Factors Affecting Adoption of Health Management Information System at St. Catherine's Hospital, Uganda

HUDHAIFA SAKU

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DECLARATION

I declare that this document is my original work and has not been previously examined or ratified for an award of degree in other universities. To the best of my knowledge, the document does not contain any material previously published by other scholars except where due acknowledgement is made.

Investigator: HUDHAIFA SAKU

Admission No: MBA/HCM 100748/17

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Approval

The dissertation of Hudhaifa Saku was reviewed and approved by:

Dr. Pratap Kumar (Supervisor)
Strathmore University Business School

Dr. George Njenga
Dean, Strathmore University Business School

Prof. Ruth Kiraka
Dean, School of Graduate Studies
Strathmore University Business School

ABSTRACT

Health management information systems are essential in improving the performance of medical service delivery in health organizations. While changes have been made to improve the healthcare sector across the continent, much information is still needed to explain how HMIS work across the hospital departments. This study sought to establish factors affecting the adoption of ClinicMaster/HMIS across different departments at St. Catherine's hospital. The specific objectives were; to establish how organizational factor, human factor and technological factor affect adoption of ClinicMaster/HMIS across different departments at St. Catherine's Hospital. The study was based on the diffusion of innovation theory and the technology acceptance model theory. The research design was a cross-sectional survey of 109 respondents drawn various departments in the hospital. The study findings revealed that technological factor had a statistically significant relationship with adoption of HMIS/ClinicMaster. Overall, the results of the study established that there was a positive relationship between human factor, organizational factor, and technological and adoption of *ClinicMaster*/HMIS in the hospital. However, human factor and organizational factor had an insignificant positive relationship with adoption of the system. Future studies should try to determine whether other factors are affecting the adoption of HMIS in the hospital. The study also recommends that research should be carried out on the behavioural aspect of the doctors who do not use the system but rely on billers and cashiers to enter their reports and requests. The study recommends the need for standardisation of HMIS implementation by the policy makers in order to enhance adoption. This study looked at all the users of the system; whether clinical, non-clinical or even para-clinical unlike other studies which focused on mainly the clinical staff. This made it difficult to making hospital level comparisons since different hospitals are in different adoption stages hence the focus on one hospital.

LIST OF ABBREVIATIONS

EHR:	Electronic Health Record
EMR:	Electronic Medical Records
ICT:	Information Communication Technology
IT:	Information Technology
HIT:	Health Information Technology
HMI:	Health Management Information
HMIS:	Health Management Information System
MIS:	Management Information System
MPI:	Master Patient Index
R&D:	Research and Development
TAM:	Technology Accepted Model
WHO:	World Health Organization

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DEDICATION

This dissertation is dedicated to my family for their immense support throughout this period.

OPERATIONAL DEFINITION OF TERM

HMIS: Refers to data collection system specifically designed to support health facilities' planning, management and decision making (Scholl, Syed-Abdul & Ahmed, 2011).

EMR: Refers to healthcare IS created to manage patients' information in the hospital by all medical officers in different departments (Bell, 2008).

EHR: An electronic record of health-related information on an individual or patients attending the hospitals for easy retrieval by all departments (Bell, 2008).

Adoption: Zabadi (2017) defined IS adoption as using computer software and hardware applications to support healthcare operations, decision making among other activities.

CHAPTER ONE

INTRODUCTION

1.1 Background

In 2007, the World Health Organization (WHO) acknowledged that Health Management Information Systems (HMIS) are becoming essential in promoting efficient health service delivery across the world. Technological disruption has not only affected other sectors in the economy but the health sector as well. There has been a global demand for all countries to invest heavily in the health sector to support the growing capital need for the adoption of HMIS to enhance medical service delivery (Wright & Marvel, 2012).

The emergence of Health management information systems, therefore, is a result of the development of big data in the health facilities where data creation is growing at high speed (Losova, 2014). Having adequate skills, knowledge, system design and operation, training, and capital resource in the hospital can aid in faster adoption and implementation of the HMIS in the hospital. HMIS, therefore, is an application of information communication technology (ICT) across different departments to enhance operational efficiency, high-quality care, and employee satisfaction (Scholl, Syed-Abdul & Ahmed, 2011).

According to Boonstra, Versluis, and Vos (2014), EHR is widely viewed as vital to renovating the healthcare facility and delivery of sustainable, high-quality health care; however, the uptake of such systems in a hospital remains quite slow (Robertson *et al.*, 2010). Several studies indicated that some systems were not implemented successfully; some with total failure and others with partial success (Kaduruwane, 2012). The study employed the technology acceptance model (TAM), and diffusion of innovation theory to establish how human, organizational and technological factors affect the adoption of HMIS at St. Catherine's hospital.

1.1.1 Adoption of innovation

According to Autant-Bernard et al., (2010), adoption of innovation is quite considered as the most challenging and complex task in an organization as compared to individuals. Innovation involves changing or enhancing business process and delivery methods to improve quality. However, with the changes in the market and the need for sustainability, health care facilities

are faced with challenges of adopting innovation; mostly management information systems (MIS) aimed at improving quality of healthcare services (Autant-Bernard *et al.*, 2010).

Innovation adoption can be described as a model that classifies adopters of innovations into different categories based on their willingness (AbuJarad & Yusof, 2010), vision and ability to adopt the innovation in the healthcare organization, and their level of declines to accept new ideas in the market (Talukder & Quazi, 2011). These groups include innovators (visionary and first people to adopt new ideas), early adopter (people willing to try new things after innovators), early majority and late majority (like ideas but wait to be influenced by others) and laggards (the last group to adopt a new idea) (Hameed, Counsell & Swift, 2012).

Previous studies that examined the adoption of innovation provided several factors affecting innovation adoption. Wisdom, Chor, Hogwood, and Horwitz (2014) in their study indicated factors such as leadership, operational size and structure, innovation fit with norms and values, and attitudes or motivation towards innovation were critical factors in the adoption of innovation. Talukder (2012) also indicated top management support and perceived usefulness as the main factors affecting the adoption of innovation in an organization.

AbuJarad and Yusof (2010) and Zabadi (2017) provided operationalization of adoption of innovation by items such as; good ideas improve operational functions across the hospital, there are high chances of increase in organization success, we work with other technology companies to help in gaining market insights on innovation (new idea) developments in the market as well as having frequent new ideas require much learning among employees. This framework assumes that factors such as testability, complexity, compatibility and relative advantage influence adoption of innovation (Messeri *et al.*, 2013).

1.1.2 Health Management Information Systems (HMIS)/ClinicMaster

According to Bossle *et al.*, (2016), effective MIS allows healthcare facilities to get the accurate information to the right user at the right time by increasing the interaction of different departmental systems in the hospital. Ramayah and Aafagi (2004) also explained that HMIS is a system designed to manage the data collected and stored in any health care facility. It allows information and data of the patients to move freely between the departments, hence discouraging the need for face-to-face communication among medical and clinical officers (Bossle *et al.*, 2016).

According to Schroll and Mild (2011), various types of HMIS have been implemented in the hospital to reduce paper-work, manual functions, and to enhance the quality of medical services. Such may include; electronic medical records (EMR) and electronic health records (EHR) which are concerned with replacing paper-work, Practice Management Software which is concerned with assisting in daily management of operations, Master Patient Inde0x (MPI) which connect patients' records to more than one database among others (Farzandipur, 2016).

1.1.3 Factors affecting adoption of Health Management Information Systems

Several factors have been developed in explaining the concept of adoption of HMIS. Phichitchaisopa and Naenna (2013) stated technology as a significant factor. Farzandipur, Jeddi, and Azimi (2016) stated human factors like computer skills, perceived usefulness, and frequent use of the system as the most dominant. Wang *et al.*, (2005) found; market factor, organizational factor, and technological factor. Majority of the studies on factors affecting the adoption of HMIS have focused on the clinical staff; nurses and doctors and ignored the non-clinical and para-clinical staff and yet the systems are used in all these departments.

The study developed various measures that were useful in establishing the objectives of the study such as: user experience, exposure and training for the human factor, top management support; project management team, organizational culture and organizational work design for the organizational factor; system quality service quality and information quality for the technology factor; and system use, utilization of function per module and user satisfaction for adoption.

1.1.4 St. Catherine's Hospital in Uganda

In a bid to improve operational efficiency, quality of care, and patient satisfaction, many hospitals in Africa, both private and public have moved to adopt HMIS use (Boonstra *et al.*, 2014). St Catherine's Hospital is one of such private healthcare facilities in Uganda. The Hospital opened in 1983 as a Pediatric outpatient clinic. It has, over the years, expanded from a single-room clinic to a fully-fledged hospital (with a bed capacity of 80 and many clinical departments) in the hub of Kampala city.

In 2014, the hospital procured ClinicMaster, an integrated EMR type of HMIS with various departmental modules offering administrative, financial, and medical record functions to improve workflow efficiency. As part of its growth strategy, the management viewed this as a facilitator for organizational change since the hospital was in the process of transitioning

from a specialist pediatric clinic to a fully-fledged hospital with many new departments providing many new services.

This system was implemented in many other facilities successfully such as Makerere University Walter Reed Project HIV clinics, but the results of ClinicMaster at St. Catherine's hospital have not been the same as viewed by the management. This study, therefore, sought to establish factors affecting the adoption of HMIS at St. Catherine's hospital.

1.2 Statement of the Problem

Many hospitals globally have moved to adopt HMIS to improve operational efficiency. As the world becomes more globalized and competitive, healthcare organizations with poor operations management principles are edged out with more efficient ones thriving. This has seen a lot of increased research work in HMIS related studies. Majority of these studies were, however, done in high-income countries (Najaftorkaman, Hossein Ghapanchi, & Hossein, 2014; Odekunle *et al.*, 2017).

Moreover, there is an increased need for coordinated and improved different departments in every hospital. According to a report released in 2007 by WHO, HMIS is increasingly becoming part and parcel of hospital functions, hence the need for all hospitals in developing nations to adopt HMIS to improve operational efficiency and quality of care. Previous studies on factors affecting the adoption of HMIS has focused more on the organization level, and comparison across the health sector (Sillow-Carroll, Edwards, & Rodin, 2012; Damanpour & Schneider (2006).

Also, Phichitchaisopa and Naenna (2013) and Farzandipur, Jeddi, and Azimi (2016) also researched on factors affecting adoption and implementation of HMIS in hospitals. Though the studies provided an adequate literature review, findings cannot be empirically applied in establishing effective adoption across various departments in the hospital as most of them have focused on physicians and nurses leaving out other crucial personnel involved in the hospital service chain. This, therefore, implies that there is a gap that needs to be filled. In order to bridge the gap, the study aimed to establish factors affecting the adoption of HMIS at St. Catherine's Hospital.

1.3 Research Objectives

This section provides the general and specific objectives of the study.

1.3.1 General Objective

The general objective of the study was to establish the factors affecting the adoption of ClinicMaster/HMIS at St. Catherine's Hospital

1.3.2 Specific Objectives

i) To establish human factors affecting the adoption of HMIS at St. Catherine's Hospital.

ii) To determine the organizational factors affecting the adoption of HMIS at St. Catherine's Hospital.

iii) To establish the technological factors affecting the adoption of HMIS at St. Catherine's Hospital.

1.4 Research Questions

i) What human factors are affecting the adoption of *ClinicMaster*/HMIS at St. Catherine's Hospital?

ii) What organizational factors are influencing the adoption of *ClinicMaster*/HMIS at St. Catherine's Hospital?

iii) What technological factors are affecting the adoption of *ClinicMaster*/HMIS at St. Catherine's Hospital?

1.5 Scope of the Study

This study focused on establishing factors affecting the adoption of HMIS across different departments at St. Catherine's Hospital. The study focused on employees who have used the HMIS for more than six months in the hospital to provide relevant and accurate information. Organizational factor, human factor, and technological factor were the independent variables while the adoption of HMIS was the dependent variable of the study. The study was a cross-sectional one and had a sample size of 109 respondents selected using a census survey.

1.6 Significance of the Study

To the hospital management (St. Catherine) and other private hospitals, the findings may help to provide feedback essential to understanding barriers to full adoption of the system, which may guide in solution development.

To future researchers and academicians, this study added to an existing body of knowledge in Health information systems implementation and adoption thus act as a source of reference and motivation for those who intend to undertake further study on HMIS area.

To the policy makers, the study shows the need for standardization of HMIS implementation so as to avoid various barriers in order to increase chances of successful adoption.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter focused on laying the theoretical background and developing the conceptual framework for the study with the help of empirical literature review. The chapter looks at the existing theories and the studies that relate to the study and connects them to the study, identifying the knowledge gap in order to solve the research problem through a suitable conceptual framework.

2.2 Theoretical review

This section discusses the theories that contribute to the study.

2.2.1 Diffusion of Innovation Theory

Rogers developed this theory in 1962 in an attempt to explain how perceived information or an idea in the market flow over time. The theory explains that over time, an idea or a product or system may gain momentum and spread (diffuse) in the organization or a given population. According to Rogers (1962), people as part of the organizational system or just any other system tend to adapt to new ways of doing things, ideas or behavior that can help them to learn and solve existing challenges.

Adoption means that organizations must perceive an idea, a new system, or new products as innovative. Diffusion, therefore, takes place once adoption is perceived positively in the organization (Fagerberg, Fosaas & Sapprasert, 2012). Adoption of a new idea or innovation is a process that will see some organizations adopting the idea as soon as possible while others will be reluctant in it. Rodgers (1982) classified adoption of innovation into five categories; innovators (visionaries), early adopters (opinion leaders), early majority and the late majority (wait and see approach) and laggards (reluctant individuals) (Zhai, Ding & Wang, 2018).

Connecting this theory to the study, it is apparent that the rate of adoption of innovation among health care facilities always vary and therefore, the diffusion process is always different. In others, diffusion process will be fast while others diffusion process would be low depending upon components, for example, top administration support as a hierarchical factor and data quality as an innovative factor (Weigel, Hazen, Cegielski, & Hall, 2014). Different components that may decide the dispersion of development in the association might be; relative bit of leeway, consistency, adaptability, testability, and final products.

Further, the theory relates to the technology factor in the organization. A higher level of adoption has seen improvement in firm performance across the world, with many firms performing least adoption most likely to exit the market. With increased high quality health services demand, health care facilities must adopt faster and relative technologies that can enhance their operations. Diffusion of innovation theory is very critical in explaining how best organizations can be faster in adopting new ideas in the market. It further emphasizes on the need for organizations to have highly innovative workforce that can provide adequate management support during adoption of innovation process in the organization. These aspects therefore reveals how important diffusion of innovation theory is essential in supporting technological and organization factor in the organization.

2.2.2 Technology Acceptance Model (TAM)

TAM was first settled by Fred Davis in 1989 to tell the utilization and acknowledgment of IS and innovation among people. Two components are basic in this model; perceived value and perceived convenience, which are viewed as helpful in computer use practices (Davis, Bagozzi, and Warshaw, 1989). Seen convenience is an individual's oppressed inclination that utilizing explicit IS will upgrade his or her professional training and execution while usability is the degree to which an individual client anticipates that the framework should be of exertion absent much intricacies (Davis *et al.*, 1992; McCoy, Everard and Jones, 2005).

Davis (1989) highlighted that outside components, for example, social variables (abilities and dialects), social elements and political elements (effect of utilizing innovation in governmental issues and political emergency) essentially impact apparent handiness and convenience. Past investigations on TAM, for example, Venkatesh and Davis (2000) new TAM and TAM-2 with new factors. Lim (2000), in his examination, included factors; understanding, self-adequacy, saw hazard, and social impact. Chau and Hu (2002) consolidated the factor of companion impact with TAM in their investigation.

In a bid to understand the influence of system traits and personal traits on citizens' willingness to use an information system, Chomchalao and Naenna (2013) developed a modification of the TAM by borrowing a few aspects from the DeLone and McLean IS success model which included; system quality, information quality and service quality as measures of the system traits. Relating these aspects to human and technological factors as two of the objectives of the study, this model provides mechanisms of understanding how effective employees can become more productive through frequent system use, leading to

high level of computer proficiency (Losova, 2014). Additionally, the theory provides basic important technological components that every adopted systems in the hospital should have; that is, information quality, system quality and service quality (Holden & Karsh, 2010; Wilkins, 2009).

Quality of the system is the system's overall performance. According to DeLone and McLean (2003), it is one of the most critical factors that influence the usage of the system. They proposed various measurements of system quality such as; ease of use, system speed, screen interface, error recovery, functionality, reliability, flexibility, portability, integration, adaptability, and availability. Moreover, information quality is the desirable characteristics of the system output (Messeri *et al.*, 2013). It also refers to the quality of the information that the system can store, deliver and can be measured based on the content, accuracy, format, timelines, data security, completeness, consistency, and ease of understanding and relevance of work tasks. Service quality refers to internal and external support provided to the end users is measured from items such as reliability, responsiveness, assurance as well as empathy.

2.3 Empirical review

This section explains the existing studies done on each independent variables and how they relate to the dependent variable of the study.

2.3.1 Human factor and adoption of HMIS

A study by Patricia (2014) on human factor user experience on EHR attempted to understand the interaction between the nurse's frequent use and the EHR. The study used a Heuristic evaluation method, which is experience-based problem solving with nurses as the respondents of the study. The findings showed that where duplicate documentations were recorded, it showed poor experience that can affect accurate data extraction from the system hence leading to inefficiency which reduces satisfaction level in the hospital

Kushniruk, Nihr, and Borycki (2016) did a study to determine the human factor for more ability to use HIS technology, using a framework that involved multi-layered systematic approach in detecting technology-induced errors at all stage of adoption of the MIS in the hospital. The findings established that human errors related to technological or computer use have continued to be reported in the hospital. As such, healthcare managers need to emphasize on the need for the hospital management to train their employees on how to use the system at an early stage.

Frequent interaction between nurses and the computer can increase their skills in using the new HMIS. In a study by Lowry *et al.*, (2012), nurses have unique characteristics that translate into unique EHR user-experience challenges. The study highlighted the importance of user interactions that are especially salient for physicians to enhance the EHR user-centered design process. The study applied consensus in a series of teleconferences with experts from different departments as well as extensive peer review. The study found out that frequent use of the system is essential to enable users to understand how it operates.

Zahabi, Kaber, and Swangnetr (2015) reviewed EMR and related EHR as HMIS to detect technology use challenges faced by staff during their interactions with the IS. Safety analysis technique was piloted using Compendex, PubMed, CINAHL, and Web of Science database of EMR publications since 2000 with criteria being English written papers. Results showed that EMR and EHR computer user error problems include violations of natural dialog, control consistency, effective use of language, effective information presentation, and error prevention, and principles of customization.

2.3.2 Organizational factor and adoption of HMIS

Barzekar & Karami (2014) examined the organizational factors affecting the application of IT in hospitals. The study adopted a cross-sectional descriptive study with a sample size of 110 middle managers from teaching hospitals, and structured questionnaires were used to collect data. The study established a significant association between organization resource, knowledge, process, structure, values, and goals with the adoption of IT systems in the hospital.

Baada (2018) also analyzed organizational factors affecting ICT systems in the organization in Ghana. The study focused on organizational culture, structure, top management, human resources, and the availability of physical ICT infrastructure as the dependent variables of the study. By using a quantitative cross-sectional survey method, data was collected from 70 selected staff across sections of the sampled population. Results indicated that there was mutual influence between organizational culture and organizational structure on the adoption of ICT systems.

Biwott, Odini, and Musyoki (2018) inquired about on hierarchical factor for HMIS accomplishment in Elgeiyo-Marakwet County. A quantitative research configuration was utilized, and information was gathered through the organization of surveys to the tested 52 respondents for the examination. In their discoveries, the investigation demonstrated that

there was a nearness of authoritative variables like structure, objectives, and goals influencing the selection of HMIS and its presentation in the district's emergency clinic as shown by most of the respondents.

Hikmet (2008) likewise analyzed the impact of hierarchical qualities, for example, the extent of the emergency clinic, area (urban versus provincial), and tax status on the adoption of HIT in healthcare organizations. Using a survey method, data collected from 98 hospitals in Florida hospitals, the study found out that all these characteristics have an influence on HIT adoption except for the location of the hospital.

2.3.3 Technological factors and adoption of HMIS

Mohamadali and Aziz (2017) researched on barriers of a technological factor on the sustainability of health information system (HIS) review, with information quality, service quality and system quality as components of technology that affects the adoption of HIS in the hospital. Data collection involved searching for articles by specific electronic journal databases to access publications from 2010. Results showed that if these concepts of technological factors are not analyzed effectively, they can hinder the adoption of the HMIS in the hospital.

Nguyen, Bellucci & Nguyen (2014) did a systematic literature review of scholarly work published 2001 – 2010 to evaluate the impact of IS and contingency factors on the implementation of EHR using the extension of DeLone and McClean's IS evaluation framework; system, information and service qualities. The results showed both positive and negative correlation of the dependent variables and the dependent variable of the study.

In Kenya, Cheburet and Otieno (2016) researched on technological factors affecting data quality of routine HMIS. The study used a cross-sectional study design. Information was gathered from the health specialist and respondents who interact with the system frequently. The results showed that majority of the respondents agreed that technical factors such as inappropriate technological infrastructure and lack of right skills affect the adoption of HMIS in the health organizations.

2.4 Knowledge gap

Previous studies carried out on factors affecting the adoption of HMIS have produced mixed results (Patricia, 2014; Kushniruk, Nihr & Borycki, 2016). It is also evident that most empirical review undertaken has been in developed nations (Baada, 2018; Lowry et al., 2012). Moreover, most of the studies have been done to address the phenomenon on

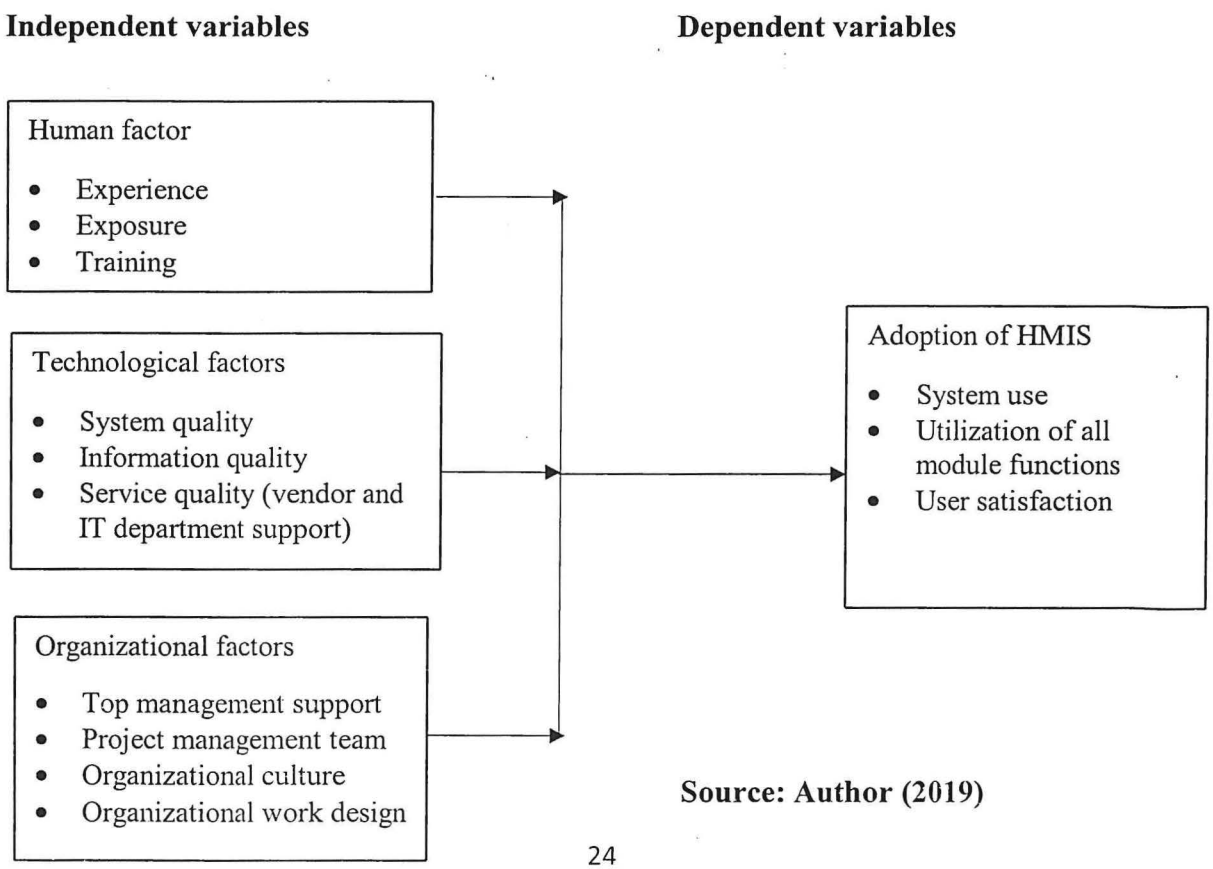
organization level (Zahabi, Kaber & Swangnetr, 2016; Hikmet, 2008) with little or no studies done to address these factors from the departmental perspective in the hospital. Nevertheless, different studies have deployed different methodologies such as heuristic approach, multi-layered systematic approach, consensus approach, and cross-sectional technique (Barzekur & Karami, 2014; Cheburet & Otieno, 2014).

Though these studies provided an adequate literature review, the results obtained cannot be effectively applied in establishing effective adoption across various departments in the hospital, as most of them have focused on physicians and nurses leaving out key personnel involved in the hospital service chain. Therefore, the existing knowledge gap in understanding how the system works across the various departments of the hospital is critical to the study. The study aimed to bridge the gap by establishing human factor, organizational factor, and technological factor and their effect on adoption of HMIS at St. Catherine's hospital.

2.5 Conceptual Framework

This section describes the relationship between the independent and dependent variables of the study. It also simplifies variables through operationalization process so that they can be easily understood in the study.

Figure 2.1 Conceptual framework



Source: Author (2019)

2.6 Operationalization of variables

Provides the measurement of study variables in a simplified way as shown in table 2.1.

Table 2.1 Operationalization of variables

No.	Variable	Definition	Indicator	Scale
1	Human factor	Entails an individual's personal interaction with computers. It is in relation to computers and computer systems in general, not just the HMIS	• Experience • Exposure • Training	Likert
2	Organizational factor	Refers to the aspects within the organizational set up which provides a conducive environment for adoption in the organization	• Top management support • Project management team • Organizational culture • Organizational work design	Likert
3	Technological factor	Refers to technical issues borne to the system	• System quality • Information quality • Service quality	Likert
4	Adoption	Refers to the optimal utilization of the system to carry out various task	• System use • Utilization of all module functions • User satisfaction	Likert

2.7 Chapter summary

The main objective of this study was to determine factors affecting the adoption of HMIS across the departments in the hospital. This chapter provided existing scholarly work that discusses the objectives of the study as well as the theories that contributes to the topic of the study. First, the chapter discussed the theoretical review of the chapter; diffusion of innovation theory and the technology acceptance model theory. In describing the theories, the study further indicated how each theory relate to the study. Moreover, the chapter also provided a critical empirical review of the study. Here, the chapter discussed the methodologies and findings of previous research findings which relate to the topic. A knowledge gap of the study was therefore drawn from these existing studies and conceptual framework drawn to indicate the relationship between independent variables (human, organizational and technological factors) and dependent variables (adoption of HMIS). The chapter further entails the operationalization of variables which described variables measurement scale as well as their indicators.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discussed the methodology that was used to gather information necessary for making study conclusions. This involved the design of the research, study population, sample size and sampling method, data collection method, data collection instruments, research quality, data analysis and presentation, and ethical consideration.

3.2 Research Design

This refers to the plan and strategy that the research utilized to gather and investigate information for the investigation (Kothari, 2004). This study employed a cross-sectional survey method. The advantage of this research design over others was that it provided much detailed information, totality, and variation which eased the processes of understanding the phenomenon and how the incorporated research tools answered the research questions (Kothari, 2004).

3.3 Target Population

The target population refers to the total number of objects, persons, or elements considered for the study (Baxter & Jack, 2008). The target population for the study included all users of the system that had used ClinicMaster for more than six months at the time of the study. This was a total of 109 users from all the departments as shown below. A census survey was carried out which meant that all the 109 users were expected to be respondents to the survey.

Table 3.1 Target Population

Major category	Minor category	Target population	Percentage
Clinical	Doctors	48	44
	Nurses	12	11
Para-Clinical	Laboratory	7	6
	Pharmacy	9	8
	Radiology	4	4
Non-clinical	Biller/Cashier	10	9
	Administration	7	6
	Receptionist	4	4
	Account/finance	4	4
	Store/procurement	2	2
	Records officer	2	2
Total		**109**	**100**

3.4 Sampling Size and Sampling Methods

Mugenda and Mugenda (2003) demonstrated that a sample size of more than 30 is adequate for the examination. As such, the sample size of this study was drawn from the target population of the study. Sampling method refers to techniques adopted by the study to determine a good sample size (Cobb, Confrey, DiSessa, Lehrer & Schauble, 2003). A census survey sampling method was used. Kothari (2004) indicated that the census survey technique is appropriate where the researcher feels the population is too small for some objects or part of the population to be left out. Therefore the whole population of 109 was studied.

Also, the stratified arbitrary inspecting procedure was utilized to characterize the number of inhabitants in the investigation into strata to allow the researcher to collect data accurately and effectively.

3.5 Data Collection

This involved instruments and techniques. Information accumulation instruments allude to the devices that will be utilized to assemble data from the respondents. The instruments for information accumulation ought to be basic, simple and sufficiently exact to enable respondents to comprehend the goals and research inquiries of the examination in a straightforward and clear way (Mackenzie and Knipe, 2006). A survey was utilized to assemble essential information dependent on scale investigation (Likert-scale 1-5). The questionnaires were self-directed by the specialist through the pick-drop approach. The questionnaires were administered to the study population in their various departments after clearly explaining to them what the study was about. They were given the option to consent to the study voluntarily. Five days were allowed to complete the questionnaires. Upon completion of the questionnaire, the respondent was required to put it in an envelope and seal it. The sealed envelopes containing the completed questionnaires were then duly collected.

Table 3.2 Likert-Scale Structure

Scale	5	4	3	2	1
Strongly Agree	√				
Agree		√			
Neutral			√		
Disagree				√	
Strongly Disagree					√

Source: Author (2019)

3.6 Research Quality

Research quality alludes to the legitimacy and dependability of the investigation instruments. The nature of this investigation was guaranteed through a pilot test contemplate. The poll was first tried to guarantee that their legitimacy and unwavering quality accomplished the exploration goals (Srivastava and Thomson, 2009). The apparatus was additionally given to a specialist (supervisor) to assess the pertinence of everything in the instrument to the examination goals of the investigation. Once the questionnaires were developed, the researcher sought the opinion of the supervisor by discussing the relevance of contents of each question in the Likert-scale sections. Where changes were made, the researcher redesigned the questions to meet the criteria set by the experts (supervisor) so as to aid in providing accurate results.

3.6.1 Reliability

Reliability alludes to the consistency of the examination instruments in addressing the exploration questions. Reliability of the study was tested using Cronbach's alpha test. Values between 0.5 to 0.7 and above indicated that the instrument is reliable enough in answering the research questions while those below 0.5 indicated that the instrument was not effective enough in meeting study objectives (Pinsonneault & Kraemer, 1993). Even though the most recommended scale for reliability test is 0.7, Pinsonneault and Kraemer (1993) argued that a scale above 0.5 should also be considered useful for determining the reliability of the research instrument.

The findings established that all the values of the independent variables of the study were consistent and above 0.7. Therefore, should the study be repeated, the findings may be the same. The human factor, organizational factor and technological factor all had alpha values of .7620, .7987 and .8580 respectively, only dependent variable (adoption of HMIS) had a value below 0.7 but above 0.5 as presented in table 3.4

Table 3.3 Reliability Test-Results

Variables	Alpha Value	No. of items
Human factor	.7620	6
Organizational factor	.7987	6
Technological factor	.8580	12
Adoption	.5032	5

3.6.2 Validity test

Refers to the accuracy and truthfulness of the research instruments in measuring the purpose of the study as it is intended to measure without causing variation of mixed results. For this study, validity test was done using content validity which involved seeking the opinion of the experts such as the supervisor to analyze and evaluate the relevance of the research questions in the questionnaire (Srivastava & Thomson, 2009).

A pilot study was carried out to ensure that the questions in the initially developed tool were easy to understand and that they would not cause any confusion in the mind of the respondents. Three questionnaires were given out; one to a doctor, one to a laboratory technician and the last one to a biller to cater for the three departmental classifications. The questionnaires were filled and the views and comments of the respondents were used to make changes to the final tool that was used in the study.

3.7 Data Analysis and Presentation

Data was analyzed using Statistical Package for Social Sciences (SPSS) with the help of Excel spreadsheet. The advantage of this software analysis is that the software has several in-built mathematical formulas which assist in formatting the data effectively for analysis. Descriptive and inferential statistical tests were used. Quantitative data were computed into frequency and percentages and standard deviations. Also, the Pearson Correlation coefficient, regression analysis was used to show the relationship that exists among the study variables. Additionally, the study sought to determine factors affecting adoption among three major departmental categories using regression and correlation analysis to assist in comparison across the departments. Multiple regression model, therefore, was;

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

Where; Y = Adoption of HMIS

β_0= Constant

$\beta_1 - \beta_3$ = Regression coefficients

X_1 – Human factor

X_2 – Technological factor

X_2– Organizational factor

ε – Error term

3.8 Ethical Considerations

The study ensured honesty since ethical norms promote the aims of the research. Honesty ensures that the study prevents falsifying and misrepresentation of data. The study also informed consent of the respondents as it gave respondents adequate information regarding the objectives of the study. Also, confirmation that their participation would be free instead of being forced. Additionally, respondents' character was unknown in that their names and individual data was not recorded anyplace in the exploration instruments. All in all, the examination looked for the college letter and a consent letter from the clinic; the executives in order to access data from the objective populace of the investigation. Additionally, the study sought the letter from the ethics committee letter from the school as shown in appendix 6.

CHAPTER FOUR

DATA ANALYSIS, RESEARCH FINDINGS AND INTERPRETATION

4.1 Introduction

This chapter presents the study findings based on the research objectives which were; to determine the human factor, technological factor and organizational factor affecting the adoption of HMIS/ClinicMaster across different departments at St. Catherine's Hospital. The chapter, therefore, discusses demographic information of the respondents, descriptive statistics, and inferential statistics.

There were 109 surveys which were printed and managed for the investigation by the analyst. An aggregate of 73 surveys were completely filled and returned and were all usable for information examination. The information was gathered in April 2019. The investigation subsequently had a response rate of 67%.

Table 4.1 Response Rate

Questionnaire	Frequency	Percentage %
Filled	73	66
Not filled	36	34
Total	**109**	**100**

4.2 Demographic Information

In this section, the study presents the information gathered on gender, age, and department/function of the respondents.

4.2.1 Gender of the respondents

The investigation looked to discover the gender of the respondents. This was mostly to guarantee that there is equivalent appropriation of study respondents.

Table 4.2 Gender of the respondents

Gender	Frequency	Percentage %
Male	37	51
female	36	49
Total	**73**	**100**

The findings established that 51% of the respondents who partook in the examination were male while 49% were female, and the discoveries were displayed as pursues. This implied that there was a relatively even gender distribution among the respondents.

4.2.2 Age of the respondents

The examination likewise decided the age section of the respondents. The revealed that 45% of the respondents were in the age section 20 – 30 years, 26% in 31 – 40 years, 10% in 41 – 50 years, 3% in 51 – 60 years while none was either underneath 20 years or over 60 years. This indicated that majority of the respondents were in the age bracket of 20 – 30 years, the age bracket perceived to be more computer and system use friendly in many organizations.

Table 4.3 Age

Age bracket	Frequency	Percentage
Below 20 years	-	-
20 – 30 years	45	62
31 - 40 years	19	26
41 – 50 years	7	10
51 – 60 years	2	3
Above 60 years	-	-
Total	**73**	**100**

4.2.3 Department/Function

This section presents the findings on the hospital functions.

Table 4.4 Department/Function

Department	Functions	Frequency	Percentage %
Clinical	Doctors	23	32
	Nurses	10	14
Para-Clinical	Laboratory	5	7
	Pharmacy	5	7
	Radiology	3	4
Non-clinical	Biller/Cashier	10	14
	Administration	6	8
	Receptionist	4	5
	Account/finance	3	4
	Store/procurement	2	3
	Records officer	2	3
Total		**73**	**100**

The study results in table 4.4 revealed that 8% of the respondents were in administration, 32% were doctors, 14% were nurses, 7% were in laboratory, 7% pharmacy, 14% were biller/cashiers, 5% receptionists, 4% accounts/finance, 4% radiology, 3% store and procurement and 3% records officer. The high response rate of doctors and nurses was as a result of them being the highest number of participants in the study.

4.2.4 System Use Experience

The study established that majority of the respondents with 49% have system use experience above two years, 32% had 1 – 2 years, and 19% had six months – 1-year experience. This implied that those who took part in the study had vast knowledge on use of the system in the hospital.

Table 4.5 System use experience

Experience	Frequency	Percentage %
Less than 6 months	-	
6 months – 1 year	14	19
1 – 2 years	23	32
Above 2 years	36	49
Total	**73**	**100**

4.3 Descriptive statistics

This section presents the findings on the mean and standard deviations of each research objectives.

4.3.1 Human factor

In order to determine how human factor affects the adoption of HMIS/ClinicMaster across different departments in the hospital, the study developed several statements relating to respondents' personal interaction with computers, experience, and exposure in using them as aspects of the human factor. In a scale of 1-5 where 1-strongly disagree, 2-disagree, 3-neutral, 4-agree, and 5-strongly agree, respondents were asked to indicate their level of agreement with each statement, and the findings were presented as follows.

The findings as shown in table 4.6 established that respondents agreed with most of the parameters or questions related to the human factor. The overall mean of 4.18 that was determined as shown in Table 4.6, suggests that the hospital staff had some knowledge of

computer use and the ability to apply various computer skills without facing human challenges.

Table 4.6 Human factor

Statement	Mean	Std. Dev
I often use a computer both at work and at home	4.03	.928
I can easily navigate on different pages/windows and between applications when using a computer	4.18	.887
I am able to type without difficulty at all time	4.38	.810
I have experience in using computer-based information systems	3.95	.762
Frequent computer use makes me understand how information systems work efficiently	4.29	.754
I am able to apply my computer skills when using computer-based information systems	4.23	.677
Overall Mean	**4.18**	-

4.3.2 Computer training

This section sought to determine whether respondents had a computer training/course before using ClinicMaster. 81% said yes, while 19% said no. It is therefore evident that majority of the system users had had computer training before interfacing with the clinic master system.

Table 4.7 Computer training/course

Computer training	Frequency	Percentage %
Yes	59	81
No	14	19
Total	**73**	**100**

4.3.3 Rating of the effect of human factor on adoption

The study assessed the rating of extent of the effect of human factor on the adoption of ClinicMaster in the hospital.

Table 4.8 Rating of the effect of human factor on adoption

Extent of influence	Frequency	Percentage %

Very great extent	19	26
Great extent	38	52
Moderate extent	14	19
Little/no extent	2	3
Total	**73**	**100**

The findings in table 4.8 shows that 26% of the respondents indicated very great extent, 52% great extent, 19% moderate and 3% little/no extent. Therefore, this finding implied that at least 78% of the users believe that their own computer exposure, experience and training in computer use have a great influence on their adoption of the system.

4.3.4 Organizational factor

The study developed several statements to find out how the organizational factor affects the adoption of ClinicMaster/HMIS across the different departments in the hospital. The statements focused on the organizational setup, culture, project management, and level of project commitment as aspects of organizational factor. In a scale of 1-5 where 1-strongly disagree, 2-disagree, 3-neutral, 4-agree, and 5-strongly agree, respondents were asked to indicate their level of agreement with each statement, and the findings were as follows.

Table 4.9 Organizational factor

Statement	**Mean**	**Std. Dev**
The project management team provide proper plan and resources for HMIS adoption in the hospital	3.85	.828
Organization workplace design creates a good working environment that encourages the use of HMIS	3.84	.898
There is a clear definition and roadmap for achieving the objectives of HMIS adoption in all departments	3.49	.945
Management and employees are aware of the benefits of using HMIS		
Top Management is fully committed to the success of the HMIS project	3.81	.967
The culture of the organization has been created through communication and symbols, and these have an impact on the adoption HMIS	3.93	1.004
	3.73	.917
Overall Mean	**3.78**	

The various aspects developed relating to organizational factor had an overall mean below of 3.78 which is below 4.0. The study findings, therefore, established that majority of the respondents to some extent did not agree with some statements relating to organizational factor as one of the factors that could be affecting the adoption of ClinicMaster/HMIS across different departments in the hospital.

4.3.5 On-going training of ClinicMaster/HMIS by management

The study assessed whether the management of the hospital provides ongoing training on the use of the ClinicMaster/HMIS across the different departments in the hospital. 74% of the respondents said yes while 26% said no. By providing an on-going training of the system therefore provides employees with opportunity to gain adequate knowledge on how to best use the system in the hospital.

Table 4.10 On-going training on ClinicMaster/HMIS

Ongoing training	Frequency	Percentage
Yes	54	74
No	19	26
Total	**73**	**100**

4.3.6 Rating of the effect of the organizational factor on adoption

The findings revealed that 15% of the respondents rated the effect of the organizational factor on the adoption of ClinicMaster/HMIS across the different departments as very high, 60% indicated high, 21% moderate while 4%. This finding may imply the majority of the users believe the organisational set up, culture, work design and management support have a high influence on their adoption of the system.

Table 4.11 Rating of the effect of the organizational factor on adoption

Rate of influence	Frequency	Percentage %
Very high	11	15
High	44	60
Moderate	21	21
Low	3	4
Total	**73**	**100**

4.3.7 Technological factor

Also, the study established that the technological factor has a significant effect on adoption of ClinicMaster/HMIS across different departments in the hospital. Statements relating to technical issues were developed, and respondents were asked to indicate their level of

agreement with each statement in a scale of 1-5 where 1-strongly disagree, 2-disagree, 3-neutral, 4-agree, and 5-strongly agree.

Table 4.12 Technological factor

Statement	Mean	Std. Dev
Information I get from the system is clear and in a useful format	4.16	.746
I always have access to a computer when I need to use the system	4.16	.928
The system provides accurate and up-to-date information	3.37	1.034
The information I get from the system is very secure and free from alteration	3.41	1.116
The system allows easy retrieval of information at all times	3.84	.958
The system is always up and available	3.38	1.075
The system is easy to use	3.82	.805
The system helps me complete my tasks	3.96	.824
The ClinicMaster team responds promptly when there is an issue with the system	3.64	1.005
Whenever I am in trouble with the system, the IT staff are on standby to help	4.33	.800
The system is customized to my needs	3.37	.874
The system easily detects errors and alerts you to correct them	3.21	1.142
Overall Mean	**3.72**	

As presented in table 4.12, the findings of the study revealed that respondents did not entirely agree with statements relating to technological factor in the organization. The study findings established an overall mean of 3.72 which is below 4.0, and this, therefore, implied that technology as a factor had not been efficiently utilized across the different departments to aid in the adoption of ClinicMaster system in the hospital. Even though the respondents indicated that the information they get from the system is clear and very useful, as well as having easy access to a computer, the findings reveal that for the hospital to attain the optimal adoption of ClinicMaster across the different departments, the quality of the technological must be improved.

4.3.8 Rating of the effect of the technological factor on adoption

Further, the study determined the rate of the effect of the technological factor on adoption in the hospital.

The study results in table 4.13 revealed that 32% of the respondents indicated that technological factor has a very great effect on the adoption of *ClinicMaster*, 47% great extent, 16 moderate extent and 5% little or no extent. The results revealed that the users of the system believe the quality of the technology has used has a very strong influence on their adoption of the system.

Table 4.13 Rating of the effect of the technological factor on adoption

Extent of influence	Frequency	Percentage %
Very great extent	23	32
Great extent	34	47
Moderate extent	12	16
Little/no extent	4	5
Total	**73**	**100**

4.3.9 Adoption of ClinicMaster/HMIS

Adoption of ClinicMaster (HMIS) was the dependent variable of the study. The researcher developed several statements relating to the optimal utilization of the system to perform their duties and asked the respondents to indicate their level of agreement with each statement on a scale of 1-5. Where 1-strongly disagree, 2-disagree, 3-neutral, 4-agree and 5-strongly agree.

Table 4.14 Adoption of ClinicMaster (HMIS)

Statement	Mean	Std. Dev
I always use the system to accomplish my work tasks	3.86	.918
I often use other information methods/tools (paper or electronic, e.g. financial systems) instead of the HMIS to accomplish some of my tasks	3.71	1.047
I have not/cannot use(d) some of the functions in my module	3.60	1.051
I log into the system several times during my shift/working hours	3.60	1.139
Overall, I am satisfied with the system	3.66	.901
Overall Mean	**3.69**	

The study findings, as recorded in table 4.14 found out that overall, adoption of ClinicMaster/HMIS has not been fully achieved across the different departments in the hospital. This was revealed by an overall mean of 3.69, which is below 4.0, suggesting that respondents did not agree/strongly agree with most of the statements indicative of the adoption in the hospital. As a result, it is therefore evident that hospital management must find mechanisms of ensuring that adoption of ClinicMaster is useful in assisting employees in making healthcare decisions to enhance the utilization of health services across the different departments.

4.3.10 Adoption and implementation of ClinicMaster

The study sought to determine whether adoption and implementation of ClinicMaster/HMIS across the different departments in the hospital have been easy. 47% said yes, while 53% said no. This displayed a picture that ClinicMaster/HMIS presents a big challenge for hospitals in its implementation.

Table 4.15 Adoption and implementation of HMIS/*ClinicMaster*

Implementation process	Frequency	Percentage
Yes	34	47
No	39	53
Total	**73**	**100**

4.4 Inferential analysis

This section provides the inferential analysis of findings in the hospital through correlation and regression analysis.

4.4.1 Correlation analysis

This analysis was performed to determine the correlation between study variables in a range of -1 to +1 where -1 implied perfect negative correlation and +1 implied perfect positive correlation, and where there was 0, it means that there was no correlation. The findings are presented in table 4.16

Table 4.16 Pearson correlation matrix

Variables		Human	Organizational	technological	Adoption
Human	Correlation	1.0000			
	N	73			
Organizational	Correlation	.2469	1.0000		

	Sig (2-tailed)	.0352*			
	N	73	73		
Technological	Correlation	.2634	.5802	1.0000	
	Sig (2-tailed)	.0245*	.0000*		
	N	73	73	73	
Adoption	Correlation	.1191	.2308	.3261	1.0000
	Sig (2-tailed)	.3156*	.0495*	.0049*	
	N	73	73	73	

*Correlation is significant at 5% level (2-tailed)

From the correlation matrix table, the independent variables of the study (human factor, organizational factor and technological factor) had a weak positive correlation with the adoption of ClinicMaster/HMIS across the different departments with correlation coefficient values of .1191, .2308 and .3261 respectively at 0.05 level of significance. Organizational and technological factors had p-values of .0495 and .0049, respectively, while only human factor had a p-value of .3156. Of the three variables, technological factor had a higher weak positive correlation with the adoption of ClinicMaster/HMIS, followed by organizational factor then human factor with the weakest correlation. Though the study variables had positive correlation coefficients, the findings established that they were not effective in explaining the effects of human, organizational, and technological factors on the adoption of ClinicMaster/HMIS across different departments. This is because a robust positive correlation should range between +0.5 - +1.

4.4.2 Model summary

Described how changes in one variable causes variations in the dependent variable of the study, as described in table 4.23. R – Square (R^2) or the coefficient of determination shows the percentage changes in the adoption of ClinicMaster/HMIS across different departments as dependent variable caused by changes in the effect of human, organizational and technological factors as independent variables.

Table 4.17 Model summary on adoption of HMIS in the hospital

Model	R	R - Square	Adjusted R - Square	Std. Error Estimate
1	.3314	.1098	.0711	.5257

a. Predictors (Constant); Human Factor, Organizational Factor, Technological Factor

Thus, R^2 of .1098 showed that the independent variables in the model provided 10.98% explanation of the changes in adoption of ClinicMaster/HMIS across different departments in

the hospital. Therefore, this could mean that 89.02% changes in the adoption of the system in the hospital could be explained by other factor variables not included in the study. It therefore means that there is need to include other factors which the study did not consider.

4.4.3 Analysis of variance

The analysis was performed to indicate the significance of the overall model of the study.

Table 4.18 ANOVA results

Model	Sum of Squares	df	Mean Square	F	Sig
Model	2.8657	3	.9552	2.84	.0444
Residual	23243	69	.3368		
Total	**25.1087**	**72**	**.4033**		

a. Predictors (Constant), Human Factor, Organizational Factor, Technological Factor

b. Dependent Variable: Adoption of ClinicMaster (HMIS)

The ANOVA table results established that the overall model is significant at the 0.05 level of significance. F calculated was greater than F critical of 2.84. The p-value of the model was 0.0444 lower than 0.05, which confirmed the significance of the overall model.

4.4.4 Regression coefficient

This was established to show the statistical significance relationship between independent variables and dependent variable in the study using the established model.

Table 4.19 Regression coefficient results

	Unstandardized Coefficients		Standardized Coefficient		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
Constant	2.4879	.5257		4.73	.000
Human	.0259	.1031	.0298	.25	.802
Organizational	.0504	.1205	.0585	.42	.679
Technological	.2325	.1154	.2843	2.01	.048

a. Dependent Variable: Adoption of ClinicMaster (HMIS)

The model established that there was a positive coefficient for all the independent variables of the study, suggesting that human factor, organizational factor and technological factor positively affects the adoption of ClinicMaster/HMIS across different departments in the hospital. Thus, a unit increase in human, technological, and organizational factors increases the adoption of ClinicMaster/HMIS across different departments. However, their unit increase varies.

From the model, the regression equation was derived;

$$Y = 2.4879 + .0259X_1 + .2325X_2 + .0504X_3 + \varepsilon$$

The results showed that technological factor (X_2) had a moderate positive beta coefficient of .2325, then organizational factor (X_3) with a beta coefficient of .1129 and lastly human factor (X_1) with a beta coefficient of .0259. Therefore, when every other factor is held constant, the adoption of ClinicMaster/HMIS across different departments in the hospital is 2.4879. As such, a unit increase in human, technological and organizational factors will lead to an increase in adoption of ClinicMaster/HMIS across different departments with .0259, .2325 and .0504 respectively, a sign that there is a positive relationship between the independent and dependent variables of the study.

Also, the model found out a statistical significant positive relationship between technological factor (β = .2325, t = 2.01 and p-value < .05) with adoption of *ClinicMaster*/HMIS across different departments in the hospital. While this suggests that technology has an effect on adoption across different departments, the evidence also demonstrates that technological factor has not been effective in achieving the optimal adoption level of ClinicMaster/HMIS across the different departments. This was also evident in other factors under consideration in the study, as shown by a p-value above recommended 0.05. Human factor (β = .0259, t = .25 and p-value > .05) and organizational factor (β = .0504, t = .42 and p-value > .05) had insignificant positive relationship with adoption of ClinicMaster/HMIS across different departments in the hospital as dependent variable in the hospital.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the discussions, conclusions and recommendations of the research study in line with the research objectives. It also provides limitations and areas of further study.

5.2 Discussions

This study sought to determine factors affecting the adoption of ClinicMaster/HMIS across departmental functions at St. Catherine's Hospital in Uganda. The study was guided by the three research objectives; to determine human factor affecting adoption of ClinicMaster/HMIS, to determine technological factor affecting adoption of ClinicMaster/HMIS and to find out organizational factor affecting adoption of ClinicMaster/HMIS across departmental functions at St. Catherine's hospital. The discussion of the research findings are therefore based on research objectives.

5.2.1 Effect of human factor on adoption of ClinicMaster/HMIS

The level of user interactions and how frequently people use computers has remained influential in determining the level of system use in every organization as the study established. The study found out a high mean, which indicated that respondents agreed that human factor had played a vital role in the adoption of ClinicMaster/HMIS across the hospital based on the statistical findings. This suggested that their level of interaction with the system in the hospital has been high compared to other factors. The findings support the previous findings of Farzandipur, Jeddi, and Azimi (2016) who found out that computer skills and frequent use of the computer can enhance the level of adoption of HMIS in the organization.

From the regression model of the study, the results revealed that there was an insignificant positive relationship between human factor and adoption of ClinicMaster/HMIS in the hospital (combined different departments). Further, the study findings revealed that there was a weak positive correlation coefficient between human factor and adoption of ClinicMaster/HMIS in the hospital. Though the results were not strong enough to explain the sub-optimal utilization of the system in the hospital, the findings still agreed with the study by Patricia (2014) that even though human factor may have both effects on adoption, its positive effects have been vital in enhancing the level of adoption in the hospital.

A correlation analysis performed between human factor and adoption of HMIS in the hospital revealed that there was a positive correlation between the variables. Even though the strength of the relationship was weak, the results revealed that it contributed in showing the relationship between the two variables. However, the level of effect that human factor has on adoption in the hospital is minimal as it could not translate to optimal adoption level. As a result, the study indicated that there is need for the management to promote continuous use of not only the system but also computer so as to improve their proficiency in the hospital. This findings relates to the study findings of Lowry *et al.,* (2012) who found out that frequent use of computer or system enables users to understand how the newly adopted information systems operates in the organization.

5.2.2 Effect of organizational factor on adoption of ClinicMaster/HMIS

The results of the study revealed that the overall mean of the descriptive statistical findings on organizational factor variable was not sufficient enough to promote optimal adoption of ClinicMaster/HMIS in the hospital. The findings suggested that respondents did not agree/strongly agree that organizational factor has been effective in providing needed support and systems that support maximum adoption in the hospital. While this could not entirely mean that adoption has not been effective in the hospital, the study pointed out that some lags still exist concerning the hospital structure and system/frameworks that can enhance optimal adoption of ClinicMaster/HMIS (Barzekar & Karami, 2014). Therefore, the results revealed that the hospital still has room to improve its organizational aspects to attain optimal adoption across the different departments in the hospital.

From the regression analysis, the study findings recorded that there was an insignificant positive relationship between organizational factor and adoption of ClinicMaster/HMIS in the hospital. This implied that a slight increase in the adoption of ClinicMaster/HMIS in the hospital can be caused by positive changes in organizational factor, as suggested by Hikmet (2008). However, the changes are insignificant and may not determine the optimal adoption of ClinicMaster/HMIS in the hospital. This further revealed that the organizational factor had not effectively attained a high level of adoption. Hence, there is a need for the hospital to relook at its organizational factors and develop mechanisms on how organizational factors be used effectively to enhance adoption level in the hospital (Barzekar & Karami, 2014).

Also, the findings of the study showed that there was a weak positive correlation between organizational factor and adoption of ClinicMaster/HMIS across various departments in the

hospital. This result implied that even though the hospital has put in place various structures, cultures and management support to aid in effective adoption of the HMIS, little has been achieved in determining optimal use of the system in the hospital. However, the hospital has made slight changes which may indicate the effects of positive adoption as shown by the positive correlation results. This finding correlates with the findings of Baada (2018) who concluded that there exists substantial correlation between organizational structures, processes, and culture and adoption of new IS in the organization.

5.2.3 Effect of technological factor on adoption of ClinicMaster/HMIS

From the overall regression and correlation of the study, the results established that technological factor significantly affects adoption of ClinicMaster/HMIS in the hospital with a moderate correlation coefficient value at the required level of significance, a clear indication that there is a positive relationship between technological factor and adoption of ClinicMaster/HMIS in the hospital. The technological factor, therefore, had the highest regression coefficient value, which was supported by the work of Nguyen, Bellucci, and Nguyen (2014). A unit increase in the technological factor, therefore, would results in a unit increase of adoption in the hospital, more than any other factor. However, the level of effect still illustrates that it has not been able to effectively result in optimal adoption of ClinicMaster/HMIS in the hospital.

In determining the extent of the effect of the technological factor affecting the adoption of ClinicMaster/HMIS in the hospital, the study results indicated that technological factor has a great extent on the adoption of the system in the hospital. Also, the study found out that IT staffs in the hospital are always on standby to offer any technical support that may be needed by the users to ensure the information they get from and enter into the system is clear and in a useful format. Therefore, this finding concurred with the results obtained in the work of Cheburet and Otieno (2016) who found out that having skilled personnel with adequate technological infrastructure may lead to efficient adoption of HMIS in the organization, and the reverse could be true.

Furthermore, the study indicated that there was a low level of agreement among respondents that information employees get from the system is very secure and free from alteration, the system is easy to use, and the system is always up and available. Based on the findings, the study emphasizes the need for a better quality of the information from the system. Information quality, system quality, and service quality are components that determine the

success or failure of adoption, as explained by the study. This was supported by the previous study done by Mohamadali and Aziz (2017) who in their study concluded that system quality, information quality, and service quality are critical at each stage of adoption of HMIS in the organization. However, the study established that adoption of ClinicMaster/HMIS across the departments has not been smooth and successful. This could suggest that to attain optimization of the system, vendors must provide systems and support that enhance service, information, and system quality.

5.3 Conclusion

First, the study concluded that that all the three variables of the study (human, technological and organizational factors) all had positive relationship with the independent variables of the study (adoption of ClinicMaster/HMIS across the departmental functions) in the hospital. However, human and organizational factors have insignificant positive relationship with the adoption of ClinicMaster/HMIS. Of the three variables, only technological factor had a positive significant relationship with adoption of ClinicMaster/HMIS in the hospital since it had a p – value less than the level of significance.

Moreover, the study also established a weak positive correlation between the variables. The study concluded that only technological factor had a moderate correlation with adoption of ClinicMaster/HMIS across departmental functions in the hospital, with a moderate correlation coefficient above the other variables and a p – value less than level of significance. The positive correlation could be as a result of assistance that IT officers offer to the management and employees in case of IT challenges and reduction of technical errors.

The study also concluded that the hospital provides on-going training on the use of the ClinicMaster/HMIS system in the hospital. In establishing the extent of the three variables affecting adoption of ClinicMaster/HMIS across departmental functions in the hospital, the study concluded that the users rated all the three factors as having affecting the adoption of ClinicMaster/HMIS in the hospital to a great extent. Therefore, the study concluded that a unit increase in the three variables of the study increase the adoption of the ClinicMaster, however the rates of increase vary.

5.4 Recommendations

In regards to the study conclusions, several recommendations are made. This study has revealed that human, organizational, and technological factor have a weak positive relationship with adoption of ClinicMaster/HMIS in the hospital. Key stakeholders in the field of healthcare management, therefore, need to undertake more research using other variables or study indicators in order to establish other factors significantly affecting the adoption of ClinicMaster/HMIS in hospitals.

The study also recommends that management of various hospitals should understand that healthcare management field is changing and with technology, decision making is easy and aimed at enhancing performance. Therefore, there is need by each hospital to not only adopt HMIS but to also to ensure that newly adopted IS have high-quality information, quality system, and quality services which provides easy access to the employees at all levels in the hospital. Vendors also must ensure their system entails the adoption characteristics, which are system quality, information quality, and service quality. The management is advised to engage the vendor on how to improve the quality of the system or even procure a different system in order to enhance the adoption of the system.

5.5 Areas of Further Research

The current research aimed at determining factors affecting the adoption of *ClinicMaster*/HMIS across departmental functions at St. Catherine's Hospital in Uganda. The study was successfully carried out; however, a number of gaps were identified that should form knowledge gap for future research. First, the study established that most doctors do not frequently use the ClinicMaster system in making their health decisions, and at most times, rely on billers and cashiers to finish their processes of billing the patient. Therefore, the study recommends future research to be done on the same topic but with only doctors as the target population so as to get their insights on how human, organizational and technological factors affects adoption of HMIS in the hospital.

This study also recommends that future research scope to be expanded to include other hospitals across the country (Uganda) so as to provide useful information that can be utilized in both private and public hospitals. This will aid in cross-comparison of effectiveness of adoption of HMIS in various hospitals.

5. 6 Limitations of the Study

The study had some limitations. The study adopted a cross-sectional design where the respondents provided information once on the study objectives and therefore did not consider other relations in accessing the information, more so where intended respondents failed to provide critical information. Also, different hospitals are at different stages of implementation of HMIS, so it is hard to study different hospitals while comparing their departments with those of others at a different stage.

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APPENDICES

Appendix 1: Introduction Letter

My name is Hudhaifa Saku a student of master's in business administration in Healthcare Management at Strathmore University in Nairobi Kenya. One of the main requirements for degree is conducting a research and, in this regard, I would like **to establish the factors affecting the adoption of HMIS (*ClinicMaster*) at St. Catherine's Hospital.** You have been identified to take part in this investigation because of your knowledge and use of the ClinicMaster system over the last six months or more. The data you give will be utilized carefully for scholastic purposes and will never be utilized against you or your office. The data acquired from you will be kept secret. You are additionally advised not to write your name on the tool. Upon completing the survey, kindly put the provided tool in the envelope and seal it. I will personally collect the envelope after 5 days. Your participation in this project is totally to your discretion. I extraordinarily value your help with this activity.

Thank you very much for your collaboration.

Appendix 2: Consent Form

Consent

Your signature indicates that this research study has been explained to you, that you've understood the information provided above, been given the opportunity to ask questions, and that you agree to take part in this study.

Sign: .....

Date: .....

For Official Use:

Name: .....

Sign: .....

Date: .....

(of Research Personnel)

For further clarifications or questions on this study, please contact me

1. Investigator: Hudhaifa Saku

Mob: +256774582233

Email: hudhaifasaku582@gmail.com)

2. My Supervisor: Dr. Pratap Kumar

Mob: +254731848163

Email: pkumar@strathmore.edu)

3. Inquiries to: The Secretary- Strathmore University Institutional Ethics Review Board P.O Box 59857-00200, Nairobi

Email: ethicsreview@strathmore.edu

Tel: +254703034375

Appendix 3: Questionnaire

The information given in this questionnaire will be treated with utmost confidentiality. Do not indicate your name. Please indicate by putting a tick (√) where applicable.

PART 1: RESPONDENTS SOCIAL DEMOGRAPHIC INFORMATION				
			CODE	
Q1	**Gender of respondent**	Male	1	
		Female	2	
Q2	**Age**	Below 20	1	
		20–30	2	
		31–40	3	
		41-50	4	
		51-60	5	
		above 60	6	
Q3	**Department/Function**	Administration	1	
		Doctor	2	
		Nurse	3	
		Laboratory	4	
		Pharmacy	5	
		Biller/Cashier	6	
		Receptionist	7	
		Accounts and Finance	8	
		Store and Procurement	9	
		Radiology	10	
		Records Officer	11	

Part 2. Factors affecting adoption of HMIS at St. Catherine's Hospital.

Human Factor

4. The following statements relate to human factor and their effect on adoption of HMIS. Please indicate with a tick (√) your level of agreement with each statement in a scale of 1-5 where 1=strongly disagree (SD), 2=agree (A), 3=neutral (N), 4=agree (A) and 5=strongly agree (SA).

	Statement	**1**	**2**	**3**	**4**	**5**
1	I often use a computer both at work and at home					
2	I can easily navigate on different pages/windows and between applications when using a computer					
3	I am able to type without difficulty at all time					
4	I have experience in using computer-based information systems					
5	Frequent computer use makes me understand how information systems work efficiently					
6	I am able to apply my computer skills when using computer-based information systems					

5. I had a computer literacy training/ course before this job/or before *ClinicMaster* training

Yes [ ] No [ ]

6. To what extent do you agree that that human factor affect adoption of *ClinicMaster* in the hospital?

Very great extent [ ] Great extent [ ]

Moderate extent [ ] Little/no extent [ ]

Organizational Factor

7. The following statements relate to organizational factor and their effect on adoption of HMIS. Please indicate with a tick (√) your level of agreement with each statement in a scale of 1-5 where 1=strongly disagree (SD), 2=agree (A), 3=neutral (N), 4=agree (A) and 5=strongly agree (SA).

	Statement	**1**	**2**	**3**	**4**	**5**
1	Project management team provide proper plan and resources for HMIS					

	adoption in the hospital					
2	Organization workplace design creates a good working environment that encourages use of HMIS					
3	There is clear definition and roadmap of the objectives of HMIS adoption in all departments					
4	Management and employees are aware of the benefits of using HMIS					
5	Top Management is fully committed to the success of the HMIS project					
6	The culture of the organization has been created through communication and symbols and these have an impact on the adoption of the HMIS					

8. Does the health facility provide organizational system training on occasional basis?

Yes [ ] No [ ]

9. How would you rate the effect of organizational factor on adoption of *ClinicMaster*?

Very high [ ] High [ ]

Moderate [ ] Low [ ]

Technological Factor

10. The following statements relate to technological factor and their effect on adoption of HMIS. Please indicate with a tick (√) your level of agreement with each statement in a scale of 1-5 where 1=strongly disagree (SD), 2=agree (A), 3=neutral (N), 4=agree (A) and 5=strongly agree (SA).

	Statement	**1**	**2**	**3**	**4**	**5**
1	Information I get from the system is clear and in a useful format					
2	I always have access to a computer when I need to use the system					
3	The system provides accurate and up-to date information					
4	The information I get from system is very secure and free from alteration					
5	The system allows easy retrieval of information at all times					

6	The system is always up and available					
7	The system is easy to use					
8	The system helps me complete my tasks					
9	*ClinicMaster* team responds promptly when there is an issue with the system					
10	Whenever I am in trouble with the system the IT staff are on standby to help					
11.	The system is customized to my needs					
12	The system easily detects errors and alerts you to correct them					

11. To what extent does technological factor affect adoption of *ClinicMaster*?

Very great extent [ ] Great extent [ ]

Moderate extent [ ] Little/no extent [ ]

Adoption of Health Management Information System

12. The following statements relate to adoption of HMIS (*ClinicMaster*) in the hospital. Please indicate with a tick (√) your level of agreement with each statement in a scale of 1-5 where 1=strongly disagree (SD), 2=agree (A), 3=neutral (N), 4=agree (A) and 5=strongly agree (SA).

	Statement	**1**	**2**	**3**	**4**	**5**
1	I always use the system to accomplish my work tasks					
2	I often use other information methods/tools (paper or electronic e.g. financial systems) instead of the HMIS to accomplish some of my tasks					
3	I have not/cannot use(d) some of the functions in my module					
4	I log into the system several times during my shift/working hours					
5	Overall, I am satisfied with the system					

13. Has adoption and implementation of HMIS been easy in the hospital?

Yes [ ] No [ ]

Appendix 4: Work Plan

Activity	Duration	Person responsible
Proposal development	December 2018-Febrruary 2019	Student
Submission of Proposal for defense	Last week of February 2019	Student
Proposal approval	1st week of March 2019	Strathmore Business School
Approval to conduct research at St. Catherine's Hospital	2nd week of March 2019	Management of St. Catherine's Hospital
Data collection	3rd and 4th week of March 2019	Student
Data Analysis	1st week of April 2019	Student
Writing of final report	2nd and 3rd week of April 2019	Student
Mock Defense	4th week of April 2019	Student
Submission of dissertation	End of 4th week of April 2019	Student
Dissertation defense	2nd week of May 2019	Strathmore Business School
Corrections if any and submission of final dissertation	3rd week of May 2019	Student
Graduation	28th June 2019	Strathmore Business School

Appendix 5: Budget

No.	Expenditure Item	Quantity	Cost (UGX)
1.	**Stationary**		
	Printing		600,000
	Binding		300,000
	Note books	3	20,000
	Pens	1 box	10,000
	Envelopes	150	80,000
2.	**Equipment**		
	Computer	1	2,000,000
	Software	2	900,000
3	**Travel**	30 Days	
4	**Indirect Costs** 20% of direct research cost		782,000
	Total		**4,692,000**

Appendix 6: Ethics Review Committee Research Letter

Strathmore UNIVERSITY

11th April 2019

Saku, Hudhaifa
Email: hudhaifasaku@gmail.com

Dear Hudhaifa,

REF **Protocol ID:** SU-IERC0344/19 **Student Number**: 100748
Factors Affecting Adoption of health management information system at St. Catherine's Hospital

We acknowledge receipt of your application documents to the Strathmore University Institutional Ethics Review Committee (SU-IERC) which included:

1. Study Protocol submitted 10th April 2019

The committee reviewed your application, and your study *"Factors Affecting Adoption of health management information system at St. Catherine's Hospital"* has been granted **approval**.

This approval is valid for one year beginning **11th April 2019** until **9th April 2020**

In case the study extends beyond one year, you are required to seek an extension of the Ethics approval prior to its expiry. You are required to submit any proposed changes to this proposal to SU-IERC for review and approval prior to implementation of any change.

SU-IERC should be notified when your study is complete.

This approval supersedes the previous one dated 27th March 2019

Thank you

Sincerely,

STRATHMORE UNIVERSITY INSTITUTIONAL ETHICS REVIEW COMMITTEE (SU-IERC)
2019
TEL: +254 (0)703 034 000
P. O. Box 59857 - 00200

Prof. Florence Oloo
Secretary
Strathmore University Institutional Ethics Review Committee

Appendix 7: St. Catherine's Research Permission Letter

ST. CATHERINE'S HOSPITAL

" To Preserve and Improve Human Life"

April 15th, 2019

Mr. Saku Hudhaifa
Plot 83, Buganda Road
P.O. Box 22868
Buganda Rd,
Kampala

Dear Mr. Saku,

RE: **PERMISSION TO CONDUCT RESEARCH**

Reference is made to your letter dated April 8th, 2019 in which you requested to conduct an academic research project on adoption of health management information system.

We are pleased to inform you that your request has been granted and you will be guided by the human resource manager on how to engage the staff in the various departments as you collect your data.

You are reminded to keep the research within the ethics protocol as described in the proposal you attached and that of the hospital.

We shall be happy to receive a copy of your final report and recommendations.

Good Luck.

ST CATHERINE'S HOSPITAL
PLOT 83, BUGANDA ROAD
P.O. BOX 22868, KAMPALA (U)
TEL:0414 231 534

DR. KAJUMBA MUGANGA
C.E.O