. 46.88 % of the respondents were uncertain if whether effective and sufficient training programs were drawn for the users, non of the respondents strongly disagreed, while 8.85 % strongly agreed.

Training and development is an important aspect in attaining better utilization of an information system. Without proper training, users fail to gain confidence on systems utilization, and make severe mistakes which can compromise service delivery. In MTRH setup, the hospital made deliberate efforts to empower all the users to be able to utilize the system. HMIS was a new system, most of the users may have failed to gauge

whether the training was effective and sufficient since they did not have a comparative basis.

The respondents were asked to indicate their agreement in a number of factors which determine the extent of HMIS utilization. The result indicates that the mean values were above average on a five point likert scale having a range of 3.2 to 4.1. The low standard deviation indicates that the responses had low variability. The presence of technical committee to oversee HMIS utilization is the has the highest mean as a factor of utilization of HMIS at mean of 4.1, while the utilization of HMIS being well executed had the lowest mean at 3.2.

Table 4.11: Utilization Level of Hospital Management Information System

	HMIS :	Mean	SD
UT1	Utilized in all the core areas	3.3	.67
UT2	Has replaced legendary systems	3.5	.74
UT3	Has measures were put in place to monitor utilization	3.4	.77
UT4	Utilization is well executed.	3.2	.84
UT5	Is accompanied by Effective and sufficient training	3.4	.80
UT6	Has Risk management policies, processes and procedures	3.7	.88
UT7	Has Required and reliable infrastructure was	3.4	.66
UT8	Spearheaded by Technical committee to oversee	4.1	.71
UT9	Has captured all the functionalities in the hospital	3.4	.68

For a system to be fully utilized, there are several primary have to be in place. The mean exceeds the average suggesting that the HMIS has been utilized in all the core areas of

the Hospital, replaced legendary systems, measures were put in place to monitor utilization, Risk management policies, processes and procedures were put in place to foster utilization, there was a technical committee overseeing the implementation and there was the required infrastructure.

Level of Utilization of Modules

Further, as per the second objective, the study researched into the extent of utilization of the modules in various service points in the hospital. The results are captured in Table 4.11. Records module had the highest utillization level with a mean of 3.8 on a five point likert scale and majority agreed that the module had been adequately utilized. On the other hand consulting doctor module posted the lowest mean of 2.0 on utilization level.

Table 4.12: Utilization of Hospital Management Information System Modules

Module	Not Utilized	Rarely Utilized	Moderately Utilized	Utilized	Highly Utilized	Totals	Mean	SD
Records	4.2%(8)	9.4%(18)	19.8%(38)	35.9%(69)	30.7%(59)	100%(192)	3.8	1.1
Outpatient	13.0%(25)	18.2%(35)	24.0%(46)	26.0%(50)	18.8%(36)	100%(192)	3.1	1.3
Inpatient	29.7%(57)	17.7%(34)	33.3(64)	15.1%(29)	4.2%(8)	100%(192)	2.5	1.2
Pharmacy	3.1%(6)	8.9%(17)	30.7%(59)	26.0%(50)	31.3%(60)	100%(192)	3.7	1.1
Laboratory	21.4%(41)	14.6%(28)	41.1%(79)	14.6%(16)	8.3%(16)	100%(192)	2.7	1.2
Radiology	22.9%(44)	15.1%(29)	26.6%(51)	17.2%(33)	18.2%(35)	100%(192)	2.9	1.4
Consultation	35.4%(68)	35.9%(69)	20.3%(39)	6.3%(12)	2.1%(4)	100%(192)	2.0	0.1
Finance Mgt	2.6%(5)	23.4%(45)	14.1%(27)	51.0%(98)	8.9%(17)	100%(192)	3.4	1.0
Supply Chain	8.3%(16)	17.7%(34)	27.1%(52)	31.8%(61)	15.1%(29)	100%(192)	3.3	1.2

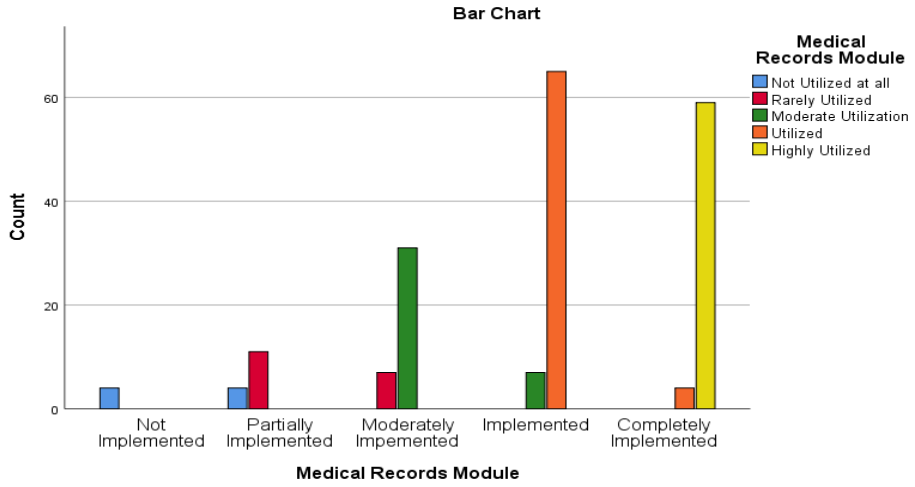
Key: Figures in parentheses indicates the frequency or number of respondents

Table 4.13 Cross-tabulation on implementation and utilization of HMIS Records Module

			Medical Records Module					
			Not Utilized at all	Rarely Utilized	Moderate Utilization	Utilized	Highly Utilized	Total
Medical Records Module	Not Implemented	Count	4	0	0	0	0	4
		% of Total	2.1%	0.0%	0.0%	0.0%	0.0%	2.1%
	Partially Implemented	Count	4	11	0	0	0	15
		% of Total	2.1%	5.7%	0.0%	0.0%	0.0%	7.8%
	Moderately Impemented	Count	0	7	31	0	0	38
		% of Total	0.0%	3.6%	16.1%	0.0%	0.0%	19.8%
	Implemented	Count	0	0	7	65	0	72
		% of Total	0.0%	0.0%	3.6%	33.9%	0.0%	37.5%
	Completely Implemented	Count	0	0	0	4	59	63
		% of Total	0.0%	0.0%	0.0%	2.1%	30.7%	32.8%
Total		Count	8	18	38	69	59	192
		% of Total	4.2%	9.4%	19.8%	35.9%	30.7%	100.0%

A cross-tabulation of the Implementation and utilization of the Medical records module shows most respondents who felt that records module has been Records Module has not been implemented also felt that the module is not utilized at all (2.1 % respondents), Most respondents who felt that the Records Module has been partially implemented where also of the opinion that the module is rarely utilized (5.7 % respondents), 16.1 % respondents who felt that the module is moderately implemented also where of the opinion that it is moderately utilized, most of the respondents (33.9%) who felt that the module has been implemented also of the opinion that the module is utilized and of the respondents who answered that the Records Module has been completely implemented most of them where of the

opinion that the module is highly utilized. This is graphically represented in the figure 4.4 below.



Interviews conducted with key informants, indicate that a number of Hospital Management Information System utilization factors impact on service delivery. The interview responses are in agreement with the quantitative data results.

The level of utilization of HMIS has an influence on the Service delivery with the participant describing that "*We have realized better client satisfaction with the Radiology Information System, we no longer have to travel to the radiology reporting room to see physical printouts of CT Scans, we can access them from the comfort of my computer, and give the patients results quickly*" Informant 14 (Radiographer)

From the research findings, whereas there exists relationship between Records Module implementation and Records Module Utilization, HMIS implementation does not necessarily mean utilization. This is in agreement with Ford & Evans, (2006) who opines that in organizations a number of systems are implemented, this does not however guarantee the utilization of such systems.

4.4.3 Strategies Motivating Utilization of HMIS

Considering the third objective of the study, the strategies motivating the utilization of HMIS was studied. Respondents were asked to indicate their level of acceptance on the strategies that have been deployed to motivate HMIS utilization. The data collected was analyzed and the results summarized in Table 4.12. Results indicate that the strategy of HMIS utilization is the most deployed strategy with a mean of 3.73, while allaying perceptions and fears among staff on the use of HMIS follows with a mean of 3.49. Legal and regulatory changes is the least important factor in motivating HMIS use with a mean of 3.15.

Table 4.12: Strategies Motivating Utilization of HMIS

	Mean	SD
The hospital allays fears and Perceptions and fears on use of HMIS	3.49	.74
HMIS modules performs the functions, it was programmed to perform	3.41	.77
Utilization of HMIS has management support	3.16	.84
The hospital has skilled workforce to implement and utilize HMIS	3.39	.80
The hospital has strategy guiding utilization of HMIS	3.73	.88
There have been sufficient resources to implement and utilize HMIS	3.27	.74
Legal and regulatory changes motivate HMIS use	3.15	.95
Global standards motivate HMIS utilization	3.20	.71

The adoption of Systems is dependent on various factors. Implementation of information systems without a guiding strategy is a recipe for systems failure. The common driving force for utilizing the HMIS system is the presence of a guiding

strategy, which is in agreement with the organizations strategic plan. The Information Systems strategy aligns the organizations business needs with the information system development, and presents a roadmap in which the systems drive organizational goals. The presence of Information systems strategy as a driving force in HMIS utilization, information systems enable effective and efficient achievement of organizational core vision when there is an existing strategy document to provide direction.

Systems utilization is highly dependent on the acceptability of users. A large number of systems fail due to the users having negative perceptions and amplifying system implementation challenges while failing to appreciate the efficiency of the systems. The strategy of dispelling fears and Perceptions that users have, works in enhancing system acceptance, this also reduces on resistance where most users perceive that the systems may disrupt the status quo.

The findings from analysis is in agreement with the responses received on the interviews, High percentage of drugs availability in drug formulary is a motivating factor driving the utilization of HMIS. This was captured thus "*With the implementation of HMIS in the Pharmacy, we are able to check all the drugs available in all pharmacies in the hospital and effectively keep the re-order levels, hence ensuring that patients are assured of drugs availability since HMIS aids in decision making while ordering drugs"*(Informant 4, Pharmacy). Furthermore, informant 27, (Records) added that "*The management is keen in ensuring that the average patient length of stay is reduced, to avoid keeping the patients unnecessarily in the Hospital, HMIS has enabled generation of accurate Daily Bed returns"*

The research findings are in agreement with the results published by Oboth, (2011) that implementation and utilization of systems should have a driving force, where the

person's implementation or users have perceived benefits from successful implementation.

4.4.4 Benefits of HMIS to MTRH

The fourth objective of the study was to determine the benefits of HMIS. Data collected was analyzed and the results are presented in Table 4.12. The respondents indicated that the anticipated benefits of HMIS were all in the range of 2.85 to 3.56 on a 5-point likert scale. This is above the average point and hence it was concluded that HMIS had some accrued benefits to the hospital as indicated in Table 4.12. The low standard deviation indicates that the responses had low variability.

Table 4.13: Benefits of HMIS

	Mean	SD
Utilization of HMIS has increased revenue collection in the hospital	4.50	.95
Utilization of HMIS has resulted to comprehensive follow-up of both inpatient and outpatient	3.20	1.01
In the pharmacy with HMIS there is no loss of drugs, while drugs can be traced to the patient and complete drug reports available	3.13	.96
With HMIS laboratory and radiology, specimens can be traced to the patient	3.04	.98
Payment of creditors and billing of patients is prompt and accurate.	3.04	1.12
Implementation of HMIS nursing can triage patients and doctors clerk in patients electronically, effectively	3.56	1.03

The research findings highlight that all the expected benefits of HMIS implementation have a mean greater than the average, suggesting that HMIS implementation benefits can be felt by the respondents. The benefit of Utilization of HMIS has increased revenue collection in the hospital is affirmed by the Annual Financial returns where the Hospitals revenue have grown from One Billion annually before the implementation of HMIS to Three billion in 2017/2018 Financial year. Further, the benefit of doctors and nurses being able to triage patients more effectively can be observed from the Turn-Around-Time in the Hospitals annual as well as the number of patients served. Utilization of HMIS has resulted to comprehensive follow-up of both inpatient and outpatient is a benefit that the hospital has experienced with the patient data being available electronically and with the integration, enhanced patient care is achieved. This is in agreement with Avedis (2002), who opines that electronic health gives the patients the flexibility and empowers the patients to have access to their medical information regardless of the geographical location. With enhanced empowerment, the clients are involved in the decision making process.

There were varied views on the benefits of HMIS on service delivery from the interviewees, some respondents felt that "*We though HMIS shall be the panacea of service delivery challenges in the Hospital, we are still experiencing customer complaints even with the implementation of HMIS*", (informant 32, Public Relations), however a number of respondents were contented that with "*HMIS Implementation, information is available as and when required, therefore enhancing clinical decision making,* (informant 9, Clinical). In addition, (Informant 8, Finance) was of the opinion that *"With HMIS implementation, the Hospitals chart of accounts and user fee manual is clearer, therefore enhancing revenue generation"*

4.4.5 Service Delivery in MTRH

The dependent variable in this study was service delivery. It was therefore imperative to measure the level of this variable at the hospital. Table 4.13 indicates service delivery at the hospital. From the items used to measure level of service delivery in the hospital, the means were in the range 3.16 to 4.00 0 on a 5-point likert scale. This indicated that the level of service delivery was above the average mark of 2.5 on a 5-point likert scale. The item on fewer complaints and increased revenue collection as a measure of service delivery posted the highest mean of 4.00 and 4.50 respectively.

Table 4.14: Service Delivery metrics

	Mean Statistic	Std. Deviation Statistic
Shorter outpatient time spent	3.27	.67
Improved service per 100 cases	3.49	.74
Shorter inpatient length of stay	3.41	.77
High percentage of drugs availability in drug formulary	3.16	.84
High patient satisfaction level	3.39	.80
Ease of service delivery	3.73	.88
Fewer complaints from patients	4.00	.63

There are various metrics to define what constitutes service delivery in the health sector. Patients would like to be offered services and spend the least amount of time at the health facility. With manual systems, there is no integration of the various service areas hence interoperability does not exist, leading to long waiting times. With HMIS, the turnaround time is drastically reduced, while patient data is easily retrieved and available service providers are empowered to make decisions, this improves the service availability in the health facility.

Patients visiting health facility hope to get all the medications prescribed to them. Due to sparse nature of drugs available, countries maintain drug formulary. World Health

Organization maintains the Essential medicines list, while the country Kenya Essential Medicine List. MTRH maintains a drugs formulary which are prescription drugs offering the greatest overall value. With HMIS, the hospital can actively maintain a list of available drugs, and clinicians have a platform where they can check on the available drugs at the pharmacies, hence enabling better drug availability as per the formulary.

Customer satisfaction is an important factor in evaluating service delivery. According to Bansal (2004), customer satisfaction can be used as the primary measure on service delivery since it measures the extent to which products and services offered by an organization meets or exceeds customer expectations. The research findings that use of HMIS leads to less complains from patients agrees with the presentation of Bansal (2004), who opines that customer satisfaction is a Key performance Indicator of service delivery.

Validity and Reliability Tests

It is of paramount importance to assess the research instrument to understand the accuracy of the relationship between the essential characteristics that the research instrument is trying to measure and the measure so as to gauge the validity and reliability of a research instrument. The research instrument should assure valid and reliable outcome.

4.5.1 Content Validity of Study Measures

McQueen and Christina, (2002) presents that the degree at which the questions from the research instrument and the scores from the responses are representative of all the possible questions that could be asked about the subject area, defines content validity.

Content validity is the extent to which the questions on the instrument and the scores from these questions represent all possible questions that could be asked about the content or skill

Content validity refers to the adequacy of indicators to measure the concepts. This approach addresses the question in full content of a definition represented in a measure. The content validity of a scale asks whether the scale items are truly measuring what they are supposed to measure. The better the scale items measure the domain of content, the greater the validity. An assessment of content validity requires a panel of experts to attest to the content validity of each instrument.

Content validity is said to be good when the research instrument has a representative sample of the universe of the area under research. In order to ensure content validity, previously validated measures were pretested and the preliminary questionnaire was pre-tested on a pilot set of respondent for comprehension, logic and relevance.

As recommended by Keith (2007), respondents' attitudes and reactions, the questionnaire pre-tests were done through personal interviews. During the pre-tests various aspects of the questionnaire including understanding of the instructions, difficulty of the questions, form and layout, sequence, wording and question content were pre-tested. The recommendations of the pretest were used in the revision of the final questionnaire before administering to the study respondents.

4.5.2 Reliability.

Anderson, Sweeney and Williams (2003) presents that the closer the reliability coefficient gets to 1.0, the better since reliability is the extent to which a research instrument is free from random error, this is the consistency of a measure. Finding the

Cronbach's alpha is a method of measuring reliability using internal consistency. The internal reliability for the measures from the research findings indicated a reliability coefficient of .665 on strategies motivating HMIS implementation, to .925 on measure of service delivery. Anderson, Sweeney and Williams (2003) suggest that Cronbach's alpha value of 0.60 is the lower limit of acceptability. McQueen and Christina (2002) present that benchmark of Cronbach's coefficient is indicated to be reliable to measure the variable when it is greater than 0.7. From the results tabulated in Table 4.14, alpha coefficient for all the variables ranged from .665 to .925, indicating the reliability of the scales utilized in the study.

Table 4.15: Cronbach's alpha Reliability coefficient

Variable	Constructs	No of items	Alpha
HMIS	Implementation	9	.764
	Utilization	9	.778
	Strategies Motivating Utilization	12	.665
	Benefits of HMIS	6	.790
Service Delivery	-	12	.923

Test of Regression Assumptions

As a precursor for regression analysis, there was need to determine if the data meets the assumptions of ordinary least square (OLS) are met.

Test of Normality

To determine the normality of the data distribution for the variables under research, the study skewness and kurtosis and were used. Hair et al. (2010) presents that between -1.00 and +1.00 is the requisite range for normally distributed data. From the study findings presented in Table 4.16, the skewness statistic ranged from .282-.827 while the

kurtosis statistic ranged from -.199 to -.963 for kurtosis. The distribution for the data for HMIS Implementation, HMIS utilization, Motivating strategies, HMIS benefits and Service Delivery was therefore normal.

The normality of the distribution for the variables was determined through Kolmogrov-Smirnov test. The distribution of the study sample is not significantly diverse from normal distribution when the comparison of the scores in the sample is not non-significant (p>0.5) hen compared with a normally distributed set of scores with the same mean and standard deviation. The results of the K-S test were as indicated in Table 4.17. The K-S test statistic for the variables HMIS implementation, HMIS utilization, Motivating strategies, Benefits of HMIS and service delivery were not significant (p>0.05) and it was concluded that the variables are normally distributed. Statistical tests such as correlation and regression that assume normality of these variables as defined by Hanson, (2006), can be used since the key variables did not deviate significantly from normal distribution.

Table 4.17: One-Sample Kolmogorov-Smirnov Test Results

		Implementation	Utilization	Strategies	Benefits	Service Delivery
N		192	192	192	192	192
Normal Parameters'	Mean	3.8460	3.6033	3.5464	3.5072	3.1259
	SD	.95960	1.02612	1.22850	1.05684	1.45470
Most Extreme Differences	Absolute	.158	.142	.087	.102	.124
	Positive	.156	.141	.087	.102	.124
	Negative	-.158	-.142	-.036	-.098	-.081
KS- Z		2.630	2.361	1.453	1.702	2.065
Asymp. Sig. (2-tailed)		.670	.0790	.069	.089	.098

4.6.2 Multi-collinearity Diagnostics

When there exists a linear relationship between two or more of the explanatory/independent/ variables in regression causes collinearity. Variance Inflation Factors (VIF) was used to assess Multi-collinearity while considering the suggestion of Kleinbaum et al. (1988), that Variance inflation factor of 10 should have a threshold of 10. The variance inflation factor values for Strategies motivating HMIS utilization was 1.132, Service Delivery was 1.74, and the highest variance inflation factor was 2.597 on the implementation of HMIS. All the VIF are less than the set threshold which indicate that multi-collinearity was not an issue. The results are presented in Table 4.19.

Table 4.18: Collinearity Statistic for variables

Variables	Tolerance	VIF
Implementation	.385	2.597
Utilization	.301	3.318
Strategies Motivating Utilization	.883	1.132
Benefits of HMIS	.605	1.652
Service Delivery	.574	1.74

Source: survey data (2018)

Correlation Analysis of Study Variables

Pearson correlation analysis was conducted used to examine the relationship between the variables. According to MAcnee and McCabe (2008) correlation coefficient should

Table 4.19: Correlation coefficients

	1	2	3	4	5
1. Service Delivery	1				
2. HMIS Implementation Level	.754**	1			
3. HMIS Utilization Level	.834**	.775**	1		
4. HMIS Motivation Strategy	.437**	.354**	.219**	1	
5. HMIS Benefits	.602**	.372**	.568**	.315**	1

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

4.5 Effect of HMIS on service delivery

Regression Results

The study sought to investigate the effect of HMIS on service delivery. The hypothesis (H_{01}) stated that HMIS has no significant effect on service delivery. The results are presented in Table 4.20.

Table 4.20: Regression Results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.887[a]	.787	.783	.09942

ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	6.837	4	1.709	172.917	.000[b]
	Residual	1.848	187	.010		
	Total	8.685	191			

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.434	.196		-2.221	.028
	Implementation	.215	.060	.205	3.572	.000
	Utilization Level	.697	.080	.543	8.710	.000
	Motivation Strategy	.193	.037	.197	5.189	.000
	HMIS Benefits	.045	.013	.156	3.603	.000

The results of the regression analysis suggested that HMIS implementation (β= .215, $p<0.05$), HMIS utilization (β= ..697, $p<0.05$), motivation strategy (β= .193, $p<0.05$), and benefits (β= .045, $p<0.05$) had a positive significant effect on service delivery. Hence the null hypothesis is rejected . The model was robust enough to be used to

explain the relationship between the variables ($F=172.917$, $p<0.05$) as suggested by the value of the F-statistic. The coefficient of determination value of $R^2 = .787$ means that 78.7% of the variation in service delivery at the hospital can be explained by HMIS implementation, HMIS utilization, motivation strategy, and benefits combined.

The regression equation constructed from the regression results took the form:

$$Y = 0.028 + .215X_1 + .697X_2 + .193X_3 + .045X_4 + \varepsilon$$

Where:

Y = Hospital Service Delivery

X_1 = HMIS Implementation extent

X_2 = Level of HMIS Utilization

X_3= Motivating Strategies

X_4 = HMIS Benefits

4.6 Discussion of Results

The study sought to establish the effect hospital management information system on service delivery in Moi Teaching and Referral Hospital, Kenya. With respect to familiarity with hospital management information system by the respondents was determined. Results indicated that majority of the respondents were familiar with the system. This is in line with the assertion by Chetley (2006) that in the developing countries, which involve several countries in Africa, Kenya included the adoption, level utilization and achieving the benefits of HMIS has been entrenched in managing and using information,

Considering the first objective of the study on level of implementation of Hospital Management Information System in MTRH, the respondents moderately agreed that the

implementation of Hospital Management Information System in MTRH was done well as per expectations. This results parallels WHO Health Metrics Network, (2005), which presents that Hospital Management Information system, can be viewed from the wider context as part of Health Information System which is an integrated endeavor to collect, process, report send and use health information and knowledge for individual and public health outcomes, programme action, research and to influence policy and decision-making. From the study findings, Hospital service delivery which constitutes Shorter outpatient time spent, Improved service per 100 cases, Shorter outpatient length of stay, High percentage of drugs availability in drug formulary, High patient satisfaction level, Ease of service delivery and Fewer complaints from patients is impacted by extend of HMIS implementation. The findings suggest that with increased HMIS implementation, Service delivery shall also increase by increase positively. To realize better service delivery, MTRH has to increase HMIS extend of HMIS implementation, with Timely provision of information at each stage having the highest score.

As per the second objective of this study, the level of utilization of HMIS result indicates that the mean values were above average on a five point likert scale. Further, as per the second objective, Records module had the highest implementation level and majority agreed that the module had been adequately utilized. On the other hand consulting doctor module posted the lowest utilization level. This is supported by Leung, (2001) who posits that the utilization of several modules in a number of hospitals in has enhanced the level of HMIS utilization, hence driving the attainment of service delivery.

The impacts of level of HMIS utilization in service delivery is further presented by Staggers & Snyder, (2011). The author argues that regardless of the level of utilization

of HMIS in hospital, this does not necessarily translate to fostering and driving the healthcare service delivery if convincing and operational framework does not exist.

Module, Laboratory, Radiology, Consultation, Finance Management and Supply Chain.

As per the third objective of the study on the strategies motivating the utilization of HMIS results indicate that the strategy of allaying perceptions and fears among staff on the use of HMIS is the one mostly deployed by the hospital in order to improve the level of utilization of HMIS. The results mirrors the postulate of Dobbs (2004) adoption theory that the individual and the choices an individual makes to accept or reject a particular innovation is of the essence. Adoption theory, then, is a micro perspective on change, focusing not on the whole but rather the pieces that make up the whole.

Further Al-Mamary, Shamsuddin, & Nor (2014), have proposed that user satisfaction is paramount to motivating information system, features such as response times, flexibility, sophistication, intuitiveness, system reliability, ease of learning, system flexibility as well as ease of use work to motivate or otherwise impact on the system. The results are also in line with the findings of Petter et al. (2008) that organizational dimension is a motivating factor. Management support, resource allocation and stakeholder involvement are important organizational dimensions, with organizations where the management are involved in system implementation most likely achieving successful implementation, the inverse is true. Stakeholders play a critical role and may jeopardize the success of the system, involving the critical stakeholders' works as a motivating factor, which works towards availing more resources.

The adoption of HMIS according to Jennifer, (2002) is dependent on the perceived usefulness where the user adopts a technology based on how they perceive that technology shall assist them in their performance within an organizational context. The

model further presumes that perceived ease of use, influences perceived usefulness considering that, other factors being constant, the easier is a technology to use, the more useful it can be, this is supported by Rockwell & Alton (2003), who are of the opinion that Management Support, Resource availability, Stakeholder involvement and customer focus are important motivating strategies. Technology Acceptance Model, (TAM), considers the impacts of external variables such as characteristics of system design, training, documentation and characteristics of the decision –maker may also influence technology adoption.

Adoption of HMIS is also motivated by various factors according to Venkatesh and Davis (2000), who presents Technology Acceptance Model 2 which two main motivating strategies, namely Social influence processes and Cognitive instrumental processes. The social influence processes influence a person's decision to accept or reject a system is image, voluntariness and subjective norm. The authors further argued that four cognitive instrumental processes that motivate or otherwise the application of a system are perceived ease of use, result demonstrability, output quality and job relevance as presented by (Clark, 2007).

As per the fifth objective, the study sought to investigate the effect of HMIS on service delivery. The hypothesis (H_{01}) stated that HMIS has no significant effect on service delivery. The results of the regression analysis suggested that HMIS implementation, HMIS utilization, motivation strategy, and benefits had a positive significant effect on service delivery. This support the findings by European Commission, (2016) that there is hard evidence exists that prove that E-Health is offering substantial benefits to the public while reducing financial expenditures, while decreasing the required timeframe for performing healthcare processes and tasks as presented by Seth, (2010) who opines

that appointments and 24 hour emergency consultations can be offered from any geographical area. Through quicker data handling, decisions can be made faster and this could potentially save lives. To achieve better service delivery, focus should be on level of utilization of HMIS with the results of regression analysis showing a positive relation of (.697), extend of Implementation of HMIS with a positive relation of (.215), motivating strategies with a relation of (.193). HMIS benefits have the least influence on HMIS service delivery with (.045).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter contains the summary of the research findings analyzed in the previous chapter, the conclusions drawn from the summary of the findings, and the recommendations made arising from the conclusions made. The Conclusions of the study are based on results of hypotheses testing. Recommendations on the implications of the research on theory, management practice and policy, and suggestions for further research are discussed. Thus the chapter has the following sections; summary, conclusions, and recommendations.

5.2 Summary

The study sought to establish the effect Hospital Management Information System on service delivery in Moi Teaching and Referral Hospital, Kenya. Logical positivism philosophy guided the study. The study used cross sectional survey research design that was quantitative in nature. The study targeted the employees in MTRH. A total of 240 questionnaires were distributed to the respondents and 192 were filled and returned. This gave a response rate of 80%. Descriptive statistics of frequencies, percentages, mean, standard deviation, and standard error were used to summarize the data and draw vital conclusions. Inferential statistics of correlation, and multiple regression were used to establish the effect hospital management information system on service delivery in Moi Teaching and Referral Hospital, Kenya.

With respect to familiarity with hospital management information system by the respondents was determined. Results indicated that majority of the respondents were familiar with the system.

5.2.1 Level of implementation of Hospital Management Information System in MTRH

Considering the first objective of the study on level of implementation of Hospital Management Information System in MTRH, the respondents moderately agreed that the implementation of Hospital Management Information System in MTRH was done well as per expectations. All the responses on the factors determining the level of implementation where above average (Mean 2.5), therefore MTRH involved all the stakeholders in the implementation, the HMIS implementation covered all the core areas in the hospital, there was an optimum environment for HMIS implementation, current Kenyan laws fostered the implementation, the HMIS meets global standards and is compatible with systems used in referring/collaborating Hospitals. Timely provision of information at every stage is also an HMIS implementation force, while the implementation agreed with the hospital's vision and strategic plan effectively automating the hospital functions.

For the extent of implementation on the modules in various service points in the hospital records module had the highest implementation level with a while consulting doctor module posted the lowest.

5.2.2. Level of HMIS utilization

As per the second objective of this study, the level of utilization of HMIS result indicates that the mean values were above average on a five point likert scale. The system is therefore utilized in all core areas of the hospital, the HMIS has replaced legendary systems and that adequate measures were put in place to monitor utilization of the system, which was well executed as per the respondents. The HMIS utilization was also driven by effective and sufficient training, while risk management policies, processes

and procedures were put in place. Implementation of any information system requires reliable infrastructure, the aspect of availability of infrastructure had lower mean, in comparison with other factor, while the presence of a technical committee to oversee fostered utilization

Further, as per the second objective, Records module had the highest implementation level and majority agreed that the module had been adequately utilized. On the other hand consulting doctor module posted the lowest utilization level.

5.2.3 Strategies motivating the utilization of HMIS

As per the third objective of the study on the strategies motivating the utilization of HMIS results indicate that the strategy of allaying perceptions and fears among staff on the use of HMIS is the one mostly deployed by the hospital in order to improve the level of utilization of HMIS.

5.2.4 Benefits of HMIS

The fourth objective of the study was to determine the benefits of HMIS. Respondents indicated that the anticipated benefits of HMIS were all in above the average. For correlations between the variables of interest, all the associated pairs of variables were significant at level 0.01, therefore the hypothesized relationships established were statistically significant at level $p < 0.01$. Service delivery and implementation of HMIS had a positive significant relationship. Service delivery correlated with HMIS utilization significantly and positively. There was a positive significant relationship between service delivery and strategies motivating utilization of HMIS, while service delivery correlated benefits of HMIS significantly and positively.

5.2.5 Effect of HMIS implementation and utilization on service delivery

Finally, as per the fifth objective, the study sought to investigate the effect of HMIS on service delivery. The hypothesis (H_{01}) stated that HMIS has no significant effect on service delivery. The results of the regression analysis suggested that HMIS implementation, HMIS utilization, motivation strategy, and benefits had a positive significant effect on service delivery. Hence the null hypothesis is rejected. The model was robust enough to be used to explain the relationship between the variables as shown by the value of the F-statistic.

5.3 Conclusions

From the summary of the results of given above, a number of conclusions can be drawn. First, the study concluded that the HMIS was a familiar system and that its implementation and utilization in MTRH was more pronounced in records and least in consulting doctor domains.

Secondly the conclusion stemming from the results on benefits of HMIS is that the hospital is reaping well from the use of HMIS in all the departments. The HMIS has made service delivery in all service points have been enhanced by HMIS. Thirdly, for the strategies motivating the use of HMIS the study concluded that the to entrench HMIS in the hospital, is paramount for the management to look at the perceptions and fears that the employees harbor with respect to the use of HMIS and make them ready for change before introducing HMIS. This would in the long run lead to better implementation utilization of HMIS in the hospital.

Lastly, the study found a positive and significant effect of HMIS on service delivery. It can therefore be concluded that implementation of HMIS, utilization of HMIS,

strategies motivating use of HMIS, and benefits of HMIS are key in improving service delivery in MTRH.

5.4 Recommendation

Base on the general objective of assessing the implementation of Hospital Management Information Systems in Moi Teaching and Referral Hospital and the research findings, the study makes the following recommendations

i) There is need to extend the departments which HMIS has been implemented in MTRH, to ensure that a complete integrated system is achieved.

ii) Considering that the core of the Hospital is clinical function, there is need to ensure HMIS utilization in clinical areas such as Doctors consultation module to have seamless service provision between clinical and administrative areas of the hospital.

iii) The factors that motivate utilization of Hospital Management Information Systems should be encouraged, including allocation of more resources and involving all the stakeholders.

iv) The government to anchor on the benefits that have been realized in utilizing Hospital Management Information Systems in MTRH, and entrench policy to implement a national HMIS.

5.5 Areas for further Research

This study was carried out to assess the influence of implementation of HMIS on service delivery in MTRH. The following areas of concern can be considered for further research:

i) The moderating effect of leadership style on the relationship between HMIS on service delivery needs to be researched on.

ii) The tool used in this study was self-rated. There is need for further research to be done using a tool that allows the involvement of all the stakeholders on implementation and utilization of HMIS including the HMIS vendor and regulatory bodies.

iii) This study can be extended to others contexts and other factors impacting on service delivery, since HMIS implementation is not the sole factor affecting service delivery.

iv) A similar study with the same hypotheses could be done in future, but to take care of data rages relative to time element, the study could be implemented as a longitudinal rather than a cross-sectional design.

REFERENCES

Adebiyi A. (2011), *Design and development of hospital management system.* GmbH KG: Lambert Academic Publishing.

Al-Assaf, A. & June. (2003). *The textbook of total quality in healthcare.* New York: CRC-Press.

Al-Mamary, H., Shamsuddin,A., & Nor, A., H. (2014). Key factors enhancing acceptance of management information systems in Yemeni companies, *Journal of Business and Management Research*, 5(1), 108-111. Retrieved from http://pubs.sciepub.com/ajss/2/5/2

Alvarez, R. (2002). The promise of E-health- a Canadian perspective. *Journal of E-Health Int., 1*(4), 1. DOI: 10.1186/1476-3591-1-4

Anderson, R., Sweeney, J., & Williams, A. (2003). *Modern business statistics*. (5th ed.). Ohio: Southern-Western (Thompson Learning).

Appari, A., & Eric, M. (2010). Information security and privacy in healthcare: current state of research, *Int. J. Internet and Enterprise Management, 6*(4), 279–314. doi:10.1504/ijiem.2010.035624

Avedis, D. (2002). *An introduction to quality assurance in health care.* London: Oxford Press.

Bansal, K. (2004). Optimizing value and quality in general practice within the primary health care sector through relationship marketing: a conceptual framework. *International Journal of Health Care Quality Assurance, 17*(4), 180-188. Retrieved from https://doi.org/10.1108/09526860410541496

Bernstein, T. Mccreless, B., & J. Côté, (2007). Five constants of information technology adoption in healthcare, *Winter Journal, 85*(1), 1. Retrieved from https://doi.org/10.1108/09526860410541496

Chetley, A. (2006). Improving health, connecting people: the role of ICT in the health sectors of developing countries a framework paper. *InfoDev journal, 8*(1), 9. DOI: 10.13140/RG.2.1.4665.5524

Clark, T. (2007). Adopting health care informatics and technologies, *Am J Health-Syst Pharm, 64*(1), 1. Retrieved from https://doi.org/10.2146/ajhp060573

Cooper, R. & Schinder, S. (2011). *Business research methods*. (10th ed.). New York: McGraw Hill.

Demiris G., Oliver, P., Porock D., & Courtney K. (2004). Home telE-Health: The Missouri telehospice project: Background and next steps. *Home Health Care Technology Report, 1*(49), 55-57. DOI: 10.2146/ajhp060573

Dobbs, L. (2004). Impact of training on faculty and administrators in an interactive television environment. *Quarterly Review of Distance Education, 5*(1), 183–194. Retrieved from https://doi.org/10.1080/15228835.2011.568678

Donald, L., & Douglas, F. (2000). *Principles and methods of quality management in health care.* New York: Jones & Bartlett Learning.

Earl, R. (2010). *The practice of social research.* Boston: Cengage Learning.

Eysenbach, G. (2001). What is E-health? *Journal of Medical Internet Research, 3*(2), 1. doi:10.2196/jmir.8106

Eysenbach, G. (2002). Issues in evaluating health websites in an internet-based randomized controlled trial. *Journal of Medical Internet Research, 4*(3), 1. doi: 10.3389/fmed.2019.00215

Ford, W., & Evans, R. (2006). The role of follow-up in achieving results from self-assessment processes. *International Journal of Quality & Reliability Management*, 23(6), 589-606. DOI: 10.1108/02656710610672443

Gilad J., Reed M., & Allan. P., (2013). *HELP: A dynamic hospital information system*. New York: Springer Science & Business Media.

Gregory, O., & Linda, H. (2008). *Fundamentals of health care improvement: A guide to improving your patients' care.* London: Joint Commission Resources.

Hanafizadeh, P., & A. Saghaei, (2009). The pros and cons of digital divide and e-health assessments, *International Journal of E-Adoption, 4*(1), 1-29. DOI: 10.4018/jea.2009092901

Hanson, W. (2006). *Healthcare informatics.* London: Mc Graw Hill.

Jennifer, M. (2002). *Qualitative researching.* California: SAGE.

Joydeep, G. (2009). *Hospital administration and management: A comprehensive guide*. India: Jaypee Brothers, Medical Publishers Pvt. Limited.

Karen W., Frances W. & Glaser J. (2013), *Health care information systems: A practical approach for health care management.* New York: John Wiley & Sons.

Keith, P. (2005). *Introduction to social research: quantitative and qualitative approaches.* California: SAGE.

Kenya National Audit Office. (2015). *Annual Report 2014-2015*, Nairobi, Kenya. Retrieved from file:///C:/Users/labuser/Downloads/report%20%202014-2015.pdf

Kothari, R. (2008). *Research methodology: Methods and techniques.* London: New Age International.

Kumar, S. & Aldrich, K. (2011). Overcoming barriers to electronic medical record (EMR) implementation in the US healthcare system: A comparative study. *Health Informatics Journal*, *16*(4), 8. DOI: 10.1177/1460458210380523

Leung, G. (2001). Computerization of clinical practice in Hong Kong. *International Journal of Medical Informatics*, *62*(3), 143-154. DOI: 10.1016/S1386-5056(01)00158-7

Macnee, C., & McCabe, S. (2008). *Understanding nursing research: using research in evidence-based practice.* New York: Lippincott Williams & Wilkins.

McQueen, R., & Christina, K. (2002). *Research methods for social science: a practical introduction,* New Jersey: Prentice Hall.

Ministry of Medical Services, (2011). *Health Systems Strengthening Technical Aid*: Technical aspects of orientation to health systems and services for health managers in Kenya. Nairobi- Kenya.

Moi Teaching and Referral Hospital (2012). *2012- 2017 Strategic Plan*, Eldoret, Kenya. Retrieved from file:///C:/Users/labuser/Downloads/moi%20teaching%20and%20referral%20hospital.pdf

Moi Teaching and Referral Hospital (2014). *Annual Audit Report, 2013- 2014*, Eldoret, Kenya. Retrieved from http://vision2030.go.ke/inc/uploads/2018/05/SECTOR-PLAN-FOR-HEALTH-2013-2017.pdf

Moi Teaching and Referral Hospital (2015). *Annual Audit Report, 2014-2015*, Eldoret, Kenya. Retrieved from MTRH.go.ke

Ndubisi, R. (2006). *Diffusion of innovations*. (3rd ed.). New York: Free Press.

Oboth, J. (2011). *Decentralization and service delivery: Constraints and controversies.* Kampala: Makerere University Library.

Orodho, J. (2008). *Techniques of writing research proposals and reports in educational and social sciences*. Nairobi: EALB.

Peprah, A. A. (2014). Determinants of patients' satisfaction at Sunyani regional hospital, Ghana. *International Journal of Business and Social Research, 4*(1), 96-108. Retrieved from https://pdfs.semanticscholar.org/d89d/e335aadeb78d1f8f60f6e6c7deed9684c90c.pdf

Petter, S., & DeLone, W., & McLean, E. (2008). Measuring information systems success: models, dimensions, measures, and interrelationships. *European Journal of Information Systems, 17*(1), 236-263. DOI: 10.1057/ejis.2008.15

Ranjit, K. (2005). *Research methodology: A step-by-step guide for beginners.* New Delhi: SAGE.

Reinhold, H., Alfred, W., Elske, A., & Birgit, B. (2013). *Strategic information management in hospitals: An introduction to hospital information systems*. New York: Springer Science & Business Media.

Rockwell, S., & Alton C. (2003). *Management of hospitals and health services: Strategic issues and performance.* New York: Beard Books.

Seth, G. (2010). *Principles of health care management: Foundations for a changing health care system*. London: Jones & Bartlett Learning.

Staggers, N., & Snyder, H. (2011). *History and trends in clinical information systems in the United States.* New York: Nursing Scholarship.

Venkatesh, V. & Davis, F. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186-204. DOI: 10.1287/mnsc.46.2.186.11926

VíctorJupp, K. (2006). *The sage dictionary of social research method.* California: Pine Forge Press.

World Health Organization, (2006). *Health information systems in support of the Millennium Development.* Goals Report by the Secretariat, sixtieth world health assembly A60/22. Retrieved from http://apps.who.int/gb/ebwha/pdf_files/WHA66-REC1/WHA66_2013_REC1_complete.pdf

APPENDICES

APPENDIX I: INFORMED CONSENT

Kenya Methodist University

P. 0 Box 267-60200

MERU, Kenya

SUBJECT: INFORMED CONSENT

Dear Respondent,

My name is Bethwel Cheruiyot, of P.O. Box 3, 30100, Eldoret.I am a Msc student from Kenya Methodist University. I am conducting a study titled***Implementation of Hospital Management Information Systems on Service Delivery***the findings will be utilized to strengthen the health systems in Kenya and other Low-in- come countries in Africa. As a result, countries, communities and individuals will benefit from improved quality of healthcare services. This thesis is critical to strengthening health management information systems as it will generate new knowledge in this area that will inform decision makers to make decisions that are research based.

Procedure to be followed

Participation in this study will require that I ask you some questions and also access all the hospital's records in terms of HMIS. I will record the information from you in a questionnaire check list.You have the right to refuse participation in this study. You will not be penalized nor victimized for not joining the study and your decision will not be used against you nor affect you at your place of employment. Please remember that participation in the study is voluntary. You may ask questions related to the study at

any time. You may refuse to respond to any questions and you may stop an interview at any time. You may also stop being in the study at any time without any consequences to the services you are rendering.

Discomforts and risks.

Some of the questions you will be asked are on intimate subject and may be embarrassing or make you uncomfortable. If this happens; you may refuse to answer if you choose. You may also stop the interview at any time. The interview may take about 40 minutes to complete.

Benefits

If you participate in this study you will help us to strengthen the HMIS in MTRH and other hospitals in Kenya. As a result, countries, communities and individuals will benefit from improved quality of healthcare services. This field attachment is critical to strengthening the health systems as it will generate new knowledge in this area that will inform decision makers to make decisions that are research based.

Rewards

There is no reward for anyone who chooses to participate in the study.

Confidentiality

The interviews will be conducted in a private setting within the hospital. Your name will not be recorded on the questionnaire and the questionnaires will be kept in a safe place at the University.

Contact Information

If you have any questions you may contact the following

Roseline Susan Njuguna	rsmnjuguna@yahoo.com	Supervisor
Ms. Lillian Muiruri	wambuikaburi@gmail.com	Supervisor
Bethwel Cheruiyot	bethwelc@gmail.com	Chief Investigator

Wanja Mwaura wanjamwaura@gmail.com HOD HSM Dept

Department of Health Systems Management of Kenya Methodist University, Nairobi campus.

Participant's Statement

The above statement regarding my participation in the study is clear to me. I have been given a chance to ask questions and my questions have been answered to my satisfaction. My participation in this study is entirely voluntary. I understand that my records will be kept private and that I can leave the study at any time. I understand that I will not be victimized at my place of work whether I decide to leave the study or not and my decision will not affect the way I am treated at my work place.

Name of Participant…….

Date……..

Signature…….

Investigator's Statement

I, the undersigned, have explained to the volunteer in a language s/he understands the procedures to be followed in the study and the risks and the benefits involved.

Name of Interviewer……

Date……

Interviewer Signature……

APPENDIX II: QUESTIONNAIRE FOR HMIS USERS IN MTRH

Introduction

The researcher is Bethwel Cheruiyot a postgraduate student at the Department of Health Systems Management, Kenya Methodist University.

NB. Please you are going to give your opinions based on a five –point scale as shown below.

Strongly agree	5
Agree	4
Uncertain	3
Disagree	2
Strongly disagree	1

1. Please type /write your response/choice number (i.e. 1, 2, 3, 4 or 5) in the blank text box provided. You may make a comment on your choice in the space below each item.

2. You are kindly requested that once you have received the questionnaire, fill it in and return it as soon as possible.

3. From the next page, you will find statements and a set of numbers with a title above each.

4. All questions should only have one answer

Example: on a scale of 1-5, where 1 means strongly disagree and 5 means strongly agree, to what extent do you agree that advances in technology has enhanced the management of public hospitals?

Typing 4 as shown alongside suggests agreement that advances in technology has enhanced the management of public hospitals

A possible comment in support of the choice may be as shown:

5	4	3	2	1

Advances in technology such as hospital management systems has enabled prompt decision making hence enhancing management

SECTION A: Respondents General Information

1. Designation

□ Hospital Director/Deputy Director □ Senior Manager □ Head of Department □ Head of Section □ Administrator □ Staff

2. Level of Education

□ Diploma/Other □Bachelors □Masters □ PHD

3. Organizational Role

□ Executive □ Managerial role □Supervisory role □ Employee

4. **To what level of understanding are you familiar with Hospital Management Information System**?

□ Very familiar □ Familiar □Average □ Unfamiliar □ Very Unfamiliar

5. For how long have you worked in the Health Sector?

□ 0-5 yrs □ 6 – 10 yrs□ 11 – 15 yrs □ 16 – 20 yrs □ Over 20 yrs

6. Indicate your department

Management□Accident & Emergency □Health Records□Public Relations □

Information Communication Technology□Finance □Surgery □ Medicine □Pediatrics □Laboratory□Pharmacy

Supply Chain Management □Radiology

7. Which is your Division/ Field of operation

□ Nursing □ Clinical □ ICT □ Administration □ Others

8. How long have you worked with Hospital Management Information System ?

□ 0-1 Year □ 1– 2 years □ 3 – 4 Years □ 4 – 5 years □ Over 5 Years

SECTION B - HMIS extent of Implementation

Please indicate the extent to which you agree with the following statements concerning the HMIS implementation in the hospital

1. The implementation of Hospital Management Information System involved all the stakeholders

5	4	3	2	1

2. Hospital Management Information System was implemented in all the core areas in the hospital

5	4	3	2	1

3. There is optimum regulatory environment to foster HMIS implementation

5	4	3	2	1

4. The current Kenyan laws fosters HMIS implementation.

5	4	3	2	1

5. HMIS Implementation in the hospital meets global standards

5	4	3	2	1

6. HMIS Implementation in MTRH is compatible with other referring/collaborating Hospitals

5	4	3	2	1

7. There was Timely provision of relevant information at each stage of the implementation.

5	4	3	2	1

8. HMIS implementation agreed with the hospital's vision and strategic plan

5	4	3	2	1

9. HMIS implementation effectively automated all the hospital's functions as per the guidelines, policies and procedures

5	4	3	2	1

10. To what extent have the following HMIS modules been implemented in the hospital are (on the scale of 5-1 indicate 5 – Completely Implemented 4 – Has been Implemented 3- Moderate Implementation 2- Partial Implementation 1- Not Implemented At all)

Module	5	4	3	2	1
□ Medical Records					
□ Outpatient Module					
□ Inpatient Module					
□ Pharmacy Module					
□ Laboratory Module					
□ Radiology Module					
□ Consulting Doctor					
□ Financial Management					
□ Supply Chain Management					

SECTIONC:HMIS level of utilization

Please indicate the extent to which you agree with the following statements concerning the HMIS implementation level of use

1. Hospital Management Information System is utilized in all the core areas in the hospital

5	4	3	2	1

2. Hospital Management Information System have effectively replaced legendary systems initially utilized in the hospital

5	4	3	2	1

3. Adequate measures were put in place to monitor and control the progress of the implementation and utilization of HMIS

5	4	3	2	1

4. The process of the implementation was well executed.

5	4	3	2	1

5. Effective and sufficient training programs were drawn for the users.

5	4	3	2	1

6. Risk management policies, processes and procedures were put in place during implementation

	5	4	3	2	1

7. Required and reliable infrastructure was acquired for the implementation process.

5	4	3	2	1

8. Members of the Technical committee effectively oversaw the utilization of HMIS in their own departments.

5	4	3	2	1

9. The system developers captured all the functionalities in the hospital and translated them to the system based platform

5	4	3	2	1

10. To what extend are the under mentioned modules of HMIS utilized in the hospital

(on the scale of 5-1 indicate 5 – Highly Utilised 4 – Utilised 3- Moderate utilization 2- Rarely Utilised 1- Not Utilised At all)

Module	5	4	3	2	1
□ Medical Records					
□ Outpatient Module					
□ Inpatient Module					
□ Pharmacy Module					
□ Laboratory Module					
□ Radiology Module					
□ Consulting Doctor					
□ Financial Management					
□ Supply Chain Management					

SECTION D: Motivating Strategies

1. Most of the staff prefers manual operations to technology based hospital system

5	4	3	2	1

1. Utilization of Hospital Management Information System has been embraced by majority of the staff

5	4	3	2	1

2. Perceptions and fears have driven other staff to resist the usage of Hospital Management Information System

5	4	3	2	1

3. HMIS modules in the specific place of work effectively performs the functions, it was programmed to perform

5	4	3	2	1

4. Utilization of HMIS has management support

5	4	3	2	1

5. The hospital has competent and sufficient workforce to implement and utilize HMIS

5	4	3	2	1

6.The hospital has strategy guiding utilization of HMIS, and users subscribe to the strategy

5	4	3	2	1

7.Lack of awareness on the envisioned benefits of the system makes the employees not enthusiastic of adopting the HMIS

5	4	3	2	1

9. There have been sufficient resources to implement and utilize HMIS

5	4	3	2	1

5. On a scale of 1-5, where 1 means strongly disagree and 5 means strongly agree, to what extend do the following strategies motivate HMIS utilization in the hospital

Strategy	5	4	3	2	1
HMIS - Enhances Patient Satisfaction					
HMIS - Enhances corporate Image					
Legal and regulatory changes motivate HMIS use					
Global standards motivate HMIS utilization					

SECTION E: HMIS Benefits

21. Utilization of HMIS has increased revenue collection in the hospital

5	4	3	2	1

22. Utilization of HMIS has resulted to comprehensive follow-up of both inpatient and outpatient

5	4	3	2	1

23. In the pharmacy with HMIS there is no loss of drugs, while drugs can be traced to the patient and complete drug reports available

5	4	3	2	1

24. With HMIS laboratory and radiology, specimens can be traced to the patient

5	4	3	2	1

25. Payment of creditors and billing of patients is prompt and accurate.

5	4	3	2	1

26. Implementation of HMIS nursing can triage patients and doctors clerk in patients electronically, effectively

5	4	3	2	1

SECTION F: SERVICE DELIVERY

Indicate your Level of agreement with the following statements: Implementation, utilization, strategies and benefits of HMIS has led to:

SD1	Shorter outpatient time spent per visit					
SD2	Improved service per 100 cases					
SD3	Shorter inpatient length of stay					
SD4	High percentage of drugs availability in drug formulary					
SD5	High patient satisfaction level					
SD6	Ease of service delivery					
SD7	Fewer complaints from patients					

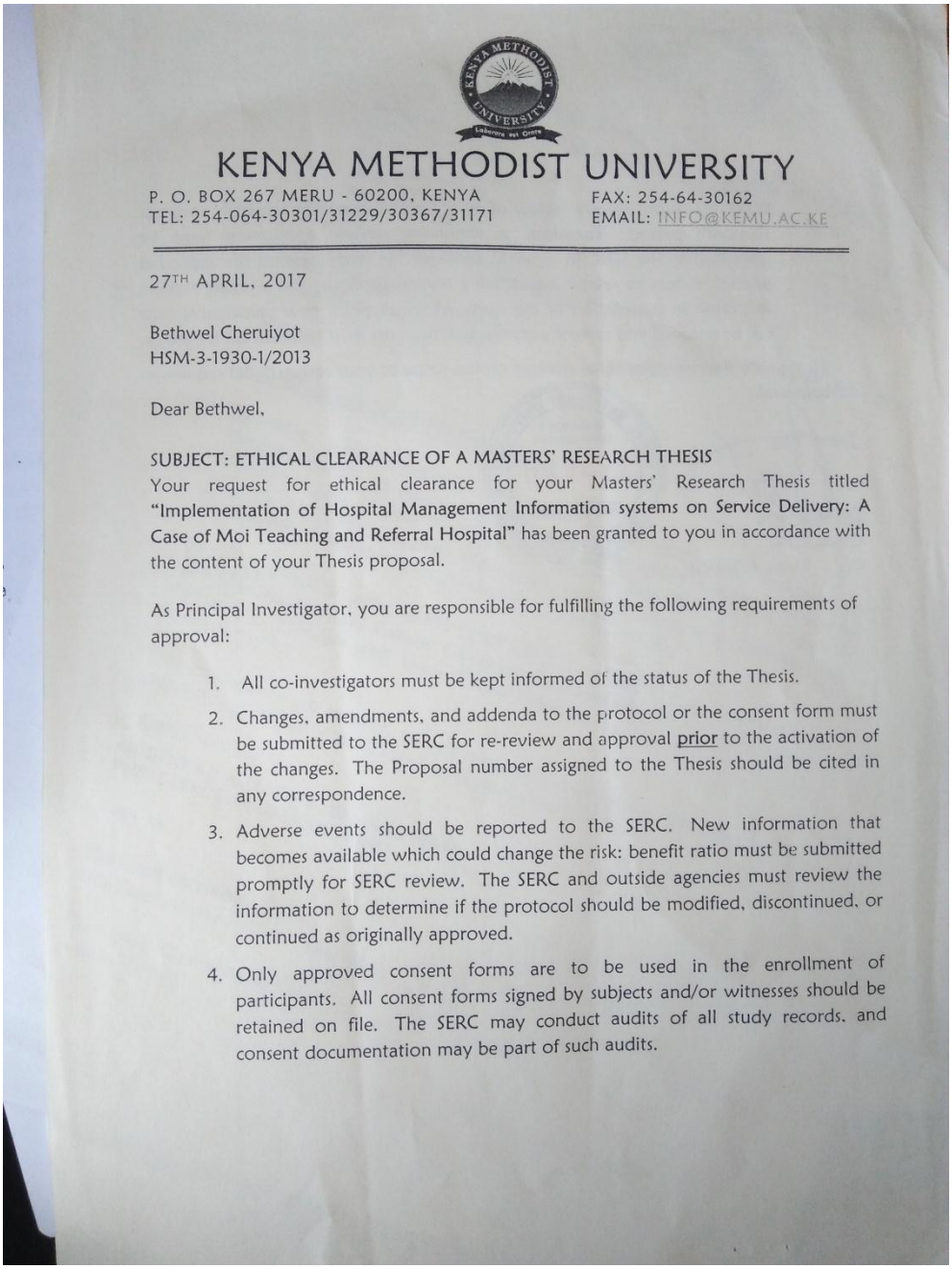
Thank you for spending time to respond to this questionnaire

APPENDIX III: INTERVIEW GUIDE

1. How was the implementation of HMIS done?
2. Is the HMIS implemented compatible with systems of other hospitals?
3. Has the HMIS been optimally utilized in all the departments?
4. Where all the relevant stakeholders engaged during HMIS implementation?
5. What modules have been beneficial to the hospital?
6. Was there management support for the HMIS implementation?
7. Does the utilization of HMIS foster customer satisfaction?
8. Does the use of HMIS enhance the organizations' corporate image?
9. What benefits has the hospital realized by using HMIS?
10. HMIS utilization enables the hospital achieve its strategic objectives?
11. Has the use of HMIS fostered the revenue generated?
12. Has the implementation and utilization of HMIS fostered service delivery?
13. What factors drove the acceptability of the HMIS in MTRH
14. Has there been reduction of costs in the provision of health services in the Hospital since the HMIS was installed ?
15. What are the expectations of the patients on HMIS usage ?
16. Has the system been utilized to foster clinical decision making ?
17. Has the Hospital Board and management set up sufficient resources to maintain the implementation and utilization of HMIS in the Hospital ?
18. What are the long term plans on HMIS in the Hospital ?
19. Has the Hospital's HMIS been integrated with other Systems ?
20. What services have been introduced to the Hospital with the deployment of HMIS ?

21. What is the comparative accuracy of drugs and other inventories between HMIS and legendary systems ?
22. Comment on the HMIS versus the manual systems initially used in the Hospital

APPENDIX IV: ETHICAL CLEARANCE LETTER



KENYA METHODIST UNIVERSITY

P. O. BOX 267 MERU - 60200, KENYA
TEL: 254-064-30301/31229/30367/31171
FAX: 254-64-30162
EMAIL: INFO@KEMU.AC.KE

27TH APRIL, 2017

Bethwel Cheruiyot
HSM-3-1930-1/2013

Dear Bethwel,

SUBJECT: ETHICAL CLEARANCE OF A MASTERS' RESEARCH THESIS

Your request for ethical clearance for your Masters' Research Thesis titled **"Implementation of Hospital Management Information systems on Service Delivery: A Case of Moi Teaching and Referral Hospital"** has been granted to you in accordance with the content of your Thesis proposal.

As Principal Investigator, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the Thesis.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the SERC for re-review and approval prior to the activation of the changes. The Proposal number assigned to the Thesis should be cited in any correspondence.
3. Adverse events should be reported to the SERC. New information that becomes available which could change the risk: benefit ratio must be submitted promptly for SERC review. The SERC and outside agencies must review the information to determine if the protocol should be modified, discontinued, or continued as originally approved.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by subjects and/or witnesses should be retained on file. The SERC may conduct audits of all study records, and consent documentation may be part of such audits.

5. SERC regulations require review of an approved study not less than once per 12-month period. **Therefore, a continuing review application must be submitted to the SERC in order to continue the study beyond the approved period.** Failure to submit a continuing review application in a timely fashion will result in termination of the study, at which point new participants may not be enrolled and currently enrolled participants must be taken off the study.

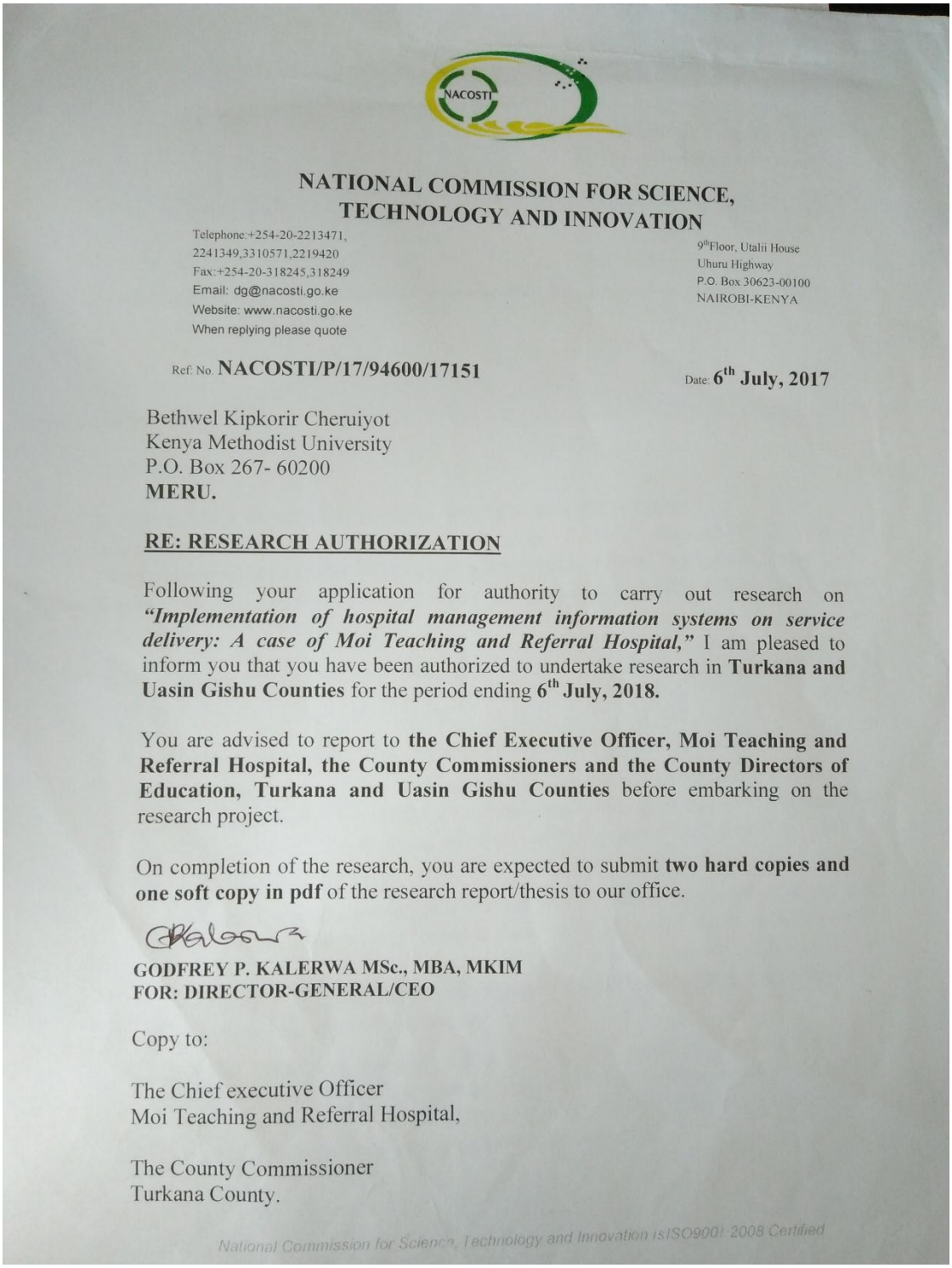
Please note that any substantial changes on the scope of your research will require an approval.

Thank You,

KENYA METHODIST UNIVERSITY
RESEARCH & DEVELOPMENT
27 APR 2017
DISPATCHED
P.O. Box 267-60200, MERU

Dr. Wamachi
Chair, SERC
Cc: Dean. RD&PGS

APPENDIX V: NACOSTI LETTER OF AUTHORIZATION



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471, 2241349,3310571,2219420
Fax:+254-20-318245,318249
Email: dg@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/17/94600/17151**

Date: **6th July, 2017**

Bethwel Kipkorir Cheruiyot
Kenya Methodist University
P.O. Box 267- 60200
MERU.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Implementation of hospital management information systems on service delivery: A case of Moi Teaching and Referral Hospital,"*** I am pleased to inform you that you have been authorized to undertake research in **Turkana and Uasin Gishu Counties** for the period ending **6th July, 2018.**

You are advised to report to **the Chief Executive Officer, Moi Teaching and Referral Hospital, the County Commissioners and the County Directors of Education, Turkana and Uasin Gishu Counties** 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.

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The Chief executive Officer
Moi Teaching and Referral Hospital,

The County Commissioner
Turkana County.

National Commission for Science, Technology and Innovation is ISO9001: 2008 Certified