UNIVERSITY OF NAIROBI
SCHOOL OF COMPUTING & INFORMATICS

Determinants of Use of Electronic Medical Records Systems to Deliver HIV Care in Kenya

BY

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A Research Project Submitted in Partial Fulfilment for the award of Master of Science in Information Systems.
Assertion

I Vincent Odari AMulega, assert that the Project report is my genuine work and has not been examined in any other university.

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As Supervisors UNIVERSITY OF NAIROBI.
ABSTRACT

Background: The increasing application of ICT to manage these countries’ Patient level health information systems (HIS) is expected to improve efficiencies, leading to availability of quality health information for clinical decision support, monitoring, evaluation and delivery of healthcare services and programs. In 2012, Kenya with the aid of its partners (USAID, PEPFAR and CDC) initiated the process of adoption and implementation of a various Electronic Medical Records Systems (EMRS) like IQ-Care, Kenya EMR and C Pad just but to name few as Patient level HIS for HIV prevention and Care that will facilitate management of patient level health information for evidence-based decision making (I-TECH 2015).

Problem: The process of adoption and implementation of Electronic Medical Records Systems (EMRS) in Kenya as Patient level HIS for HIV prevention care and treatment was initiated in 2012 (I-TECH, 2015). Unfortunately, these systems remain underutilized or all together abandoned, yet EMRS are known to revolutionize health care management (Ackerman et al., 2010). For maximum benefits to be reaped from this implementation, these EMRS needs to be optimally utilized across all categories of targeted users.

Objective: Enhance knowledge on health IT use, by determining critical influencers of EMRS use to deliver HIV care in Kenya.

Methodology: We reviewed works on IT implementation concepts and frameworks, aiming at determining the most appropriate model to adopt for this study. Majorly we focused on the theories and models’ strengths and weaknesses in selected case studies where employed in IT implementation works, their results and deductions drawn. We therefore adopted and validated UTAUT model for this work. Pretested questionnaires to collect quantitative data administered and data analyzed using SmartPLS 3 to determine the relationships between Independent and Dependent variables through the SEM modelling technique.

Results: Findings point to multiple user-associated, institutional, social and behavioral factors were the critical determinants of successful EMR use. For the full data set model PE, EE, SI, and FC account 58.8% BI change to Use EMRS which in turn accounts 56.2% in actual use of EMRS Healthcare workers in HIV Care delivery settings. Gender affects the effect of PE on BI such that the association was high for women. The effect of EE on BI was moderated by Gender such that
effect was stronger for women than men. The effect of FC on BI to use of EMRS was moderated by Experience, such that the effect was strongest for the highly experienced HCWs.

**Conclusion:** The study confirms that UTAUT model is applicable in this context but not all the factors currently included in UTAUT explain use of HIS in Kenya. This results also tend to agree with Karuri et al. (2017) that that the strength of factors that determine acceptance and use of health IT varies across different health workers' categories. These findings therefore bring new insights to technology adoption that is not in tandem with the works of Davis (1989) hence a new contribution to the current body of knowledge.
Dedication

First to Almighty God in the name of Jesus Christ

Secondly to my Family:

My Spouse Stella Mugambi

My Wonderful Children Alvin Masitsa & Christine Vuyanzi

My Valuable Parents: Herbert Amulega Masitsa & Beatrice Migarusha Amulega
Acknowledgement

First it is purely by God’s grace and Power I have come this far. I am grateful to God for the strength and capacity that enabled me this far to finish this work. I am grateful to my networks, fellow students, contemporaries at NASCOP and SCI, the supervising and examining panel, University of Nairobi, who were all key to the accomplishment of this Study.

My supervisors

1. Dr. Daniel Ochieng for his invaluable support in understanding technology adoption and use models and grounding me in the field of health informatics.

2. Professor Peter W. Wagacha; for his encouragement and helping me transform my research idea into a tangible research project. Your willingness to be consulted even beyond working hours and even introduction of my project to my boss at NASCOP was just incredible and the entire Examining Panel.

My Wife Stella, Children, Parents, siblings; for your invaluable support for such an earnest course. I am forever grateful for your prayers.
# ABBREVIATIONS AND ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AIDS</td>
<td>Acquired Immune Deficiency Syndrome</td>
</tr>
<tr>
<td>ANCOVA</td>
<td>Analysis of Covariance</td>
</tr>
<tr>
<td>ARV</td>
<td>Antiretroviral drugs</td>
</tr>
<tr>
<td>CCC</td>
<td>Comprehensive Care Centre</td>
</tr>
<tr>
<td>CDC</td>
<td>Centre for Disease Control and Prevention</td>
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<tr>
<td>DOI</td>
<td>Diffusion of Innovation</td>
</tr>
<tr>
<td>EE</td>
<td>Effort Expectancy</td>
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<tr>
<td>EMRS</td>
<td>Electronic Medical Record Systems</td>
</tr>
<tr>
<td>GoK</td>
<td>Government of Kenya</td>
</tr>
<tr>
<td>HCW</td>
<td>Health Care Workers</td>
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<tr>
<td>ICT</td>
<td>Information and Communications Technology</td>
</tr>
<tr>
<td>IOM</td>
<td>Institute of Medicine</td>
</tr>
<tr>
<td>IS</td>
<td>Information System</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
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<tr>
<td>KEPH</td>
<td>Kenya Essential Packages for Health</td>
</tr>
<tr>
<td>LAN</td>
<td>Local Area Network</td>
</tr>
<tr>
<td>LCN</td>
<td>Linkage Care Navigator</td>
</tr>
<tr>
<td>MOH</td>
<td>Ministry of Health</td>
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<td>WHO</td>
<td>World Health Organization</td>
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CHAPTER 1: INTRODUCTION

1.1 Background: Electronic Medical Records

EMRS are ICT systems that store data at patient level in health care facilities for efficient patient management. E-Health has the benefit of lowering costs in health sector at the same time delivering better patient care.

Developing countries Kenya included are highly burdened with diseases and HIV is one of them that is yet to be contained (WHO, 2013). This has resulted in high patient numbers making healthcare industry an information-intensive industry. Application of technology in patient management documentation provides efficient and well-organized alternative of patient records management. Despite the investment in EMRs for HIV care or other health care domains and their associated benefits when optimally utilized, failure, underutilization and abandonment of these systems still remains a challenge in developing countries from literature reviewed.

A major factor cited as a cause is lack of capacity to operate by end users including monetary, infrastructure knowledge and the political and social issues among HCWs (Lorenzi & Riley 2003; Little johns et al. 2003). Three assessments of EMRS in Kenya revealed that infrastructure, interoperability with other systems like DHIS2 and lack of system support resources on the ground were reasons for failing EMRS adoption and use (Ministry of Health, 2010). Acceptance of technology though explored widely by previous studies using different established Models, additional work needs to be done to extend and validate existing research results in different environments and contexts (Hu et al. 1999; Aarts & Gorman 2007; Schaper & Pervan 2007).
1.2 Problem Statement

The process of adoption and implementation of Electronic Medical Records Systems (EMRS) in Kenya as Patient level HIS for HIV prevention care and treatment was initiated in 2012 (I-TECH, 2015). Implementation of health IT in Kenya still lags behind compared to other sectors like Communication, Education and the Financial sectors (MoH, 2011). Application of ICT to manage Patient level health information systems (HIS) is expected to improve efficiencies, leading to availability of quality health information for clinical decision support, monitoring, evaluation and delivery of healthcare services and programs. Unfortunately, these systems remain underutilized or all together abandoned, yet EMRS are known to revolutionize the process by which physicians consult with, educate, and treat their patients (Ackerman et al., 2010). For maximum benefits to be reaped from this implementation, these EMRS needs to be optimally utilized across all categories of targeted users.

For instance, EMRS currently in use for HIV care in Kenya remain underutilized or abandoned. This has resulted in lack of proper patient records management hence inaccurate information for decision support hence putting the monitoring and Evaluation aspect of the HIV pandemic in jeopardy. As at December 2016, 675 public and faith-based health care facilities had EMRS installed for HIV Prevention, Care and Treatment but 45% out of these Health Care Facilities have their EMRs inactive despite huge investments that have been incurred to install them (Palladium Group, 2017).

A validated technology adoption model to evaluate the complex interrelations between factors affecting user acceptance of EMRS is therefore beneficial in informing policy makers as well as system designers and implementers on approaches that will contribute to optimal EMRS use. UTAUT in its original or adapted form has been applied in various sectors to study technology adoption and use. However, this application has not been in the healthcare context of developing countries. This provides an opportunity to review existing adoption models and adapt them to include technology acceptance factors that are relevant to the developing countries healthcare context. This study therefore examined the applicability of UTAUT to measure the level of use of EMR system in the Kenyan health care setting by HCWs in public and faith-based health care facilities.
1.3 Study Objectives

Generally: “Enhance knowledge in understanding of health I.T. Use in HIV prevention and Care settings by validating UTAUT technology adoption model to study determinants of use of EMRS to deliver HIV Prevention and Care in Kenya”. The specific objectives are to:

i. To develop a technology adoption model than can predict the complex relationships that affect EMRs use in public & Faith based health care facilities in Kenya for HIV care delivery.
ii. Use Modeling techniques to validate the model using empirical data collected from public and Faith based health care workers in Kenya.
iii. Generate the final model and evaluate relationships among External and Internal constructs, to determine factors that most contribute to the EMR Use process.
iv. Cross-validate the model across Public and Faith based categories of healthcare workers via multi-group analysis to isolate influential determinants in these settings.

1.4 Research Questions

i. What unique factors predict EMR use in public & Faith based health care HIV care delivery settings in Kenya?
ii. Can existing models be leveraged upon to study contribution of the identified factors in this context?
iii. Which of the identified factors are most influential in determining use of EMRS?
iv. Is the new theoretical model valid across public and faith-based healthcare settings of HIV care?

1.5 Problem Justification

Literature surveyed is silent on the reasons why health care workers resist use of EMRs especially in developing countries. There is therefore need to expand research agenda on EMRS and healthcare technology use for expansion of knowledge in this field (Dimitrovski, et al 2013).

The government of Kenya through NASCOP, (2015) 90-90-90 strategy of ensuring identification of 90% of People living with HIV (PLWHIV), 90% of PLWHIV are put on treatment and of those on treatment 90% achieve viral suppression i.e. the National Plan for Accelerating HIV Care and Treatment services majorly depends on accurate patient level data which can only be realized via
optimum utilization of EMRS. Therefore, finding variables that will ensure optimum EMRS utilization which this study proposes is essential for NASCOP to realize this strategy.

Without EMR systems, patients in HIV care are difficult to track, measure their adherence to ARV drugs as well as make clinical decisions for their management by clinicians. This is because they are put on a life-long treatment with various laboratory tests at different stages of Antiretroviral (ARVS) drugs medication. Ensuring that these patients adhere well to ARVS is key as adherence to ARVS is the second strongest predictor of progression to AIDS and death. Therefore, this research is key to HCWs and HIV patients since optimum use of EMRS will ensure that Health care workers measure ARVs adherence hence make timely and informed decisions on HIV patient management hence improving patient outcomes.

1.6 Research Presupposition

Assumptions are:

I. Permission once sort from UoN - KNH ethical research committee and other relevant bodies and stakeholders is granted to carry out this study.

II. The terms EMRS and EHRS are used interchangeably as used in the US.

III. Health care workers are available and honestly respond to questions that will guide this study correctly without rushing through the questionnaire.

IV. Healthcare workers’ understandings of EMR systems use is constant in all health care settings.

V. Results of this research are of importance in helping other HCWs who have challenges of EMRs use.

VI. Study respondents are normally distributed to allow generalizability to the whole population of HCWs.
1.7 Limitations of the study

The primary Limitation to realizing the objective of this research was ensuring an efficient survey instrument that guarantees 100% response rate by healthcare workers as well as the need to generalize the results. Olson, (2013) suggested that HCWs response rate is high when the survey instrument is administered by themselves and/or when anonymity is assured. This study instrument did not bear any names of the respondents and Smith (2013) formula for calculation of a generalizable sample size was applied. Hence all limitations were dealt with.
CHAPTER 2: LITERATURE REVIEW

2.1 Technology Adoption Background

Considerable investments by governments in innovative health care information technologies has occurred over the last decade. For instance, between 2004 and 2006 the U.S government and the E.U Countries increased spending for health informatics considerably (Lapointe & Rivard, 2006; European Commission, 2013). Health IT has also been embraced in developing economies but these investments are challenged by suboptimal utilization in addition to infrastructural issues.

Major advancements have been made in explanation and forecasting factors influencing use of IT at work. To be specific, considerable theoretical & empirical backing has been amassed for Technology Acceptance Model (TAM) and its extended versions TAM2 and TAM3. Other cited frameworks & theories include; Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Social-Cognitive Theory (SCT) & Unified Theory of Acceptance and Use of Technology (UTAUT). Moris & Dillon (1996) observed Indicator overlap in these frameworks in their respective autonomous & non-autonomous even though they are tagged differently. This has generated a lot of debates on applicability of these frameworks elucidate ICT use. We review each of the models below with the aim of building our research framework.

2.1.1 Theory of Reasoned Action

This was derived from the theory of attitude by Martin, F. et al (1975). The theory aims to explain the relationship between an individual’s viewpoint and his/her conducts and deeds. A Parsons’s choice to a specific conduct relies on the results he/she supposes that Execution the conduct will yield. According to Fishbein & Ajzen (1975), study T R A predicts behavior in an individual from BI, which is as a result of SI as shown Figure 1 below.
Figure 2.1: TRA: Fishbein & Ajzen (1975)

TRA is based on assumption that persons are cogent and considers results of their conduct before choosing to action them (Ajzen & Fishbein, 1980). According to the TRA, as illustrated above in Fig. 1, behavior intent is a precursor of a person’s conduct. TRA theorizes “many actions of societal bearing are influenced volition hence probable from BI” (Ajzen and Fishbein 1980).

From this theory many extraneous issues influence stability of intention. The relationship between intention and behavior depends on two factors namely: (i) the measure of intention must correspond to the behavioral criterion in action, target, context, and time; and (ii) intention does not change before the behavior is observed (Ajzen & Fishbein, 1980).

The TRA specifies that behavioral intention is a function of two determinants: a personal factor termed attitude toward behavior, and a person’s perception of social pressures termed subjective norm (Fishbein & Ajzen, 1975). Attitude refers to the person’s own performance of the behavior, rather than his or her performance in general (Fishbein & Ajzen, 1975). Subjective norm is a function of a set of beliefs termed normative beliefs. According to Azen and Madden (1986), normative beliefs “are concerned with the likelihood that important referent individuals or groups would approve or disapprove of performing the behavior”. According to the TRA, to obtain an estimate of a subjective norm, each normative belief of an individual is first multiplied by motivation to comply with the referent and the cross product is summed for all salient referents.
TRA is not specific to any behavior hence it has served as the foundation for predicting and explaining human behavior in any context. We find limitations in this theory when applied in a particular contextual setting (Davis 1989; Ajzen 1991). The theory is also unsuitable to predict behavior in situations where the individual has low levels of volitional control. The model also lacks elements that would explain the effect of the prevailing condition on ICT Use. Vekatesh et al. (2003) tested this theory and found that it was only able to account for 19% to 20% variance in BI. Nevertheless, BI construct from this theory is used to predict actual technology use behavior. In addition, BI was used in theories that were developed later from TRA i.e. TPB, TAM and UTAUT. Ajzen, (1991) found TRA insufficient in settings of low volition. However, we used the subjective norm from this model in our conceptual model. This is so as to establish the effect of SI towards use of EMRS among HCWs in public and faith-based health care facilities to deliver of HIV care in Kenya.

2.1.2 Theory of Planned Behavior framework
The theory of planned behavior according to Ajzen (1991), extends TRA and solves initial framework challenges with respect to performances in which persons volition is inadequate hence addition of construct “perceived behavioral control” see Fig. 2.2 below. Venkatesh et al. (2003) showed that this theory predicted (21-37) % variance in BI to use new IT.

![Figure 2.2 TPB Ajzen 1991]
Ajzen (1991) was of the opinion that TPB is undeveloped hence additional forecasters need to be included once proved that doing so will increase variance in intent or actual conduct. TPB has been criticized for failing to account for effect on adoption of factors like perceived levels of complexity to the user of a given technology, the role of experience and voluntariness and perceived usefulness of a technology. We reviewed this model with the aim of establishing its strengths, weaknesses and shortcomings in building our conceptual research framework. This led us to include perceived usefulness also known as performance expectancy in the conceptual framework. We seek to establish role played the perception a health care worker may have about the usefulness of EMRS before adoption and use to deliver HIV care. Furthermore, because of the criticism leveled against this theory above, it made us to consider the need to establish the effect of perceived levels of complexity, also called effort expectancy to the user of the technology to be adopted.

2.1.3 Technology Acceptance Model (TAM)

This model is derived from T R A and theorizes that: “use of new IT is influenced by one’s volition intent. BI is influenced by one’s attitude and perception on the usefulness toward the use IT (Davis F. D. 1989). See fig. 2.3 below.

![Fig. 2.3: TAM (Davis et al. 1989)]
The first credence, *perceive useful* (P U), is HCW’s “personal chance that use of ICT raises his/her performance for the task” (Davs et al., 1 9 8 9). The second credence, *perceive ease of use* (P E O U), is “the extent at which HCWS anticipate an effortless EMRS” (Davs et al., 1 9 8 9). P U is influenced by P E O U. Davs (1 9 8 9) additionally found an association between credence users attach to ICT worthiness and viewpoint and intent to use ICT. In his study we found perceived usefulness to exhibit significant and reliable association with use than other indicators.

(Saga & Zmud, 1994) reported that if an individual perceives a technology to be convenient and useful, they may adopt it regardless of use. Therefore, direct association of credence and intent is probable. Contrarily, Venkatesh (1996) after refining TAM found intervening influence of viewpoint on P U insignificant.

This model is authoritative in predicting acceptance. However, it does so in in methods that suggest ICT physiognomies development have a bearing on the ICT use effortless and worthiness. That guide development beyond suggesting that system impact usefulness and ease of use, there by introducing barriers on the capability to evocatively design interfaces to encourage acceptance (Venkatesh 2000).

There are other factors that may be attributed to organizational influences and system characteristics. Tulu et al. (2006) explained that in the medical practices, the affirmation frameworks should account for P U and P E O U in the settings of the health care practitioners in order to make the clinical information system more effective. Seman and Gibon (2 0 0 9) and study looked into effects of different personal traits between health care practitioners and other knowledge workers in information technology acceptance. They reported variation due to specific trainings, independent practice, and expert work arrangements and the perceived threat to the professional independence of I C T had a substantial negative influence on P U. Functionality of ICT alone does not relate to PU. Other attributes contribute to PU e.g. personal traits, characteristics of the system and resistance to change. Therefore, TAM in its original design emphasizes on the design characteristics of system. Scholars have pointed out that it lacks the social influence factor which is extremely important (Fus e t a l., 2 0 0 6; Matieson, K., 1991). In addition to this TAM does not account for facilitating conditions like money and time as factors that influence use of new IT. Davis (1989), acknowledged that further studies were needed in
order to unpack the generalizability of TAM findings. Consequently, a modified model of TAM, referred to as TAM 2 was proposed for contemporary technologies studies (Chau and Hu, 2001).

2.1.4 Technology Adoption Model 2 (TAM 2)
TAM 2 incorporates additional theoretical constructs in TAM. It extends TAM by introducing SI processes as previously discussed in this chapter.

Figure 2.4: Technology Acceptance Model 2 Source Venkatesh, V. and Davis, F.D (2000)

P E O U has the backing of numerous technology adoption research findings in significantly influencing new ICT use and use of new technology. We therefore include it in our research conceptual model since we need to establish what role if any, will be played by this factor in EMRS adoption among healthcare workers in Kenyan Public hospitals to deliver HIV care. Experience moderates the Perceived usefulness factor in TAM 2 hence this has influenced the inclusion of duration of use as a moderator in our research conceptual model in order to determine how duration of use will influence adoption and use of EMRS by healthcare workers to deliver HIV care in public and faith-based health care facilities of Kenya.


2.1.5 The Unified Theory of Acceptance & Use of Technology Framework

Developed by Venkatesh et al. (2003). This model appreciates the probability that moderators have influence on the associations of the main individual indicators. UTAUT was able to account for about seventy percent variance hence making it more authoritative see fig. 5 below.

![UTAUT Framework](image)

*Fig. 5: UTAUT framework (Venkatesh et al., 2003)*

It recognizes three factors that directly influence BI of new ICT, i.e.: PE, EE and SI. According to the model, the two factors that influence IT use are Behavioral Intention (BI) and FC. While Sex, Age, Experience and volition moderate these associations as illustrated in figure 2.5 above. All these factors are defined in subsequent sections of this report.

Some studies have Criticized this model as very recent hence more validation required on it. However Pro-UTAUT Scholars have argued that it has a robust theoretical foundation (Schaper and Pervan, 2005; Han et al., 2004). The ability of this model to elucidate seventy percent variance in UB is also a plus since other models have only been able to explain seventeen to fifty three percent (Han et al., 2004; Venkatesh et al., 2003). By including voluntariness as a
moderator factor which has been ignored by other models UTAUT is also able to explain IT use in scenarios where IT use is mandatory or voluntary. Despite all this advantages studies have shown limited application of this framework in health I C T (Holtz & Krein 2 0 1 1).

Three things are therefore evident from literature on EMRS adoption; first no studies have used the UTAUT to explain determinants of EMRS use despite its robustness. Secondly, studies on EMRS adoption have been conducted mainly in America, Europe, Australia and Japan, China and Taiwan), countries that are evidently advanced in terms of computing technology. Thirdly, many researches have emphasized on adoption of IT like online learning and telemedicine and not EMRS. We needed to establish whether F C will affect B I to adopt EMRS among HCW in Kenyan Public and faith-based health care facilities moderated by age, gender and years in Health care factors only considered by UTAUT.

2.3 Research Conceptual model
From literature review related to technology adoption and the various models and theories discussed above we derive our research conceptual model see figure 6 below from the UTAUT model. This research will focus on public GOK hospitals and Faith-based hospitals with EMRS installed to deliver HIV care. It is Mandatory for HCW to use them as manual tools have been faced out in high volume HIV care health facilities. Voluntariness will therefore not be considered as a moderating factor in our conceptual model while facilitating Conditions directly influenced BI.
Fig. 2.6: Study Conceptual framework
CHAPTER 3: RESEARCH METHODOLOGY

3.0 Overview
Here we highlight methods that were used for answering research objectives and questions. Comprehensive literature review points at UTAUT as the most comprehensive and predictive among the available technology acceptance models.

The Conceptual model also called study model helped the researcher to formulate testable relationships to aid the understanding of the determinants of the situation under study. Studies surveyed indicate a strong resistance to adoption and use of EMRs among HCWs (Cherry, Ford & Peterson, 2011; Ferris, 2010). The study used a self-administered questionnaire to determine the factors that affect optimal utilization of EMRS for realization of a more effective deployment of the system to deliver HIV care in public and Faith-based health care facilities of Kenya using a quantitative approach. A comprehensive survey instrument will be developed to measure the constructs in the study’s conceptual model.

3.1 Study Framework
Cross-sectional analysis focusing on determinants influencing the use of EMRS by HCW in public and faith-based health care facilities to deliver HIV care, using a quantitative approach. We opted to use this kind of research design because this survey method has been found to offer more precise methods in appraising of data analysis and allows the investigator to infer and generalize easily findings from a sample to the population.

This research was conducted mainly through the use of quantitative methods. Overall, the research design included four main stages as summarized below:

Stage one focused broad review on available literature on acceptance of technology, with a bias on the studies conducted in healthcare domain. The literature review was aimed at identifying the possible indicators to be examined with regard to optimal utilization of ICT for healthcare. These factors were considered and used in developing the contextual study model and initial survey questionnaire adapted from the UTAUT model, as well as the hypotheses associated with these factors.
Stage two involved a preliminary study to validate the appropriateness of the indicators selected to provide measures for the latent variables of the study’s conceptual model. The findings from this stage refined the questionnaire before the main data collection phase.

Stage three was the mainly survey instrument administration. Quantitative data through a cross-sectional investigation approach was obtained. The sample was carefully selected to be representative of EMRS users in HIV services delivery points in Kenya.

The final stage i.e. stage four, involved quantitative data analysis and contextualizing the research findings. The investigator employed a two-step approach in S. E. M. analysis using SmartPLS 3. All the above stages are depicted in the figure 7 below and discussed extensively in different sections of this chapter.
Figure 7: Research Design Summary

Overall Research Objective
Adapt U T A U T model to assess use of E M R S to Deliver HIV Care among health care professional in public & Faith Based health care facilities in Kenya.

Stage 1: Preliminary Information gathering through literature review and development of hypothesis initial survey tool design.

Stage 2: Pilot the questionnaire to test its reliability and validity, and appropriateness for data capture.

Stage 3: Conduct Final Survey

Stage 4: Data Analysis and Hypothesis Testing

Contextualize Results

Research Questions
i. What unique factors predict EMR use in public & Faith based health care HIV care delivery settings in Kenya?
ii. Can existing models be leveraged upon to study contribution of the identified factors in this context?
iii. Which of the identified factors are most influential?
iv. Is the new theoretical model valid across public and faith based settings?

i. Confirm gap and scope of the research needed.
ii. Develop conceptual framework.
iii. Develop hypotheses.
iv. Develop initial survey tool.

i. Access the completeness and face validity of survey tool.
ii. Refine the Survey tool.
iii. Establish Model Reliability and Validity

i. Define target Population & determine the sample size
ii. Data collection.
iii. Data cleaning, coding & entry in SPSS.

i. Confirm Framework legitimacy
ii. Evaluate the framework for Confirmation of presence or absence of support for proposed hypotheses

i. Discuss results and compare with existing literature.
ii. Conclude and make recommendations.
3.2 Survey Instrument Development
We adopted the questionnaire method was adopted because its advantages have been highlighted in literature which include of eliminating bias by the interviewer, reaching respondents conveniently and can cover a large geographical area conveniently hence making results more dependable and reliable (Kothari, 2004; Singh, 2006). It also gave health care workers enough time to respond adequately to the questions. A 5-part Likert-scale-based questionnaire was designed to generate descriptive characteristics on the independent and dependent variables. The 5-point Likert scale questionnaire will be adopted because it will be easier for HCW to differentiate between the different levels in the scale as compared to wider scale see Appendix 1.

3.2.1 Survey Instrument Design Steps
We conducted pilot tests, focus groups discussion and consultation of experts at primary phases of survey instrument design so as to appreciate how HCW’s grasp statements. The questionnaire was a hard copy printed and designed with considerations from literature concerning presentation, legibility and clarity of the questions. We followed the following steps:

i. Formulation of research objectives and discussion with experts to ensure their clarity and ability to address fully the research questions.

ii. We also surveyed available literature on IT utilization so as to guide the development of the study conceptual model as well as select appropriate model constructs and indicators.

iii. Enough measure statements were selected for each latent variable with consideration of its meaning as conceptualized.

iv. The expert opinion and criticism of stakeholders and academic researchers was sought through this stage.

v. The survey tool was finally piloted and all feedback included in the final tool.
3.3 Constructs Operationalization and Measurement Scale Development

A five-point Likert Scale defined as 1 = Disagree, 2 = Disagree Somewhat, 3 = Neutral, 4 = Agree Somewhat, 5 = Agree was used to measure the latent construct indicators. While user defined scale for Technology Experience was measured by user’s duration of using EMRS in months and years while the corresponding frequency of use in days, weeks and months.

3.4 Construct Measures

The researcher measured the latent variables indicators as below on a 5-point Likert Scale:

3.4.1 Performance Expectancy

In order to measure Health care workers’ opinion on the usefulness of EMRS, Performance Expectancy will be measured using four statements:

i. P E 1: Overall, EMRS valuable to my tasks
ii. P E 2: EMRS use enables me to complete duties swiftly than would be otherwise.
iii. P E 3: EMRS use rises my productivity
iv. P E 4: EMRS use allows me to make work related decisions based on better evidence

3.4.2 Effort Expectancy

Effort Expectancy in relation to EMRS use by HCWS will be measured using four statements:

i. E E 1: I have a clear and fathomable interaction with EMRS.
ii. E E 2: EMR Use Makes me skillful
iii. E E 3: Generally, EMRS use is stress-free.
iv. E E 4: It’s easy to learn how to operate EMRS
v. E E 5: EMRS are user friendly

3.4.3 Social Influence

Measured using four statements below:

i. S I 1: My influencers contemplate I ought to utilize EMRS.
ii. S I 2: Those significant to me contemplate I ought to utilize EMRS.
iii. S I 3: Hospital administrators encourage EMRS use.
iv. S I 4: I am stimulated by my Peers to use EMRs.
3.4.4 Facilitating Condition
Facilitation condition will be measured using four statements below:

i. F C 1: Resources e.g. computers, antivirus, power, books, manuals etc. are available to facilitate EMRS use.

ii. F C 2: I am knowledgeable and skilled to use EMRS

iii. F C 3: Other systems I utilize at work are compatible EMRs.

iv. F C 4: EMR specialists are accessible to support EMRS complications.

3.4.5 Behavior Intention
Behavioral intention will be measured using three statement:

BI1: I intend to continue using EMRS.

3.4.6 Use Behavior
Behavioral intention will be measured using three statement:

UB1: I will always use EMRS

3.5 Pilot Study
For research results to be valid and authoritative an analysis of the questionnaire statements from the respondents view point is of importance. We piloted the survey instrument in order to find and eliminate potential problems of the survey instrument like: phrasing & grammatical issues. Any part of the tool without clarity or irrelevant was redone or eliminated during this stage. The final survey tool was updated based on results of the various tests done on the instrument as well as feedback received. Specifically, the following tests were done on the survey instrument during piloting:

3.5.1 Content Validity Testing of Data Collection Instrument
Validity is the degree to which a data collection instrument is legitimate and accurately captures reality. Two forms of validity were considered in this research i.e. external validity and the internal validity. External validity of research findings is their generalizability to populations, settings, treatment variables and measurement variables. The internal validity of a research design is its ability to measure what it aims to measure (Kothari, 2004).
This study will be ensured internal validity through several measures which included; collecting data from reliable sources i.e. bona fide Health care workers in HIV care delivery settings from the health care facilities that were targeted. Additionally, robust scientific techniques of questionnaire development including piloting were followed. We will also pre-test the questionnaire using 20 health care workers through focused group discussions for meaning and semantics and appropriately review it by experts and experienced researchers.

3.5.2 Reliability of Construct Measurement Testing
A Questionnaire is dependable if it is able to deliver reliable outcomes. It is when a survey instrument fulfills the required levels of reliability quality. There are several reliability tests. For this study Cronbach (1951) for internal consistency reliability and composite reliability measures were computed from the pilot data of 20 HCW. This method is superior over other methods and has been successfully applied in many other similar and related studies. Its value should be at least 0.7 for reliable results. (Taylor, 2011; Venkatesh et al., 2003; Davis, 1989; Pallant, 2007; Davis 1989).

3.5.3 Survey Tool Understandability and Completion Time Test
This involved practically identifying and eliminating potential misunderstandings in the questionnaire e.g. grammatical and phrasing issues. The respondents noted the time they took to complete the survey and this was used to ensure the survey instrument was clear and concise.

3.6 Main Study Sample and Sampling Design
We limited our sample to only HCWs in HIV care service points in public and faith-based healthcare facilities using EMRS.

3.6.1 Study Population
We targeted HCW from public and faith-based health care facilities in all HIV prevention and care settings, which includes TB Clinics, PMTCT clinics, and HTS points, Pharmacy, Laboratory and Comprehensive Care Centers (CCC). For purposes of this study, the target population was grouped as Health Records Information Officers (HRIO), Nurses, Pharmacists, Laboratory technologists and Clinicians at these health care facilities in all the 47 counties of Kenya.
HRIOS form the Data Management Team at these health care facilities. They are primarily the caretakers of data in their respective facilities and ensure proper custody as well as generate timely routine monthly reports of health service delivery for decision making. The target population for this group is estimated at 2500 members.

Nurses are HCW involved in coordination of patient care and education in health care facilities.

Clinicians are physicians or other qualified persons who are involved in the treatment and observation of living patients. Due to resource constraints some healthcare facilities especially, smaller ones have nurses working as clinicians and this population group is estimated to be 58,500 in Kenya.

A lab technologist performs the practical hands-on work in laboratories by analyzing samples. They are responsible for diagnosis the HIV virus. While Pharmacists include Pharmacy technologists’ smaller health facilities and pharmacists at county referral hospitals. They are responsible for dispensing ARVs as prescribed by clinicians in addition to ensuring proper storage of drugs under their custody. The target population for this group was estimated at about 900 members.

3.6.2 Sample Size Determination

A subset of a particular population selected for study is called a sample (Mugenda and Mugenda 2003). We have many methods of obtaining sample size. Two key factors in determining Sample size are the desired level of precision and population size. In this study, we applied Yamane (1967:886), formula in which Sample size is derived as a function of the population.

Population of HCW registered is approximately 90,000 for Kenya. Using the formula with ‘e’ as ±7% for this study, which is our sampling error, we arrive at a sample of 204 HCW. To ensure that this target of 204 respondents was reached and even surpassed, the researcher distributed a total of 350 questionnaires across the 5 categories of health workers.
3.7 Sampling Method
Sampling of counties within which to administer the survey was purposive based on geographical location, HIV burden, and available resources including time and human resource available to collect data hence Nairobi, Kiambu, Makueni, Kisumu and Siaya were selected. Stratified chance selection was then employed to determine the Healthcare amenities to administer the questionnaires within these counties. A list of Health facilities with EMRs installed from these counties was divided into two groups/strata i.e. Faith-based & GOK based. The list in the two strata is then randomized so as to give each Health facility an equal chance of being selected. Five health care facilities per county with EMRS installed was then randomly selected within which a total of 41 health care workers per county in HIV prevention and care service points were randomly recruited to participate in the study. This translated to nine health care workers per health facility also selected randomly and proportionately depending on the number of health care workers per service delivery point and the five cadres according to this study to achieve our sample. Choice number of health care facilities per stratum was also proportionately done depending on the total number of health care facilities with EMRS installed in the selected counties.

3.8 Ethical Consideration
We presented the project proposal to KNH-UoN ERC for ethical review and clearance. In addition permission from all relevant stakeholders of the targeted Faith-based and Public Health care facilities was sought before commencing data collection. This involved submitting formal introduction letter to these facilities from the Director, School of Computing and Informatics University, clearance letters from NACOSTI and KNH-UON ERC and a copy of the proposal to information/research offices of the targeted health care facilities for evaluation and approval. Consent was also sought from HCWs willingly participate in the research and their privacy and confidentiality assured. HCWs participating in this study were requested to be honest when filling the questionnaires.
3.9 Data Collection Process

Data collection process started after obtaining a formal approval from all relevant stakeholders of the targeted Faith-based and Public Health care facilities. Literature has many different methods identified that can be used for collection of quantitative data using a questionnaire. These include meeting face-to-face with participants, conducting telephone interviews, reaching participants through postal and electronic mail services and web-based survey completion. This research used structured questionnaire comprising a pre-formulated written set of statements adopted from Venkatesh et al. (2003). The researcher applied the drop-off method whereby the researcher traveled to the respondent’s location, delivered the questionnaire to the respondents after the respondents had been selected and consented. The researcher was motivated by this kind of survey administration because the respondents had an ample time to respond to the questions as well as availability by the researcher to answer any questions raised by the respondents hence encourage them to complete the questionnaires. All hardcopy questionnaires were serialized before distribution to the respondents. This helped in tracking of the distributed questionnaires in order to know the response rate.

3.10 Pre-analysis Data Cleaning

This involved going through the questionnaires to ensure that all the questions were satisfactorily responded to and any incongruities addressed. Incomplete questionnaires were eliminated from the sample. This was paramount for authenticating the deductions as well as eliminating bias in this research (Levy, 2006). Response set was also investigated and addressed by eliminating all responses that qualified to be response sets using Microsoft excel. Response set is known to weaken the soundness and dependability of the survey instrument (Levy, 2006). Outliers were also addressed at this stage to eliminate skewness.

We also analyzed data from the 19 manifest variables used in this research theoretical model for normality or non-normality of the sample using SPSS version 20.0. through Kurtosis and Skewness statistics. Skewness measures the symmetry or lack of symmetry of a distribution around the mean while Kurtosis measures the peak sharpness of the normal curve. According to Joanes & Gill (1998), skewness measures lies between +/-1 otherwise value outside this range indicate a
high level of skewness in the distribution. Kurtosis is the sharpness of the peak of a frequency-distribution curve. Normality of the distribution is a key factor for consideration when deciding on the kind of structural equation modeling that can be performed from the sample.

![General Forms of Kurtosis](image)

*Figure 8: Kurtosis General Forms Source: Joanes & Gill 1998*

### 3.11 Structural Equation Modeling (SEM)

This study used SEM. This is a statistical technique that allows concurrent examination of a set of theoretical associations among one or more autonomous variables, continuous or discrete and one or more dependent variables, also continuous or discrete (Tabachnick & Fidell, 1996). SEM is a combination of factorial analysis aspects with multiple regression (Hair Jr, Hult, Ringle, & Sarstedt, 2014). SEM has been able to overcome limitations in first generation multivariate methods of data analysis like regression in ordinary least squares. This has been a robust technique especially in research designs where a dependent variable turns to an independent variable like the case of UTAUT indicators in our research design as illustrated in figure 3.3 below (Hair Jr., Black, Babin, Anderson, & Tatham, 2009).
3.12 PLS SEM

We applied PLS-SEM analysis because of the reasons adopted from literature. The researcher adopted and followed the eight Systematic Processes for applying PLS-SEM according to Hair et al., 2013 but excluded step 5b which is not applicable in the evaluation of the purely reflective theoretical model.

3.13 PLS-SEM Study Model Validation

Model validation in PLS-SEM is done in two stages as recommend by Hair et al. (2006). The first stage involves evaluation to confirm the suitability of the selected indicators to operationalize model’s constructs. The type of evaluations done at this stage are: content validity, indicator reliability, construct reliability, convergent and discriminate validities discussed below. At this stage any measurement items found to load poorly on its construct can be deleted. The second stage involves evaluation of the structural model and it’s done after the assessment of the measurement model has been done with satisfactory results. As done in many other studies, this two-stage approach was adopted for this research.
3.13.1 Measurement Model assessment

We investigated the study conceptual model for the following conditions:

i. **Content Legitimacy**

This involves examining selected measurement indicators for determination of whether they collectively capture the essence of the model’s construct clearly. Content validity for our research instrument was assessed by literature review and pretesting using two sets of different survey participants and conducting feedback sessions with them (Straub 1989; Cronbach 1951).

ii. **Measurement Model’s Reliability**

This is the consistency of an indicator. For PLS-SEM reliability assessment ensures that the block of indicators selected for each construct operationalizes it suitably. For each construct reliability is computed separately and it’s independent of the reliability of other constructs (Straub et al. 2004). We used SmartPLS path modelling software for this research to determine indicator reliability and construct reliability through the following tests:

- **Discriminant Legitimacy**

Exhibited when inter-indicator inter-construct association is weak (Fornell & Larcker 1981). A highly reliable measurement instrument is expected to exhibit this characteristic. Indicators load strongly if the coefficient is at least 0.6 and weakly if this value is less than 0.4 (Hair et al., 1998).

- **Convergent Legitimacy**

This is shown when each indicator associates strongly with its assigned theoretical construct than other constructs. Convergent validity was measured by probing the factor loadings of the measurement indicators of the model’s constructs. This measured using AVE, the variance shared between a construct and its measures, and this value should be greater than the variance shared between the construct and other constructs. The value of each latent variable’s Average Variance Extracted (AVE) should be least 0.5 (Bagozzi & Yi 1988; Fornell & Larcker 1981).
3.13.2 Structural Model Assessment

This involves assessment of associations between the constructs which are conjectured in harmony with the investigator’s hypothetical and rational perceptive. The study ultimately aimed at assessment of the causal or predictive relationships between the constructs, and subsequently validate or otherwise invalidate the study’s conceptual model and hypotheses. The strength of these relationships is verified by the amount of $R^2$ in the internal indicators as well inner model’s path coefficient sizes, direction and significance (Chin 1998). The following three statistics were adopted for this study and have been used to evaluate the structural model in other related studies.

i. $R^2$ Values

Assess predictive influence of exogenous indicators for the structural framework and ranges 0 -1. No study has given rules about the acceptable threshold value of $R^2$ hence the larger the $R^2$ the larger the proportion of variance explained. Generally, $R^2$ values of 0.670, 0.333 and less than or equal to 0.190 represents substantial, average and weak respectively (Chin 1998).

ii. Path Coefficient ($\beta$)

This indicates the direction and strength of the relationships between latent variables. The significance of each path coefficient is assessed by means of a bootstrap procedure which generates the corresponding T-statistics. Non-significant paths or those that show signs contrary to the hypothesized direction fail to support the a priori hypothesis, whereas significant paths showing the hypothesized direction empirically support the proposed causal relationship. The magnitude of the path values must be greater than 0.1 for significant path relationship to exist between the variables (Hair et al., 2011).

iii. $f^2$ Values

This evaluates fundamental effect in each autonomous construct on the non-autonomous constructs. Values 0.02, 0.15 and 0.35 exhibit that the external indicator is of frail, average and significant effect respectively on internal indicator (Chin 1998; Cohen 1988). These values are generated in SmartPLS 3.
3.14 Hypothesis Formulation

Discernment of one’s assessment on IT and intern his/her choices to use is evident from both cognitive and behavioral sciences. Moore & Benbasat, (1991) in their study showed discernments, instead of technical aspects of IT were most paramount in deciding whether to use IT or not which is the basis for this study. Figure 7 below illustrates the constructs with their causal relationships.

Figure 7: Study Concept Diagram with causal Associations

For our model we leave out Voluntariness of use because in our study setting EMRS our sampling frame was HIV service delivery points with EMRS use as Mandatory. This left Age, Sex and Experience (EXP) to mediate the associations. We therefore proposed the following hypotheses:
3.14.1 Performance Expectancy

This is the extent at which one accept as true that I C T use enhances his/her work” (Venkatesh et al, 2 0 0 3). UTAUT theorizes that the effect of P E on B I is more for young males. Studies have shown P E as a strong influencer of B I (Taylor & Todd, 1 9 9 5; Davis et al., 1 9 9 2 and Venkatesh & Davis 2 0 0 0).

We argue logic with respect to P E will be the same as demonstrated in the previous studies hence the hypotheses:

H1: P E positively influences HCWs’ B I EMRS for HIV care.

H2: Sex will intervene the effect of P E on B I, in that the effect will be more for males than females.

H3: Age will significantly intervene the effect of P E on B I

3.14.2 Effort Expectancy

This is the extent at which I C T use is effortless and UTAUT found it a substantial forecaster of B I. When I C T being introduced is quite new E E is expected to have a substantial effect on B I. We argue same as UTAUT and thus we postulate that effort expectancy will have a substantial effect on HCWs acceptance for EMRS in HIV care.

Similarly, we argue the moderating role of age, gender and experience on effort expectancy will be the same among health care workers. We therefore hypothesize:

H4: E E will absolutely impact the health worker’s B I to use EMRS for HIV care.

H5: Gender will intervene the effect of E E on B I, in that the association will be more for females than males.

H6: EXP will expressively intervene the effect E E on B I.

H7: Age will expressively intervene the effect of EE on BI.
3.14.3 Social influence

This is the extent HCWs feels those significant to him/her accept as true that he or she should use ICT (Venkatesh et al., 2003). It implies that HCWs B I is affected by acuities and views of others in his/her surroundings.

Health care workers have a strongly collective culture hence have a tendency of working collectively and with respect to each other. This study setup is in a developing country context where the cultural values of collectivism and high power-distance are expected to be quite dominant (Hofstede et al. 2010), hence the influence of peers and supervisors is expected to be higher. Therefore, Kenya being one of the developing countries its probable for societal rules and influencers to significantly affect I C T use choices of Health care workers. Voluntariness will not moderate social influence because EMRs is mandatory in these settings. Hence:

H8: S I will absolutely affect health worker’s B I to use EMRS for HIV Care.

H9: EXP will intervene the result of S I on B I, in that the outcome will be more in initial phases of EXP

3.14.4 Facilitating Conditions

This is the availability of the necessary infrastructure to facilitate use of EMRS by HCWs (Venkatesh et al., 2003). Users are likely to use a new technology when these conditions are satisfied. This includes top organization’s administrators support in addition to availability IT user technical support. From health informatics literature review several studies have pointed on F C as a forecaster for U B and not B I where P E and E E existed in the same framework (Anderson 1997; Kijsanayotin et al. 2009). Developing countries are resource constrained hence availability of the prerequisite infrastructure for new IT use is not guaranteed. Hence when facilitating conditions are present, they definitely will influence choices to utilize ICT.

The effect of facilitating conditions is likely to increase with experience as users of technology find multiple avenues for help and support throughout the organization, thereby removing impediments to sustained usage (Venkatesh et al., 2003). Therefore, we postulate that:

H10: Organizational facilitating conditions (FC) will positively affect the behavioral intention use of EMRS for HIV care
H\textsubscript{11}: The effect of F C on B I to use of EMRS is intervened by EXP, in that it is more with growing EXP.

H\textsubscript{12}: Age will intervene the effect of F C on B I to use of EMRS, in that influence is strongest for older HCWs.

3.14.5 Behavior Intention

From the UTAUT model, it is argued that all intention frameworks will have behavioral intention directly influence use behavior hence the hypothesis:

H\textsubscript{13}: B I will significantly positive affect U B EMRS for HIV care.

3.15 Data Analysis

This involved evaluation of the associations between constructs as hypothesized by the investigator using Microsoft Excel, SPSS version 20.0 and SmartPLS version 3. This was after confirmation of the legitimacy of the framework by ensuring that the necessary values to test this were within the theoretically accepted limits as previously discussed in this report. The causal relationships were investigated by estimation of the $R^2$, $\beta$, and $f^2$ also discussed early in this report.
CHAPTER 4: RESULTS AND DISCUSSION

4.1 Response rate
We distributed 350 questionnaires among health care workers in five counties i.e. Nairobi, Kiambu, Siaya, Makueni and Kisumu. Two hundred and twenty questionnaires were returned out of which only 207 were found complete hence considered for analysis. This represented a response rate of 59%.

4.2 General Summary Statistics on HCWs Demographics & Profile
We categorized HCW into age groups and their level of study see Table 1 below. Most HCW in HIV services delivery settings are between 26 to 30 years old. Majority i.e. 66% have a diploma as the highest level of education, followed by Certificate at 18% and those with an undergraduate degree are the least at 16%.

Table 4.1: Respondents Distribution by Age and Highest Level of Education

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Number of HCW</th>
<th>Overall Representation by Age</th>
<th>Certificate</th>
<th>Diploma</th>
<th>Undergraduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-25</td>
<td>25</td>
<td>12%</td>
<td>4(16%)</td>
<td>16(64%)</td>
<td>5(20%)</td>
</tr>
<tr>
<td>26-30</td>
<td>99</td>
<td>43%</td>
<td>8(8%)</td>
<td>73(74%)</td>
<td>18(18%)</td>
</tr>
<tr>
<td>31-35</td>
<td>52</td>
<td>30%</td>
<td>4(8%)</td>
<td>38(73%)</td>
<td>10(19%)</td>
</tr>
<tr>
<td>36-40</td>
<td>22</td>
<td>11%</td>
<td>18(82%)</td>
<td>4(18%)</td>
<td>0(0%)</td>
</tr>
<tr>
<td>41+</td>
<td>9</td>
<td>4%</td>
<td>3(33%)</td>
<td>5(56%)</td>
<td>1(11%)</td>
</tr>
<tr>
<td>Total</td>
<td>207</td>
<td>100%</td>
<td>37(18%)</td>
<td>136(66%)</td>
<td>34(16%)</td>
</tr>
</tbody>
</table>

*Source: Research*
From Table 2 below, Kisumu County had the highest response rate at 30%. Kiambu & Siaya both tied at 24% while Makueni and Nairobi had 14% and 8% respectively. Though the questionnaires were distributed equally in all counties they were administered. The results tend to suggest that generally HIV service delivery points are manned mostly by Female staff at 56%.

Table 4.2: Study Subjects by Gender and County

<table>
<thead>
<tr>
<th>County</th>
<th>No. of HCW</th>
<th>Gender</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>Female</td>
<td></td>
</tr>
<tr>
<td>Kiambu</td>
<td>50(24%)</td>
<td>14(28%)</td>
<td>36(72%)</td>
<td></td>
</tr>
<tr>
<td>Kisumu</td>
<td>61(30%)</td>
<td>24(39%)</td>
<td>37(61%)</td>
<td></td>
</tr>
<tr>
<td>Makueni</td>
<td>30(14%)</td>
<td>13(43%)</td>
<td>17(57%)</td>
<td></td>
</tr>
<tr>
<td>Nairobi</td>
<td>16(8%)</td>
<td>4(25%)</td>
<td>12(75%)</td>
<td></td>
</tr>
<tr>
<td>Siaya</td>
<td>50(24%)</td>
<td>36(72%)</td>
<td>14(28%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>207(100%)</td>
<td>91(44%)</td>
<td>116(56%)</td>
<td></td>
</tr>
</tbody>
</table>

Source: Research

We also categorized the respondents by Cadre of HCWs and the Figure 8 below shows how the results are distributed. HRIO are the majority at 36%. This are followed by Clinical officers (CO) at 17%, Nurses at 16%, Pharmacists and Pharmacy Technologist at 12%, Laboratory Technologists at 10% and others group which included Linkage and Care Navigators (LCN), Data Clerks, Accounts, Nutritionists, Peer Educators, Psychologist and Social Workers at 9%.
Responses were also categorized based on experience i.e. duration of EMRs use by HCW. Table 3 below illustrates the results of the analysis. The results suggest that majority (42%) of HCWs had an experience of two to three years for both faith based and Government health care facilities, followed by those with experience of up to 1 year at 27% while 21% had an experience of greater than three years in both settings.

Table 4.3: Respondents Distribution by Experience, Gender and type of Health care Facility.

<table>
<thead>
<tr>
<th>Duration of Use</th>
<th>Government based Health Care Facilities</th>
<th>Faith Based Health Care Facilities</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Up to 1Yr</td>
<td>23(11%)</td>
<td>40(19%)</td>
<td>6(3%)</td>
</tr>
<tr>
<td>2 to 3 Yrs</td>
<td>39(19%)</td>
<td>34(17%)</td>
<td>4(2%)</td>
</tr>
<tr>
<td>&gt; than 3Yrs</td>
<td>17(8%)</td>
<td>22(11%)</td>
<td>2(1%)</td>
</tr>
<tr>
<td>Total</td>
<td>79(38%)</td>
<td>96(47%)</td>
<td>12(6%)</td>
</tr>
</tbody>
</table>

Source: Research
The results indicate that 100% of HCW in Faith Based Health Care Facilities use EMRs on Daily basis. In government-based health care facilities 93% of HCW use EMRs on daily basis, 5% on weekly basis and 2% on monthly basis.

Figure 4.2: Frequency of EMRs Use in Public & Faith Based Health Care Facilities

From table 4.4 below IQ-care is used by majority in both Urban and Rural settings at 36%.

Table 4.4: Responses by EMRs type and Region

<table>
<thead>
<tr>
<th></th>
<th>URBAN</th>
<th>RURAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IQCARE</td>
<td>KENYA EMR</td>
</tr>
<tr>
<td>NO. OF RESPONSES</td>
<td>75</td>
<td>42</td>
</tr>
<tr>
<td>%AGE</td>
<td>36%</td>
<td>20%</td>
</tr>
</tbody>
</table>

Source: Research
4.3 Analysis of Model Variables

We examined the data using SPSS version 20.0 software and PLS Smart version 3 software. Table 4.5 below shows indicator definitions and the corresponding scores for 19 manifest variables values that evaluated the study’s conceptual framework.

Table 4.5 Variables Statistics

<table>
<thead>
<tr>
<th>Indicators (n=207)</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Skewness (Std. Error .169)</th>
<th>Kurtosis (Std. error .337)</th>
<th>Construct Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>P E 1: Overall, I find EMRs Valuable to my tasks</td>
<td>4.32</td>
<td>0.989</td>
<td>-1.479</td>
<td>1.559</td>
<td>PE: The extent to which HCWs believe EMRS enables improved performance</td>
</tr>
<tr>
<td>P E 2: Using EMRS enables me to complete my duties swiftly than would be otherwise.</td>
<td>4.23</td>
<td>1.012</td>
<td>-1.246</td>
<td>0.855</td>
<td></td>
</tr>
<tr>
<td>P E 3: MRS use rises my productivity</td>
<td>4.23</td>
<td>1.021</td>
<td>-1.279</td>
<td>1.007</td>
<td></td>
</tr>
<tr>
<td>P E 4: EMRS use allows me to make work related decisions based on better evidence</td>
<td>4.28</td>
<td>0.993</td>
<td>-1.536</td>
<td>2.045</td>
<td></td>
</tr>
<tr>
<td>E E 1: I have a clear &amp; fathomable interaction with EMRS</td>
<td>4.05</td>
<td>1.092</td>
<td>-1.091</td>
<td>0.539</td>
<td>EE: The degree of effortlessness of use associated with the use of EMRS</td>
</tr>
<tr>
<td>E E 2: EMRS use makes me skillful</td>
<td>4.26</td>
<td>0.989</td>
<td>-1.476</td>
<td>1.917</td>
<td></td>
</tr>
<tr>
<td>E E 3: Generally, EMRS use is stress-free</td>
<td>4.23</td>
<td>1.006</td>
<td>-1.308</td>
<td>1.082</td>
<td></td>
</tr>
<tr>
<td>E E 4: It’s easy to learn how to Operate EMRS</td>
<td>4.19</td>
<td>0.97</td>
<td>-1.225</td>
<td>1.136</td>
<td></td>
</tr>
<tr>
<td>E E 5: EMRS is user friendly</td>
<td>4.29</td>
<td>1.017</td>
<td>-1.513</td>
<td>1.765</td>
<td></td>
</tr>
<tr>
<td>S I 1: My influencers contemplate I ought to use EMRS</td>
<td>3.65</td>
<td>1.423</td>
<td>-0.715</td>
<td>-0.81</td>
<td>SI: The extent to which EMRS use by HCW is influenced by other stakeholders socially.</td>
</tr>
<tr>
<td>S I 2: Those significant to me contemplate I ought to utilize EMRS</td>
<td>3.84</td>
<td>1.33</td>
<td>-0.92</td>
<td>-0.366</td>
<td></td>
</tr>
<tr>
<td>S I 3: Hospital administrators encouraged me to use EMRS</td>
<td>4.24</td>
<td>1.096</td>
<td>-1.555</td>
<td>1.76</td>
<td></td>
</tr>
<tr>
<td>S I 4: I am stimulated by peers to use EMR</td>
<td>3.71</td>
<td>1.373</td>
<td>-0.793</td>
<td>-0.653</td>
<td></td>
</tr>
</tbody>
</table>
F C 1: Resources are available to facilitate EMRS use.

<table>
<thead>
<tr>
<th></th>
<th>FC1</th>
<th>1.517</th>
<th>-0.273</th>
<th>-1.408</th>
</tr>
</thead>
</table>

**FC:** The degree to which an individual believes an organizational or technical infrastructure exist to support use of EMRS

F C 2: I am knowledgeable and skilled to use EMRS

<table>
<thead>
<tr>
<th></th>
<th>FC2</th>
<th>1.282</th>
<th>-0.898</th>
<th>-0.425</th>
</tr>
</thead>
</table>

**FC:** I am able to use EMRS

F C 3: Other systems I use at work are compatible with EMRS

<table>
<thead>
<tr>
<th></th>
<th>FC3</th>
<th>1.454</th>
<th>0.521</th>
<th>-1.116</th>
</tr>
</thead>
</table>

**FC:** Other systems I use at work are compatible with EMRS

F C 4: EMR Specialists are accessible to support EMRS complications.

<table>
<thead>
<tr>
<th></th>
<th>FC4</th>
<th>1.349</th>
<th>-0.647</th>
<th>-0.903</th>
</tr>
</thead>
</table>

**FC:** EMR Specialists are accessible to support EMRS complications.

B I: I intend to continue using EMRS

<table>
<thead>
<tr>
<th></th>
<th>BI</th>
<th>0.989</th>
<th>-1.673</th>
<th>2.081</th>
</tr>
</thead>
</table>

**BI:** HCWs intent to use EMRs

U B: I will always use EMRS

<table>
<thead>
<tr>
<th></th>
<th>UB</th>
<th>1.07</th>
<th>-1.335</th>
<th>0.87</th>
</tr>
</thead>
</table>

**UB:** I will always use EMRS

**Source:** Research.

The two statistics that inform the normality or non-normality of the sample’s distribution are Kurtosis and Skewness. Skewness measures the symmetry or lack of symmetry of a distribution around the mean. From table 4.5 above all the model indicators are negatively skewed except FC3 i.e. the distribution is skewed to the left around the mean. Skewness measures lies between +/-1 otherwise value outside this range indicate a high level of skewness in the distribution. In Table 4.5 above 12 out of the 19 manifest variables have their skewness value less than or greater than -1 and +1 hence indicating high level of skewness in addition all manifest variables have a skewness value far from zero thus lack of normality in the sample.

In addition, from table 4.3, all the manifest variables have kurtosis values less than 3 also confirming non-normality of the sample (SPC for EXCEL 2016). The normality of the data set is a key factor for consideration when deciding on the kind of structural equation modeling that can be performed from the sample hence the investigators choice of PLS-SEM which ignores normality of the sample.
4.4 Reliability of the Measurement Model

For PLS-SEM reliability assessment ensures that the block of indicators selected for each construct operationalizes it suitably. For each construct reliability is computed separately and it’s independent of the reliability of other constructs (Straub et al. 2004). We used SmartPLS path modelling software version 3 to determine reliability as described below:

- **Indicator Reliability**
  The investigator computed the indicator reliability value for a reflective model by squaring the outer loading of each manifest variables. According to Hulland (1999) and Chin (1998) reliability value of above 0.7 is recommended, however in exploratory research, a value of above 0.4 is acceptable. Generally, indicators with loadings within the range of 0.4 to 0.7 are retained in the model. For this research the investigator dropped the Facilitating Condition indicators FC1 and FC3 from the model since they had values that were off the recommended range of indicator reliability see table 4.6 below.

- **Construct Reliability**
  Normally measured by examining the internal validity through the Cronbach’s alpha value. The results indicate Composite Reliability values of at least 0.4 for all variables. This therefore indicated a highly reliable measurement instrument (Fornell & Larcker 1981) hence reliable measurement model.
Table 4.6: Full Dataset Model’s Reliability and Validity Measures

<table>
<thead>
<tr>
<th>Latent Variable</th>
<th>Indicators</th>
<th>Loadings (L)</th>
<th>Indicator Reliability (L)^2</th>
<th>Composite Reliability</th>
<th>Cronbach’s Alpha</th>
<th>AVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>B I</td>
<td>B I</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>U B</td>
<td>U B</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>F C</td>
<td>F C 2</td>
<td>0.857</td>
<td>0.734</td>
<td>0.836</td>
<td>0.608</td>
<td>0.718</td>
</tr>
<tr>
<td></td>
<td>F C 4</td>
<td>0.838</td>
<td>0.702</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P E</td>
<td>P E 1</td>
<td>.935</td>
<td>.874</td>
<td></td>
<td>0.954</td>
<td>0.935</td>
</tr>
<tr>
<td></td>
<td>P E 2</td>
<td>.928</td>
<td>.861</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P E 3</td>
<td>.927</td>
<td>.859</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P E 4</td>
<td>.868</td>
<td>.753</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E E</td>
<td>E E 1</td>
<td>.846</td>
<td>.716</td>
<td></td>
<td>0.948</td>
<td>0.932</td>
</tr>
<tr>
<td></td>
<td>E E 2</td>
<td>.881</td>
<td>.776</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>E E 3</td>
<td>.901</td>
<td>.812</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>E E 4</td>
<td>.892</td>
<td>.796</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>E E 5</td>
<td>.910</td>
<td>.828</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S I</td>
<td>S I 1</td>
<td>.832</td>
<td>0.692</td>
<td>0.895</td>
<td>0.848</td>
<td>0.680</td>
</tr>
<tr>
<td></td>
<td>S I 2</td>
<td>.888</td>
<td>0.789</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S I 3</td>
<td>.782</td>
<td>0.612</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S I 4</td>
<td>.799</td>
<td>0.638</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Research

4.5 Construct Validity

Construct validity ensures that the measurement variables selected for a given latent construct reasonably operationalize it collectively. This was done through assessments discussed below:

- **Discriminant Soundness**

  Demonstrated when inter-indicator inter-Construct association is weak hence distinct variables (Fornell & Larcker 1981). See table 4.7 below.
Table 4.7: Discriminant Validity of the Full Dataset Model

<table>
<thead>
<tr>
<th></th>
<th>B I</th>
<th>E E</th>
<th>F C</th>
<th>P E</th>
<th>S I</th>
<th>U B</th>
</tr>
</thead>
<tbody>
<tr>
<td>B I</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E E</td>
<td>.603</td>
<td>.886</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F C</td>
<td>.634</td>
<td>.692</td>
<td>.847</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P E</td>
<td>.610</td>
<td>.673</td>
<td>.584</td>
<td>.915</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S I</td>
<td>.499</td>
<td>.514</td>
<td>.548</td>
<td>.427</td>
<td>.826</td>
<td></td>
</tr>
<tr>
<td>U B</td>
<td>.750</td>
<td>.638</td>
<td>.673</td>
<td>.559</td>
<td>.432</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Source: Research

- **Convergent Validity (C. V)**

This is exhibited when each variable associate strongly with its supposed hypothetical construct with a A. V. E. value of 0.5 or more (Fornell & Larcker 1981). From table 4.6 above it is evident that the measurement instrument in this in this research exhibited satisfactory levels of C.V.

Table 4.8 Loadings and Cross-Loadings of the Measurement Items full Data set

<table>
<thead>
<tr>
<th></th>
<th>U B</th>
<th>B I</th>
<th>E E</th>
<th>F C</th>
<th>P E</th>
<th>S I</th>
</tr>
</thead>
<tbody>
<tr>
<td>U B</td>
<td>1.000</td>
<td>.935</td>
<td>.602</td>
<td>.634</td>
<td>.610</td>
<td>.502</td>
</tr>
<tr>
<td>B I</td>
<td>.750</td>
<td>1.000</td>
<td>.640</td>
<td>.673</td>
<td>.560</td>
<td>.440</td>
</tr>
<tr>
<td>E E 1</td>
<td>.602</td>
<td>.602</td>
<td>.846</td>
<td></td>
<td>.668</td>
<td>.562</td>
</tr>
<tr>
<td>E E 2</td>
<td>.573</td>
<td>.573</td>
<td>.881</td>
<td>.579</td>
<td>.718</td>
<td>.535</td>
</tr>
<tr>
<td>E E 3</td>
<td>.576</td>
<td>.576</td>
<td>.901</td>
<td>.583</td>
<td>.524</td>
<td>.430</td>
</tr>
<tr>
<td>E E 4</td>
<td>.601</td>
<td>.601</td>
<td>.892</td>
<td>.651</td>
<td>.561</td>
<td>.478</td>
</tr>
<tr>
<td>E E 5</td>
<td>.586</td>
<td>.586</td>
<td>.910</td>
<td>.592</td>
<td>.604</td>
<td>.455</td>
</tr>
<tr>
<td>F C 2</td>
<td>.615</td>
<td>.615</td>
<td>.696</td>
<td>.857</td>
<td>.432</td>
<td>.401</td>
</tr>
<tr>
<td>F C 4</td>
<td>.567</td>
<td>.567</td>
<td>.473</td>
<td>.838</td>
<td>.560</td>
<td>.437</td>
</tr>
<tr>
<td>P E 1</td>
<td>.604</td>
<td>.604</td>
<td>.629</td>
<td>.558</td>
<td>.935</td>
<td>.401</td>
</tr>
<tr>
<td>P E 2</td>
<td>.617</td>
<td>.617</td>
<td>.626</td>
<td>.518</td>
<td>.928</td>
<td>.415</td>
</tr>
<tr>
<td>P E 3</td>
<td>.552</td>
<td>.552</td>
<td>.606</td>
<td>.521</td>
<td>.927</td>
<td>.382</td>
</tr>
<tr>
<td>P E 4</td>
<td>.504</td>
<td>.504</td>
<td>.590</td>
<td>.537</td>
<td>.868</td>
<td>.364</td>
</tr>
<tr>
<td>S I 1</td>
<td>.298</td>
<td>.298</td>
<td>.333</td>
<td>.320</td>
<td>.327</td>
<td>.832</td>
</tr>
<tr>
<td>S I 2</td>
<td>.380</td>
<td>.380</td>
<td>.378</td>
<td>.365</td>
<td>.348</td>
<td>.888</td>
</tr>
<tr>
<td>S I 3</td>
<td>.539</td>
<td>.539</td>
<td>.502</td>
<td>.479</td>
<td>.431</td>
<td>.782</td>
</tr>
<tr>
<td>S I 4</td>
<td>.356</td>
<td>.356</td>
<td>.438</td>
<td>.408</td>
<td>.255</td>
<td>.799</td>
</tr>
</tbody>
</table>

Source: Research
4.6 Structural Model Evaluation

This involved testing of the hypotheses according to the conceptual model. This was after examining the measurement model and confirmation that it demonstrated sufficient validity and reliability as previously discussed in this report. The investigator achieved this by eliminating two of the manifest indicators F C 1 and F C 2. The resulting model was therefore robust enough to evaluate causal associations between external and internal indicators of this study. Causal relationships were examined through the estimation of $R^2$, $\beta$, and $f^2$ as discussed below. Table 4.9 indicates the summary hypotheses that were evaluated.

Table 4.9 Causal Paths

<table>
<thead>
<tr>
<th>Causal Paths</th>
</tr>
</thead>
<tbody>
<tr>
<td>P E $\rightarrow$ B I</td>
</tr>
<tr>
<td>F C $\times$ EXP $\rightarrow$ B I</td>
</tr>
<tr>
<td>P E $\times$ Gender $\rightarrow$ B I</td>
</tr>
<tr>
<td>F C $\times$ Age $\rightarrow$ B I</td>
</tr>
<tr>
<td>P E $\times$ Age $\rightarrow$ B I</td>
</tr>
<tr>
<td>E E $\rightarrow$ B I</td>
</tr>
<tr>
<td>F C $\rightarrow$ B I</td>
</tr>
<tr>
<td>E E $\times$ Gender $\rightarrow$ B I</td>
</tr>
<tr>
<td>E E $\times$ EXP $\rightarrow$ B I</td>
</tr>
<tr>
<td>E E $\times$ Age $\rightarrow$ B I</td>
</tr>
<tr>
<td>S I $\rightarrow$ B I</td>
</tr>
</tbody>
</table>

4.6.1 Coefficient of Determination ($R^2$)

This evaluates the forecasting power of the exogenous variables for structural model and has values ranging from 0 to 1. No study has given rules about the acceptable threshold value of $R^2$ hence the larger the $R^2$ the larger the proportion of variance explained. From figure 4.3 below, $R^2$ internal variable (Behavioral Intention) is 0.585 hence moderate. This implies P E, E E, S I and F C accounted for 58.5% variance in B I to use EMRs to deliver HIV care and B I accounted for 56.2% variance in actual UB.
4.6.2 Path Coefficient ($\beta$)

$\beta$ values indicates direction and strength of the relationships between latent variables. This is evaluated in SmartPLS 3 by the bootstrap function which generates the corresponding T-statistics. Significant paths relationship have beta values more than 0.1 (Hair et al., 2011). The resulting model with corresponding path coefficients is shown in figure 4.3 and summarized in table 4.10 with the associated hypotheses.
Table 4.1: T-Statistics, Path Coefficient and Hypotheses Comparisons Full data set, FB & GoK Groups

<table>
<thead>
<tr>
<th>Path/Statistics</th>
<th>Full Data set n= 207</th>
<th>Cadres</th>
<th>Type of Health Care Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>HRIOS n =93</td>
<td>Clinical n=114</td>
</tr>
<tr>
<td>R square in BI</td>
<td>58.50%</td>
<td>62.40%</td>
<td>60.70%</td>
</tr>
<tr>
<td>R square in UB</td>
<td>56.20%</td>
<td>71.10%</td>
<td>49.40%</td>
</tr>
<tr>
<td>B I -&gt; use</td>
<td>0.750</td>
<td>12.351***</td>
<td>0.843</td>
</tr>
<tr>
<td>E E -&gt; BI</td>
<td>0.195</td>
<td>2.186*</td>
<td>0.129</td>
</tr>
<tr>
<td>E E * AGE -&gt; B I</td>
<td>0.038</td>
<td>0.377</td>
<td>-0.166</td>
</tr>
<tr>
<td>E E * EXP -&gt; B I</td>
<td>0.055</td>
<td>0.67</td>
<td>0.094</td>
</tr>
<tr>
<td>E E * Gender -&gt; B I</td>
<td>0.334</td>
<td>3.707**</td>
<td>0.338</td>
</tr>
<tr>
<td>F C -&gt; B I</td>
<td>0.282</td>
<td>3.735**</td>
<td>0.352</td>
</tr>
<tr>
<td>F C * AGE -&gt; B I</td>
<td>0.057</td>
<td>0.613</td>
<td>0.101</td>
</tr>
<tr>
<td>F C * EXP -&gt; B I</td>
<td>-0.106</td>
<td>1.656</td>
<td>-0.127</td>
</tr>
<tr>
<td>P E -&gt; B I</td>
<td>0.225</td>
<td>2.726</td>
<td>0.142</td>
</tr>
<tr>
<td>P E * AGE -&gt; B I</td>
<td>-0.001</td>
<td>0.014</td>
<td>0.15</td>
</tr>
<tr>
<td>P E * Gender -&gt; B I</td>
<td>-0.240</td>
<td>2.918**</td>
<td>-0.275</td>
</tr>
<tr>
<td>S I -&gt; B I</td>
<td>0.150</td>
<td>2.065*</td>
<td>0.224</td>
</tr>
<tr>
<td>S I * EXP -&gt; B I</td>
<td>-0.024</td>
<td>0.397</td>
<td>-0.023</td>
</tr>
</tbody>
</table>

Source: Research.

From table 4.10 above, the magnitude of path coefficient is above 0.1 and all t statistics greater than 1.645 hence all the paths are generally significant at 90% two tailed t test.

4.6.3 Effect Size ($f^2$)

In this study $f^2$ was obtained using PLS-SEM version 3 and the results are as displayed in table 4.11 below. Effect size is directly proportional to sample size i.e. the larger the sample the higher the propensity of obtaining statistically significant values (Ziliak & McCloskey 2008). Usually path coefficients greater that 0.1 with t-values grater that 1.96 are significant at 0.05. In SmartPLS version 3, we accept the alternative hypothesis if the bootstrapping test results are values with t-
value greater than 1.96 (for 2-tailed) which is equivalent to a $p$ value less than 0.05 (Hair, J. F. et al. 2014).

### Table 4.11 Effect Size of the Full Data Set Structural Model

<table>
<thead>
<tr>
<th>Path Coefficients ($\beta$)</th>
<th>Effect Size ($f^2$)</th>
<th>T Statistics</th>
<th>Corresponding Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>B I -&gt; U B</td>
<td>0.750</td>
<td>1.285</td>
<td>12.351***</td>
</tr>
<tr>
<td>E E -&gt;B I</td>
<td>0.195</td>
<td>0.130</td>
<td>2.186**</td>
</tr>
<tr>
<td>E E * AGE -&gt; B I</td>
<td>0.038</td>
<td>0.001</td>
<td>0.377</td>
</tr>
<tr>
<td>E E *EXP -&gt; B I</td>
<td>0.055</td>
<td>0.003</td>
<td>0.67</td>
</tr>
<tr>
<td>E E * Gender-&gt; B I</td>
<td>0.334</td>
<td>0.124</td>
<td>3.707***</td>
</tr>
<tr>
<td>F C-&gt; B I</td>
<td>0.282</td>
<td>0.186</td>
<td>3.735***</td>
</tr>
<tr>
<td>F C*AGE-&gt; B I</td>
<td>0.057</td>
<td>0.003</td>
<td>0.613</td>
</tr>
<tr>
<td>F C *EXP-&gt; B I</td>
<td>-0.106</td>
<td>0.115</td>
<td>1.656*</td>
</tr>
<tr>
<td>P E -&gt; B I</td>
<td>0.225</td>
<td>0.159</td>
<td>2.726*</td>
</tr>
<tr>
<td>P E *AGE-&gt; B I</td>
<td>-0.001</td>
<td>0.000</td>
<td>0.014</td>
</tr>
<tr>
<td>P E * Gender-&gt; B I</td>
<td>-0.240</td>
<td>0.166</td>
<td>2.918***</td>
</tr>
<tr>
<td>S I -&gt; B I</td>
<td>0.150</td>
<td>0.133</td>
<td>2.065**</td>
</tr>
<tr>
<td>S I * EXP-&gt; B I</td>
<td>-0.024</td>
<td>0.001</td>
<td>0.397</td>
</tr>
</tbody>
</table>

**Source:** Research

### 4.7 Testing the Relationships with Moderators

Testing the influence of moderation variables improves the scientific understanding complex relationships in technology adoption studies (Henseler & Fassott, 2010). But this process is considered cumbersome hence avoided. The theoretical model for this research is UTAUT, which has evaluated four moderator variables i.e. gender, age, experience and voluntariness. However, this research focused on public and Faith-based Health Care facilities with EMRS installed to deliver HIV care. It is Mandatory for HCWs to use EMRS in these facilities since manual systems have been faced out. Therefore, Voluntariness was not considered as a moderating variable.

This study used the group comparison approach according to Hensler and Fasott (2010) which involved the following steps:

i. The sample was divided into two data sets based on the result of the gender moderating variable in Microsoft Excel. We therefore had male respondents only data set with $n = 91$ and a female respondent only data set with $n = 116$. 

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ii. These data sets were then loaded independently into SmartPLS for further analysis of the measurement and structural model. SmartPLS feature was then used to add each of the moderator variables in the two data sets.

iii. Bootstrap function of SmartPLS is executed to generate beta values along with the corresponding t-statistics and P – Values for the two data sets. Table 4.12 below shows the results from Smart PLS software version 3 that was used to evaluate the moderating effect hypotheses.

4.8 Hypothesis Testing and Validation

A statistical hypothesis test is a method of statistical inference. The goal of hypothesis testing is to determine the likelihood that a population parameter like variance in this study is likely to be true. We found from table 4.11 that Performance Expectancy ($\beta = 0.230, t = 2.958$); Effort Expectancy ($\beta = 0.184, t = 1.933$); Facilitating Conditions (beta is .124, T stat. is 1.634); social Influence (beta is 0.376, T stat. is 4.967); are positively associated with Behavioral Intention since all the path coefficients ($\beta$) are positive and greater that 0.1 In addition t-values greater than 1.645 hence the effects are significant at a level of 90% hence $H_4$, $H_{10}$ and $H_8$ are supported. The second level independent varaible BI is also significant hence $H_{13}$ is supported.

However on examining the the relationships with moderation variables we found the results discussed below:

$H_2$: Gender will intervene the effect of P E on B I , in that the effect will be more for men than women. This effect P E * Gender -> B I has a $\beta = -0.240$. Since we coded men as 1 and women as 2 in our data it implies that as we increase in gender the effect reduces hence $H_2$ is supported see table 4.11 above.

$H_3$: Age will significantly intervene the effect of P E on B I The effect of PE on BI when moderated by Age is $\beta = -0.001$ with a t value of 0.014 hence insignificant thus $H_3$ is not supported see table 4.11 above.
**H₅**: Gender will intervene the effect of E E on B I, in that the association will be more for women than men. For H₅ β = 0.334 with t = 3.707. This means that as gender increases according to our coding of Male is 1 and Female is 2 the effect increases also hence supporting this hypothesis.

**H₆**: Experience will significantly intervene the effect of E E on B I. Here β = 0.055 with t = 0.670 hence insignificant thus H₆ is rejected.

**H₇**: Age will intervene the result of E E on B I significantly. For H₇ β = 0.038 with t value of 0.337 thus insignificant hence H₇ rejected.

**H₉**: EXP will intervene the result of S I on B I, in that the outcome will be more in initial phases of EXP. For H₉ β = 0.024 with t value of 0.001 thus insignificant hence H₉ rejected.

**H₁₁**: The effect of F C on B I to use of EMRS is intervened by EXP, in that it is more with growing EXP. For H₁₁ β = -0.106 with t value of 1.656 thus significant hence H₁₁ supported.

**H₁₂**: Age will intervene the effect of F C on B I to use of EMRS, in that influence is strongest for older HCWs. For H₁₂ β = -0.057 with t value of 0.656 thus insignificant hence H₁₂ not supported.

**Table 4.12 Hypothesis Testing Summary (Full Dataset Model)**

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Beta Coefficient</th>
<th>T-Statistic</th>
<th>Model Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₁: P E positively influences HCWs’ B I EMRS for HIV care.</td>
<td>0.225</td>
<td>2.726</td>
<td>Supported at 5% significance level</td>
</tr>
<tr>
<td>H₂: Gender will intervene the effect of P E on B I, in that the effect will be more for men than women.</td>
<td>-0.240</td>
<td>2.918</td>
<td>Supported at 1% level</td>
</tr>
<tr>
<td>H₃: Age will significantly intervene the effect of P E on B I</td>
<td>-0.001</td>
<td>0.014</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H₄: E E will positively influence the health worker’s B I to use EMRS for HIV care.</td>
<td>0.195</td>
<td>2.186</td>
<td>Supported at 5% significance level</td>
</tr>
<tr>
<td>H₅: Gender will intervene the effect of E E on B I, in that the association will be more for women than men.</td>
<td>0.334</td>
<td>3.707</td>
<td>Supported at 1% level</td>
</tr>
<tr>
<td>H6: The effect EE on BI will be moderated significantly Experience</td>
<td>0.055</td>
<td>0.670</td>
<td>Not Supported</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>-------</td>
<td>-------</td>
<td>---------------</td>
</tr>
<tr>
<td>H7: The result of EE on BI will be weakened positively by Oldness</td>
<td>0.038</td>
<td>0.377</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H8: SI will positively affect the health worker’s BI to use EMRS for HIV Care.</td>
<td>0.150</td>
<td>2.065</td>
<td>Supported at 5% Sig. level</td>
</tr>
<tr>
<td>H9: EXP will intervene the result of SI on BI, in that the outcome will be more in initial phases of EXP</td>
<td>-0.024</td>
<td>0.397</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H10: FC will positively affect BI to use of EMRS for HIV care.</td>
<td>0.282</td>
<td>3.735</td>
<td>Supported at 1% level</td>
</tr>
<tr>
<td>H11: The effect of FC on BI to use of EMRS is intervened by EXP, in that it is more with growing EXP.</td>
<td>0.106</td>
<td>1.656</td>
<td>Supported at 10% level</td>
</tr>
<tr>
<td>H12: Age will intervene the effect of FC on BI to use of EMRS, in that influence is strongest for older HCWs</td>
<td>0.057</td>
<td>0.613</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H13: BI will significantly positive affect UB EMRS for HIV care.</td>
<td>0.75</td>
<td>12.351</td>
<td>Supported at 1% level</td>
</tr>
</tbody>
</table>

**Source:** Research

### 4.9 Model Validation in Government, Faith Based Health Care Facilities and Type of Cadre

The full dataset model was representative of all health worker cadres in Government and Faith Based health care facilities at HIV service delivery points. However this is not a homogenous group since there exist diverse demographic characteristics as observed from the data. The categories of HCWs were recognized by level of governance of their health care facilities i.e. Faith based and Government of Kenya based and Cadre which were grouped as Clinical and Data management groups. We therefore tested the model in these scenarios to gain understanding of the factor relationships that are most important thus make appropriate conclusions.

From table 4.12 below variation was noted in A. V. E. in internal latent variable BI, UB, and beta values in some structural associations for each model when data was grouped according to health care facility type. In particular variance explained for GOK Based HCWs increased to 63.3% while UB variance explained reduced to 54.2% when compared to the full data set model. There was an increase in variance explained for both BI and UB to 71.8% and 70.8% respectively in Faith Based health care facilities as compared to the full dataset model.
Table 4.13 Variance Explained for GoK, FB Health Care Facilities and Type of Cadre

<table>
<thead>
<tr>
<th>Path/Statistics</th>
<th>Full Data set n= 207</th>
<th>Cadres</th>
<th>Type of Health Care Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Data Management</td>
<td>Clinical n=114</td>
</tr>
<tr>
<td>R square in BI</td>
<td>58.50%</td>
<td>62.40%</td>
<td>60.70%</td>
</tr>
<tr>
<td>R square in UB</td>
<td>56.20%</td>
<td>71.10%</td>
<td>49.40%</td>
</tr>
<tr>
<td>B I -&gt; use</td>
<td>beta</td>
<td>0.750</td>
<td>12.351***</td>
</tr>
<tr>
<td>E E -&gt; BI</td>
<td>beta</td>
<td>0.195</td>
<td>2.186*</td>
</tr>
<tr>
<td>EE*AGE -&gt; B I</td>
<td>beta</td>
<td>0.038</td>
<td>0.377</td>
</tr>
<tr>
<td>E E*EXP -&gt; B I</td>
<td>beta</td>
<td>0.055</td>
<td>0.67</td>
</tr>
<tr>
<td>E E*Gender -&gt; B I</td>
<td>beta</td>
<td>0.334</td>
<td>3.707*</td>
</tr>
<tr>
<td>F C -&gt; B I</td>
<td>beta</td>
<td>0.282</td>
<td>3.735*</td>
</tr>
<tr>
<td>F C*AGE -&gt; B I</td>
<td>beta</td>
<td>0.057</td>
<td>0.613</td>
</tr>
<tr>
<td>F C*EXP -&gt; B I</td>
<td>beta</td>
<td>-0.106</td>
<td>1.656</td>
</tr>
<tr>
<td>P E -&gt; B I</td>
<td>beta</td>
<td>0.225</td>
<td>2.726</td>
</tr>
<tr>
<td>P E * AGE -&gt; B I</td>
<td>beta</td>
<td>-0.001</td>
<td>0.014</td>
</tr>
<tr>
<td>P E * Gender -&gt; B I</td>
<td>beta</td>
<td>-0.240</td>
<td>2.918*</td>
</tr>
<tr>
<td>S I -&gt; B I</td>
<td>beta</td>
<td>0.150</td>
<td>2.065*</td>
</tr>
<tr>
<td>S I * EXP -&gt; B I</td>
<td>beta</td>
<td>-0.024</td>
<td>0.397</td>
</tr>
</tbody>
</table>

From our findings it was evident that all the first level independent variables of the model significantly affected BI and BI significantly affected UB in EMRS for HIV care. The effect of P E and E E on B I is intervened by Gender while Experience intervenes the association of F C on B I. These results hold for the whole sample model, the Clinical Cadre of HCWs and for the GoK based group of health care workers model. However, when it comes to Data Management group of health care workers only EE moderated by Gender and PE significantly influenced BI which in turn influenced UB significantly. No moderating effects of Age was noted on the full dataset model on PE, FC and EE and Experience on SI and EE. In addition, FC directly influence BI. From these results we were able to come up with a Determinant of use model for EMRs to deliver HIV care in Kenya.
Figures 4.4 below depict the resulting model for Full data set which was same as the Clinical and GoK group of HCWS while figure 4.5 depicts the model the Data management group of HCWS.

Figure 4.1: The resulting Model for the Full data set, Clinical and GoK groups of HCWS
In summary from table 4.12 above we observed the following:

i. The influence of EE on BI is positive and significant for the GoK based health care facilities, Data management and Clinical group of HCWS.

ii. Facilitating Conditions was germane and significant contributor to Behaviour intention and only significant in the GoK based health care facilities, Data management and Clinical group of HCWS. Though it had a strong effect in Faith Based Faciliteis it was not significant in this group of HCWs.

iii. The association between PE and BI strong, positive and significant for GoK based HCWs and the clinical group of HCWs while its effect on FB based and Data management group of HCWs was weak and insignificant.

iv. The association between SI and BI is positive and significant for both clinical and GoK categories of HCWs and insignificant in FB and Data management categories of HCWs.

v. The resulting model for the Clinical and GoK based group of HCWs remained same as that for the full data model.
CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.0 Overview
Here we summarize key results from this research and their impacts to the different stakeholders concerned with EMRs implementations for HIV care in Kenya and by extent in developing countries. We connect the results to the research objectives and questions to determine how the study was able to address them.

5.1 Linking Research Objectives to the Findings
Overall, the study aimed at “Enhance knowledge in understanding of health I.T. Use in HIV prevention and Care settings by validating UTAUT technology adoption model to study determinants of use of EMRS to deliver HIV Prevention and Care in Kenya”. We summarize how the specific objectives were realized by the study and the corresponding research questions addressed.

Objective 1: Come up with a technology adoption model that is able to forecast complex relationships affecting EMRs use in public & Faith based health care facilities in Kenya for HIV care delivery.

This study adopted and validated the UTAUT model to assess its applicability in our research settings. This was after we surveyed the available literature to acquire knowledge in this context and understanding of EMRS rollout in Kenya. Measure statements for measuring actual use were incorporated in behavioral intention measure statements thus the study did not measure actual use independently but inferred from literature. We included three moderating variables i.e. Age, Gender and Experience but left out voluntariness since it was mandatory that EMRS are used in the health care facilities sampled as manual tools of data capture have been faced out. Thus the adopted model and its construct measures were confirmed valid and feasible conceptualization of the determinants of use of EMRs in delivery of HIV care in Kenya. This objective was achieved and, in the process, the first two research questions responded to.
**Objective 2: Use Modelling techniques to validate the model using empirical data collected in public and Faith based health care facilities in Kenya.**

We Validated the UTAUT model using quantitative data from 207 health care workers in HIV delivery service points in Kenya. SmartPLS 3 was used to test the fitness of the block of items selected for operationalization of the UTAUT constructs. Indicator reliability was obtained by squaring the outer loadings of each manifest variable. Additionally, we confirmed the model’s constructs validity using tests for constructs' convergent validity and discriminant validity. From all these tests we observed that the conceptualized model was robust enough to operationalize the study. We then assessed for relationships strength and effect of the models constructs using robust statistical techniques in SmartPLS 3, i.e. $R^2$, $\beta$, and $f^2$ hence objective 2 was achieved.

**Objective 3: Generate the final framework to evaluate the association strengths between the exogenous and endogenous constructs.**

Research results aimed to find out the magnitude with which the identified factors from the conceptual framework were able to predict the endogenous construct Behavioral Intention and consequently deduce actual UB. The findings indicate that FC had the greatest effect on BI of EMRS to deliver HIV care. This was followed by PE, EE and SI in order of magnitude from the highest to the lowest respectively were. The four factors i.e. FC, PE, EE and SI were able to explain 58.5% variance in BI while BI was able to explain 56.2% variance in actual UB. SI had the lowest effect due to strict adherence to HIV guidelines on HIV care and treatment. This objective was therefore achieved and the corresponding research question (iii.) responded to i.e. Which of the identified factors are most influential in determining use of EMRS?

**Objective 4: Cross-validate the model across Public and Faith based categories of healthcare workers via multi-group analysis to isolate influential determinants in these settings**

We grouped the data into two distinct groups of health care workers i.e. those from Faith based health care facilities and those from Government based health facilities. This is because though the full dataset was a representative of all health care workers at HIV service delivery points in Kenya using EMRS they were not a homogenous group. This is because of diverse demographic characteristics observed from the data as well as management styles and availability of resources.
at these facilities. The researcher therefore tested the model individually in the two groups to determine the most influential factors in these settings after confirming that the model’s construct validity and reliability as conceptualized was valid across the two groups of HCWs.

The variance explained for the full dataset model was 58.5% for BI and 56.2% UB. However, when the model was tested using data for each of the two categories, we observed that variance explained increased in the GoK based HCWs group to 63.3% for BI but reduced to 54.2% for UB in the same group of HCWs. For FB HCWs the model was able to explain up to 71.8% BI and 70.7% UB. The structural model statistics for each of the group showed different strength among the distinct causal paths in the two groups. The effect of FC on BI was strong among the FB based HCWs but insignificant. The findings are in tandem with other works that showed HCWs in HIV care settings are guided by the current WHO guidelines and knowledge about HIV care hence autonomous and unlikely that they will be influenced socially in their decisions (Chismar & Wileypatton 2003). From these findings we deduce that HCWs in the two settings are not homogeneous which is a factor to be considered for optimum use of EMRS to deliver HIV care. Therefore, this objective was achieved and the corresponding question i.e. “is the new theoretical model valid across public and faith-based healthcare settings of HIV care?” responded to.

5.2 Assessment of the Research Contributions and Implications

Factors that should be considered when judging a conceptual paper are precise articulation, bearing on research, timeliness and importance (Whetten, D.A. 1989). We therefore evaluated the final output of this research based on Whetten, D. A. (1989) framework for evaluating or assessing a concept paper by answering the seven key questions according to the framework to determine if study had significant contributions to the subject area as discussed below:

5.2.1 What is new to the current body of knowledge?

This question determines how this study contributes to what is known currently in this subject area. This research had four objectives. First was to come up with a technology adoption framework to forecast the complex relationships affecting optimal EMRs use in public & Faith based health care facilities in Kenya for HIV care delivery. The second objective was to use
Modeling techniques (SEM) to test the framework using empirical data collected in public and Faith based health care workers in Kenya. The third was to generate the final framework and assess the associations strength among External & Internal variables, to find the aspects that most affect EMR Use process. The final objective was to Cross-validate the model across Public and Faith based categories of healthcare workers via multi-group analysis to isolate influential determinants in these settings.

The study established that Organizational facilitating conditions was most influential construct in the framework. Though Venkatesh et al., (2003) found FC as a direct determinant of UB, our study proved otherwise. The moderator variables were experience on the association between FC and BI among older users of EMR while all the other moderating variables i.e. Gender and Age though their moderating effect on PE, EE and SI was strong it was not significant hence invalidating Venkatesh et al., (2003) argument. These findings therefore brings new insights to technology adoption hence a new contribution to the current body of knowledge.

5.2.2 So what? How will the Study revolutionize EMR adoption and use?

From the study the two most influential indicator of BI with respect to EMRs in Kenyan Healthcare facilities to deliver HIV care, in order of their significance are Organizational facilitating conditions, followed by Performance Expectancy respectively which in turn directly influences use behavior. This finding therefore provides germane information to consider for EMR adoption and use for HIV care. This is because EMR vendors and providers will utilize these findings to provide targeted services in addition to ensuring that enabling infrastructure exists that facilitate adoption and use of EMRs in HIV care settings. These findings will also inform site capacity assessment by donors and implementing partners so as to determine where to direct resources in ensuring that EMRs are used for HIV care. The study findings will ensure that EMRs developed target HCWs with a certain specific need, hence the tendency by HCWs to only explore and adopt EMRs that help them accomplish certain tasks.
5.2.3 Are the underlying logic and supportive evidence compelling?
This study was grounded on existing theories and models established and proven by previous studies. We identified the conceptual model’s independent variables from UTAUT model which is a consolidation of eight previous technology adoption models and theories hence ensuring that aspects of adoption lacking in other models are included. Hypotheses formulation was based on: concrete theoretical underpinning of previously conducted and confirmed research findings; the researchers own general knowledge, observations and intuition; hence study’s underlying logic and supportive evidence was thus compelling.

5.2.4 How exhaustive was the study?
We started by establishing that no research on individual use of EMRs to deliver HIV care had not been done in Kenya. This was done by thorough review of literature related to technology use and narrowing down to determinants of use of EMRS to deliver HIV care case study of Healthcare facilities in Kenya. The choice of sample size was done scientifically to ensure representativeness using (Yamane, 1967:886). We also considered Mugenda and Mugenda, (2003) who claimed that; in the situations where time and resources allow, a researcher should take as big a sample as possible as this increases the results reliability. We grounded the research conceptual model in literature with strong justification. We also carefully selected, designed and developed the data collection instrument based on the conceptual model after a thorough review and evaluation of data collection methods used in previous studies to determine their advantages and disadvantages so as to come up with a more reliable survey instrument for the study. We achieved this by pre-testing the survey instrument and FGD inputs among a group of selected HCWs, expert opinion and guidance and the relevant statistics. Data from bonafide HCWs and all processes to ensure data integrity observed. We then analyzed using SPSS and SmartPLS 3 which are robust statistical tools according to our research design and backing from literature survey.

5.2.5 Is the thesis report well written? I.E. Does it have a logical flow?
The structure of this research report starts by providing an informative background on EMRS and review of EMRS use. In the study we review thoroughly technology use frameworks. We identified UTAUT model as the most appropriate choice on which to derive the research conceptual model with solid justifications given. A clear research methodology is then drawn;
which explains the study design, the survey instrument and justifies their choice. We explain how we ensured a robust survey instrument and data integrity processes also outlined clearly. The results are analyzed by extracting the general characteristics, summary of responses statistics, and running the SEM analysis of the variables and their moderators. We then discuss the study results firmly based on analysis output so as to put the research results into perspective in relation to other studies while deliberately comparing the various aspects of this study findings with previous study findings. Finally, we draw conclusions as well as highlight the study limitations and recommendations made. We therefore find that this thesis report responds to the above questions sufficiently.

5.2.6 Why now? Is it of interest to the stakeholders?

The goal of adoption and use of computers and computing technology is to save costs, reduce time required to accomplish complex computational tasks, ensure precision, increase production speeds and automate highly repetitive tasks. EMRS will ensure accurate patient level data is available hence save Kenya funds used to verify these numbers through surveys which can be directed elsewhere in the economy. In addition, optimal use of EMRs will put the health care sector at par with other sectors like the financial sector in application of IT (MoH, 2011). The National Plan for Accelerating HIV Care and Treatment services majorly depends on accurate patient level data which can only be realized via optimum utilization of EMRS. Therefore, finding variables that will ensure optimum EMRS utilization which this study has addressed is essential for NASCOP to realize this strategy. Hence the why now and interest by stakeholders in HIV prevention care and treatment in Kenya.

5.2.7 Which other stakeholders including academic researchers are interested in this Study?

Without optimal EMR systems use, patients in HIV care are difficult to track, measure their adherence to ARV drugs as well as make clinical decisions for their management by clinicians. This is because they are put on a life-long treatment with various laboratory tests at different stages of Antiretroviral (ARVS) drugs medication. Ensuring that these patients adhere well to ARVS is key as adherence to ARVS is the second strongest predictor of progression to AIDS and death. Therefore, this research is key to HCWs and HIV patients since optimum use of EMRS will
ensure that Health care workers measure ARVs adherence hence make timely and informed decisions on HIV patient management hence improving patient outcomes.

5.3 Restrictions and Suggestions for further work

Limitations for this study triggering recommendations for further research are that:

First, this was a cross-sectional study. Longitudinal approach to this study will be paramount to determine how the predictive effect of the identified factors varies with time particularly how the intention to use factor affects use behavior across time.

Secondly Random sampling constrained us from collecting fair samples of HCWs with respect to factors like gender, age and experience which could have had insightful moderation effects on the model relationships. Purposeful sampling can be employed by future researchers so as to eliminate this unfairness.

Lastly, we limited our sampling frame to only those health workers using EMRS in HIV care settings. It would be interesting to expand this scope in future so as to see how the model responds in settings where HCWs are yet to adopt use of EMRs.
5.4 Conclusion
The results indicate that multiple user-related, institutional, social and behavioral factors were the critical determinants of successful EMR use. The study confirms that UTAUT model is applicable in this context but not all the factors currently included in UTAUT explain use of HIS in Kenya. This results also tend to agree with Karuri et al. (2017) that that the strength of factors that determine acceptance and use of health IT varies across different health workers' categories. These findings therefore bring new insights to technology adoption that are new to previous works, hence a new contribution to the current body of knowledge.

These findings also provide germane information to consider for EMR adoption and use for HIV care. This is because EMR vendors and providers will utilize these findings to provide targeted services in addition to ensuring that enabling infrastructure exists that facilitate adoption and use of EMRs in HIV care settings. The findings will also inform site capacity assessment by donors and implementing partners so as to determine where to direct resources in ensuring that EMRs are used for HIV care. The study findings will also ensure that EMRs developed target HCWs with a certain specific need, hence the tendency by HCWs to only explore and adopt EMRs that help them accomplish certain tasks.
REFERENCES


Ekirapa, A. et al., 2013. Data Demand and Use in the Health Sector in Central and Eastern Kenya.


APPENDICES

Appendix A. Research Permit from SCI to NASCOP

UNIVERSITY OF NAIROBI
COLLEGE OF BIOLOGICAL AND PHYSICAL SCIENCES
SCHOOL OF COMPUTING AND INFORMATICS

Telephone: 4447870/4446543/4444919
Telegrams: “Varsity” Nairobi
Teletax: +254-20-4447870
director-sci@uonbi.ac.ke

Our Ref: UON/CBPS/SCI/PHD/CS/2017
11 September 2017

P. O. Box 30197
00100 GPO
Nairobi, Kenya

The Manager
Strategic Information Units
NASCOP

Dear Sir/Madam

RE: RESEARCH PERMIT – VINCENT ODARI AMULEGA REG NO. P56/7775/2014

The above named is a bona fide student pursuing an MSc. course in Information Systems at the
School of Computing and Informatics, University of Nairobi. He is currently carrying out his research
on the project entitled “Determinants of Electronic Medical Records Systems Adoption and
Use.”

The project involves gathering relevant information from various institutions and he has informed the
office that he would wish to carry his research in your organization.

We would be grateful if you could assist Mr. Amulenga as he gathers data for his research.
If you have any queries about the exercise please do not hesitate to contact us.

Yours sincerely,

DR. AGNÈS N. WAUSI
DIRECTOR
SCHOOL OF COMPUTING AND INFORMATICS
APPENDEX B. Research Permit from SCI to KNH-UON Ethical Research Committee.

 UNIVERSITY OF NAIROBI
 COLLEGE OF BIOLOGICAL AND PHYSICAL SCIENCES
 SCHOOL OF COMPUTING AND INFORMATICS

Our Ref: UON/CBPS/SCI/PHD/CS/2017

11 September 2017

The Secretary
Ethical Research Committee
KNH-UON

Dear Sir/Madam

RE: RESEARCH PERMIT – VINCENT ODARI AMULEGA, REG NO. P56/7775/2014

The above named is a bona fide student pursuing an MSc course in Information Systems at the School of Computing and Informatics, University of Nairobi. He is currently carrying out his research on the project entitled “Determinants of Electronic Medical Records Systems Adoption and Use.”

The project involves gathering relevant information from various institutions and he has informed the office that he would wish to carry his research in your organization.

We would be grateful if you could assist Mr. Amulenga as he gathers data for his research. If you have any queries about the exercise please do not hesitate to contact us.

Yours sincerely,

DR. AGNES N. WAUSI
DIRECTOR
SCHOOL OF COMPUTING AND INFORMATICS
APPENDIX C. Survey Participants Informed Consent

Consent for participation in a study to assess the determinants of Use of Electronic Medical Records Systems (EMRS) for delivery of HIV care in Kenya.

Why are you being given this form?

We are giving you this form so that you can learn more about the study. We will be happy to answer all questions you may have. Once you have understood the explanation we have given to you, you can decide if you wish to participate in the study.

Who is doing this study?

My name is Vincent Odari Amulega. I am a Masters student of information Systems undertaking this research study under the supervision of Professor Peter Waiganjo Wagacha and Dr. Daniel Orwa Ochieng at the School of Computing and Informatics, University of Nairobi, and Dr. Joyce Njeri Wamicwe of National Aids and STI control program (NASCOP).

What is the purpose of this study?

The purpose of the study is to evaluate the determinants of use of EMRS by healthcare workers in the public and faith-based hospitals of sector of Kenya to deliver HIV care. The information obtained from the study will be used to provide practical suggestions to policy makers, system developers and implementers on interventions that can lead to more successful HIS deployment for HIV care in Kenya.

What happens in this study?

We will visit 25 public and faith-based health care facilities with EMRS installed at HIV prevention and care service points, which have been randomly selected from 5 counties in Kenya. At these facilities we will randomly select ten Health care workers and request them to take a few minutes to complete the attached self-administered questionnaire. As one of the targeted respondents, we are inviting your voluntary participation in the survey.
We emphasize that this data collection exercise is not part of any regular HMT supervisory visits or MoH audits. Individual’s performance will not be judged and survey results will be used only for study purposes.

Risks and discomforts:

There is no known risk and discomfort associated with the study. When completing the survey questionnaire, you may seek any further clarifications from the person administering the survey.

What are the benefits to being in this study?

You will receive no direct benefit from your participation in this study. However, your participation will help the investigators to better understand the determinants of technology acceptance in Kenya’s public and faith-based health sector, and hence to provide practical suggestions to systems implementers and policy makers on interventions that will lead to more successful EMRS deployment in Kenya.

What are the possible costs to participating?

There are no costs to you for participating in this study.

Confidentiality:

The data collected from the study will be used for the purpose of the study only. Your name and responses will not be made public by the study team. The results of the study may be published in scientific conferences and journals, but your names will not be included in any of publications.

Compensation for Research Related Injury:

This research is non-intrusive and hence no research related injuries are anticipated.

Your rights to participate, not participate, or to withdraw from the study

Taking part in this study is voluntary. You have the right to refuse to take part in this study. If you agree to participate in the study but then change your mind you may withdraw from the study at any time. If there are any new findings during the study that may affect whether you want to continue to take part, you will be told about them as soon as possible.
APPENDIX D. Informed Consent Form

I (full name of health worker) have read the above information / the above information has been explained to me by (full name of person taking consent) and I have fully understood the information. I have had opportunity to ask questions, and all my questions have been answered to my satisfaction. I understand that I may at any time during the study revoke my consent without any loss or penalty. I consent to be enrolled in the study.

Signature (Health worker)

Name (Health worker)

Person administering the consent

Signature... Name (Print)...

If you require any further clarifications, please contact persons below:

1. Vincent Amulega
   Contact phone: +254 706 621682
   Email: vamulega2015@gmail.com

2. The Secretary, KNH-UON ERC,
   P.O. BOX 20723-00202 Nairobi.
   Email: erc@uonbi.ac.ke
APPENDIX E. Confidentiality Agreement Form (Research Assistants)

I.............................................................................. ID No.................................. agree that as a participant in execution of this research exercise, I will ensure that all information captured and handled in whatever form in the process of carrying out this research exercise will be kept confidential and will not at any point in time; during and/or after the research exercise be disclosed to any other person or used for any other purpose other than the intended research.

By signing this confidentiality agreement form, I agree to be held responsible for any breach of confidentiality.

Signature.................................................................

Date........................................................................
APPENDIX F. Survey Instrument

QUESTIONNAIRE NUMBER □ COUNTY_______________________________

Determinants of Use of Electronic Medical Records systems (EMRS) to Deliver HIV Care in Kenya

The Purpose of this study is to determine factors influencing use of EMRS to deliver HIV Care in Kenya. EMRS are considered integral for the delivery of patient care. Completing this survey will help us identify specific components that are contributing to resistance of EMRS by HCWS hence suggest interventions to counter them as well as contribute to EMRS implementation guidelines.

All questions contained in this survey are strictly confidential

SECTION A DEMOGRAPHIC INFORMATION (Tick/ Indicate Appropriately)

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<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1. Hospital Name:</td>
<td>________________________________</td>
</tr>
<tr>
<td>2. Hospital Locality: Rural □ Urban □</td>
<td></td>
</tr>
<tr>
<td>3. Hospital Type: GOK Facility □ Faith Based Facility □</td>
<td></td>
</tr>
<tr>
<td>4. Department: Lab □ Pharmacy □ CCC □ Health Records □</td>
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<tr>
<td>□Others Specify ________________________________</td>
<td></td>
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<tr>
<td>□ Others Specify ________________________________</td>
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<tr>
<td>6. Gender: Male □ Female □</td>
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<tr>
<td>7. Age: ______</td>
<td></td>
</tr>
<tr>
<td>8. Highest Level of Academic Qualification:</td>
<td></td>
</tr>
<tr>
<td>Certificate □ Diploma □ Graduate □ Post Graduate □</td>
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<tr>
<td>9. How many Years have you used EMRS (tick appropriately):</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>&lt; 1 year</td>
</tr>
<tr>
<td>□</td>
<td></td>
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<tr>
<td>If none above specify why? ________________________________</td>
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</table>
SECTION B: EMR ASSESSMENT

1. Do you have an EMR installed in your facility for HIV care? Yes □ No □

2. If Yes, please state which one(s): (IQ-care, Kenya EMR, etc.) _____________

3. Is the EMR in use? Yes □ No □

4. If 3 above is YES is data entry real-time (i.e. paperless site) Yes □ No □

5. If 4 is No specify why? ________________________________

6. If 3 is No, please state why? (E.g. no electricity, computer breakdown etc.) ________________________________

   Don’t Know □

SECTION D:

Please indicate your level of agreement with the following statements by ticking the appropriate box:

Key: Disagree (1); Disagree Somewhat (2); Neutral (3); Agree Somewhat (4); Agree (5)

1. PERFORMANCE EXPECTANCY (PE)

<table>
<thead>
<tr>
<th>NO.</th>
<th>STATEMENT</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<th>5</th>
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</thead>
<tbody>
<tr>
<td>PE1</td>
<td>Overall, I find EMRS useful to my tasks</td>
<td></td>
<td></td>
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<tr>
<td>PE2</td>
<td>Using EMRS enable me to accomplish tasks more quickly than would be otherwise be possible</td>
<td></td>
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<tr>
<td>PE3</td>
<td>Using EMRS increases my productivity</td>
<td></td>
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<tr>
<td>PE4</td>
<td>Using EMRS will allow me to make work related decisions based on better evidence</td>
<td></td>
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### 2. EFFORT EXPECTANCY

<table>
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<th>NO.</th>
<th>STATEMENT</th>
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<tbody>
<tr>
<td>EE1</td>
<td>My interaction with EMRS is clear &amp; Understandable</td>
<td></td>
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<tr>
<td>EE2</td>
<td>It is easy for me to become skillful at using EMRS</td>
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<tr>
<td>EE3</td>
<td>Overall, I find EMRS easy to use</td>
<td></td>
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<tr>
<td>EE4</td>
<td>Learning to operate EMRS is easy for me</td>
<td></td>
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<tr>
<td>EE5</td>
<td>EMRS is user friendly</td>
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### 3. SOCIAL INFLUENCE

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</thead>
<tbody>
<tr>
<td>SI1</td>
<td>People who influence my behavior think that I should use EMRS</td>
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<tr>
<td>SI2</td>
<td>People who are important to me think that I should use EMRS</td>
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<tr>
<td>SI3</td>
<td>The senior Management of this Hospital has encouraged me to use EMRS</td>
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<tr>
<td>SI4</td>
<td>My peers have encouraged me to use EMR</td>
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### 4. FACILITATING CONDITIONS

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<tr>
<th>NO.</th>
<th>STATEMENT</th>
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</thead>
<tbody>
<tr>
<td>FC1</td>
<td>I have the resources (computers, antivirus, electricity, user manuals etc.) necessary to use EMRS</td>
<td></td>
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<td>FC2</td>
<td>I have the knowledge and skills necessary to use EMRS</td>
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<td>FC3</td>
<td>EMRS is compatible with other systems I use at work</td>
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<td>FC4</td>
<td>EMR experts are available for assistance with EMRS difficulties.</td>
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### 5. BEHAVIORAL INTENTION (BI)

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<tr>
<th>NO.</th>
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<tbody>
<tr>
<td>BI1</td>
<td>I intend to continue using EMRS</td>
<td></td>
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<tr>
<td>BI2</td>
<td>I will always use EMRS</td>
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</table>

**CONTACTS**

Vincent Odari Amulega  
C/o School of Computing and Informatics, University of Nairobi,  
P.O. Box 30197 – 00100 Nairobi. Cellphone Number: 0706621682  
Email: vamulega@uonbi.ac.ke or vamulega2015@gmail.com

Your participation in this study is highly appreciated.  
Thank you.
APPENDIX G: UoN – KNH Research Permit