ADDIS ABABA UNIVERSITY POST GRATUATE STUDIES SCHOOL OF PUBLIC HEALTH AND INFORMATION SCIENCE

DEPARTEMNET OF HEALTH INFORMATICS

ADOPTION OF ELECTRONIC MEDICAL RECORDS AMONG HEALTH PROFESSIONALS AT PUBLIC HOSPITALS IN ADDIS ABABA CITY ADMINISTRATION HEALTH BUREAU, ETHIOPIA

BY

SEMERE GEBREMARIAM BARAKI (BSc.N, MSc)

A THESIS SUBMITTED TO SCHOOL OF GRATUATE STUDIES OF ADDIS ABABA UNIVERSITY IN PARTIAL FUFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTERS OF SCIENCE IN HEALTH INFORMATICS.

ADDIS ABABA, ETHIOPIA

December, 2012

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DECLARATION

I, the undersigned, declare that this thesis is my own original work, has never been presented in this or other university and that all resources and materials for this thesis have been properly acknowledged.

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This has been submitted for examination with my approval as a university advisor.

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AKNOWLEGDEMENT

I, first of all give praise to Almighty God and His mother St. VERGIN MARY who help me throughout my life. I would like to extend my heartfelt thanks to my advisors:Dr. Negussie Deyassa and Ato Workshet Lamenew for their unreserved guidance and enriching a constructive comments and suggestions while doing this study. I also deeply express my gratitude to Dr Mitike Molla for her genuine help during the data management and analysis.

I would like to thanks to Addis Ababa university academic staffs and the library worker for their contributions. I thank the Addis Ababa City Administration health Bureau and the selected hospitals in which this study was carried out.

I am also very grateful and would like to extend my heartfelt thanks and appreciation to all health professionals who took part in this study and the data collectors and the staff at the institutions involved for their full participation, responsible data collection and support.
Finally I would like to thank my family for their support during the two years period

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ACRONYMS

CEO	Chief executive officer
CCHIT	Certification Commission for Health Information Technology
CDO	Care delivery organization
EHR	Electronic Health Records
EMR	Electronic Medical Record
FMOH	Federal Ministry of Health
GP	General Practitioner
HMIS	Health Management Information System
MRD	Medical Record Data Clerk
IT	Information Technology
OPD	Outpatient Department
RIRB	Research Ethical-reviewing Board
TAM	Technology Acceptance Model
TPB	Theory of planned behavior
USA	United State of America
UTAUT	Unified Theory of Acceptance and Use Of Technology
WHO	World Health Organization

ABSTRACTS

INTRODUCTION: *Wellness and health are central to live of all people of age group. Incorporating information communication like Electronic Medical Records on the health care industries is mandatory for the better improvement of patient care and safety, integrated research, for effective planning, monitoring and evaluation of disease etc. Electronic Medical Record implementation in public hospitals in Addis Ababa is on the infant stage not more than three years since its inception. Even though There is discrepancy in adoption among health professionals and is not utilized as needed due to different factors ,most of the public hospitals have implemented it. So identifying the factors which affect the adoption will help to apply proactive measure and correction so as to increase the adoption of EMR among health professionals whom are working at the public hospitals.*

OBJECTIVE: *This study aimed at identifying the factors that affect the Behavioral Intention and usage behavior of Electronic Medical Record and determine the utilization status among health professionals working in public hospital in Addis Ababa City Administration health Bureau.*

METHOD*: A Cross-sectional survey was carried out among health professionals working at public hospitals in Addis Ababa using modified theory of unified acceptance and use of technology (UTAUT) model. Four hundred eight health professionals who had training on EMR were interviewed at the five public hospitals.*

RESULTS: *The utilization of EMR among health professions working at the public hospitals was 51.7%. Performance expectancy, Effort expectancy, social influence were factors influencing the behavioral intention of health professionals to adopt EMR and Behavioral intention was also significant influencing factor on actual usage behavior. Facilitating condition remains insignificant on the actual usage behavior of EMR among health professionals.*

CONCLUSION AND RECOMMENDATION: *The utilization rate of EMR was 51.7%: Having no experience, misunderstanding on the relative advantage, perceiving complexity of the system, inadequate support of the top managers, low behavioral intent were factors associated with the behavioral intention and actual usage of EMR. This study indicates that the necessity of integrating health management information system with the daily health care activities and development of health information policy that can scale the utilization rate.*

CHAPTER ONE: INTRODUCTION

Wellness and healthcare are central to the lives of all people, young or old, healthy or ill, rich or poor. The use of information technology has been already contributing in significant ways to enhancing healthcare delivery and to improving the quality of life. However, deployments of information technology have only scratched the surface of possibilities for the potential influence of computer and information science and engineering on the quality and cost-effectiveness of healthcare.

The medical record must tell the story of the patient as determined by the physician in the circumstances in which he or she saw the patient. The components that are necessary to tell the story are set out in detail below. The record is not just a personal memory aid for the individual physician who creates it. It must allow other health care providers to read quickly and understand the patient's past and current health concerns [1].

Electronic Medical Record (EMR): An application environment composed of the clinical data repository, clinical decision support, controlled medical vocabulary, order entry, computerized provider order entry, pharmacy, and clinical documentation applications. This environment supports the patient's electronic medical record across in-patient and out-patient environments, and is used by healthcare practitioners to document, monitor, and manage health care delivery within a care delivery organization (CDO). The data in the EMR is the legal record of what happened to the patient during their encounter at the CDO and is owned by the CDO [2].

A medical record is a confidential record that is kept for each patient by a healthcare professional or organization. It contains the patient's personal details (such as name, address, date of birth), a summary of the patient's medical history, and documentation of each event, including symptoms, diagnosis, treatment and outcome. Relevant documents and correspondence are also included. Traditionally, each healthcare provider involved in a patient's care has kept an independent record, usually paper based. The main purpose of the medical record is to provide a summary of a person's contact with a healthcare provider and treatment provided to ensure appropriate health care [3].

1.1. Statement of the problem

In the past, the way a doctor obtained the health history was by asking patient. Each time you visited a new doctor's office, you filled out forms about your history, including previous surgeries, or the drugs you take on a regular basis However, when doctors share records electronically, your new doctor only needs to ask your name, birth date, and possibly another piece of identifying information. Diagnosis and treatment decisions might be altered based on that information, which is far more complete than what you might have written down on paper. Money is saved by using electronic medical records; not just the cost of paper and file folders, but the cost of labor and space, too [4].

EMR implementations still face daunting odds. Close to 50% of implementations fail in US and Canada, causing significant financial losses, lost opportunities for improved patient care and significant distress for implementers, clinicians and senior managers. Many authors have tried to dissect factors that lead to successful EMR implementations. However, most frameworks described in the literature don’t explain all the factors that are observable in reading descriptions of primary implementations [5].

In a study done in Alabama, the individual characteristics of age and years of practice were the only two variables that were predictive of EMR use. Unfortunately, age and years of practice are two variables that cannot be changed. This investigation showed that younger physicians use EMR more often than older physicians, which is probably attributed to younger physicians receiving EMR training during medical school and their residency[6].

According a study done in Jordan, there are three underlying main barriers to EMR implementation and those are: challenges faced with new technology, training and supports of organizational leader ship, and increase time and cost [7].

Information technology is the most serious obstacle facing health professionals in Africa. Education and information have long been vital tools for promoting health controlling disease, raising the quality of life in communities and families. In the developing world, ICT are used to promote better health behavior, to improve decision making, to promote information exchange among peers, for self care & professional Support, and to enhance the effectiveness of health institutions. Innovations such as electronic medical records &community information system have altered cost, accessibility &delivery of health care [8].

Even though there is no research done related to EMR adoption in Addis Ababa, from my point of observation the hospitals are not fully adopting the system. In addition to, this hospitals are at different levels in the adoption of EMR system. When we see the health professionals working in those hospitals are also different in using the system. So, adoption of EMR by health professional is essential condition to ensure that its expected benefits will be materialized. However, there is a gap in knowledge regarding the influence of factors in determining EMR adoption. The benefit of this study is thus to assess the factors affecting the behavioral intension to use the and actual usage behavior of electronic medical records.

1.2. Literature Review

1.2.1 Adoption of electronic medical records in hospitals

For most hospitals in US, implementing electronic medical records is a tough hill to climb. Electronic medical records strategies represent a huge IT infrastructure effort, and the meaning full use act now raises the stakes even higher hospital leaders and health care IT teams. To surmount the challenges that come with EMR journey, health care executives can learn a great deal from peers who are further a long on the journey. Their insights and recommendations can vastly improve once chance of success [9].

Based on a study done in Dublin in 2010, 87% of doctors and 90% of nurses who responded, supported the introduction of an ICEHR system, and the majority indicated patient care and patient safety as the reasons for their support. A clear majority of respondents taken as a whole believed that there would be improvements in ability to make patient care decisions (92%), reduction in repetition of questions to patients (90%), enhanced timeliness of service provision (92%)and improved patient safety (96%) as a result of electronically sharing more detailed patient clinical information[10].

One major obstacle in e-healthcare adoption, either in developed or developing countries is privacy, confidentiality and security of e-healthcare information systems. The American government, for instance, for the year 2009 reserved $ 19 billion for stimulating e-healthcare adoption. However, despite this huge investment, e-healthcare adoption in the USA is still stumbling. Its users such as physicians are not sure about the security of e-healthcare information systems and hence resisting their deployment and use. Additionally, patients are also concerned about the privacy of their medical records. This has been influenced by a number of existing cases involving breaches in e-healthcare information systems. However, they argue that e-healthcare adoption is not a monetary problem per se. It goes beyond, to involve human trust. Therefore, despite focusing on securing funds for e-healthcare deployment, developing countries have to consider the human element as well [11].

1.2.2 Benefits of EMR

The EMR is an enabling technology for physician practices to pursue quality improvement in potentially powerful ways. Research finds that systematic quality improvement using EMRs is neither low cost nor easy. There is no simple solution to accelerating EMR adoption and use for quality improvement. Given the multi-faceted nature of the barriers, a range of policy interventions is needed to spur successful EMR-driven quality improvement.

These policy interventions center on improving data exchange among health care entities, providing financial rewards for quality improvement, and providing work/practice support. This package of policy interventions, in combination with ongoing trends, should hasten adoption of EMRs and their use for quality improvement in ambulatory care [12].

Computers are increasingly used by emergency medical service around the world. Electronically gathered data on the scene can be transmitted to the receiving hospital, which can then make necessary arrangement to receive the patient with the appropriate time. The development and use of new computer system provides the opportunity for very efficient system for quality improvement [13].

When it comes to electronic medical records (EMR) systems, there are literally hundreds of products on the market. Choosing one among them can be an overwhelming task unless you establish a well-defined, comprehensive process for comparing products. Unfortunately, most physicians looking EMR systems have only a vague idea of how to go about identifying the system that best meets their needs. Too many physicians make the classic mistake of beginning with a product demonstration and following up with a site visit [14].

EMR systems must address the following 6 key functional areas:

I. Basic demographic and clinical health information

II. Clinical decision support

III. Order entry and prescribing

IV. Health information and reporting

V. Security and confidentiality and exchange of electronic information

Certainly the future development of EMRs and EHRs will be entwined, and the key driver for the participation in an EHR will be the successful implementation of an EMR.

The forces shaping the direction of EMR/EHR developments are indeed powerful. The Certification Commission for Health Information Technology (CCHIT) EMR certification process is redefining the marketplace as healthcare information technology vendors adapt their products to achieve certification and remain competitive. Additionally, proposed changes in the healthcare regulatory environment, such as the modification of stark and anti-kickback laws and the promotion of electronic prescribing will have the effect of increasing physician participation and moving healthcare toward the realization of a national HER [15].

In a study done in Netherland which includes twenty-two articles that have considered barriers to EMR acceptance which are perceived by physicians are classified at eight main categories of barriers, including a total of 31 sub-categories, were identified.

These eight categories are: Financial, Technical, Time, Psychological, Social, Legal, Organizational, and change Process. All these categories are interrelated with each other. In particular, Categories Organizational and Change Process seem to be mediating factors on other barriers. By adopting a change management perspective, we develop some barrier-related interventions that could overcome the identified barriers [16].

1.2.3 ICT acceptance and use model

Computer and information technology have been widely used in different sectors and researches on information technology also common related to the acceptance and its' usage. Several models have been developed to explain users' acceptance and usage. Psychology, sociology, and information system are the origin or sources of those modes. There are different theories of technology acceptance and use model**.** These are the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Motivation Model (MM), the Theory of Planned Behavior (TPB), the Combined TAM and TPB (c-TAM-TPB), the Model of PC Utilization (MPCU), Innovation Diffusion Theory social cognitive theory [17].

As part of third phase of Ethiopia's health sector development program initiated in 2005, HMIS is a recent approach. For four years, Ethiopians" FMOH has been working with all stakeholders to shape the architecture of its HMIS M&E structure. Time is needed to finalize the strategy and allocate adequate resources, both human and financial. It will come as no surprise that human resources may not be fully allocated, thus partly providing an explanation for some complaints about scarce human resource for the HMIS[18].

I. Diffusion of Innovations

Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. Diffusion is a special type of communication concerned with the spread of messages that are perceived as new ideas. An innovation, simply put, is “an idea perceived as new by the individual. There are five categories of adopter based on the degree of innovativeness which are innovators, early adopters, early majority, late majority and laggards. IDT also presume five innovation characteristics that affect the diffusion: relative advantage, compatibility, complexity trial ability and observability. Many studies have done related to ICT adoption using the DOI model [19].

According to DOI model, there are three sources influencing the adoption of an innovation namely: characteristics of the adopter, perception of innovation characteristics and contextual factors [20].The main problem of diffusion of innovation is that it lacks of the specificity because diffusion of innovation does not provide information how to assess innovation characteristics [21]**.**

II. Theory of Planned Behavior and Reasoned Action.

TPB posits that individual behavior is driven by behavioral intentions where behavioral intentions are a function of an individual's attitude toward the behavior, the subjective norms surrounding the performance of the behavior, and the individual's perception of the ease with which the behavior can be performed (behavioral control).

Attitude toward the behavior is defined as the individual's positive or negative feelings about performing a behavior. Subjective norm is defined as an individual's perception of whether people important to the individual think the behavior should be performed.

Behavioral control is defined as one's perception of the difficulty of performing a behavior. TPB views the control that people have over their behavior as lying on a continuum from behaviors that are easily performed to those requiring considerable effort, resources, etc [22.].

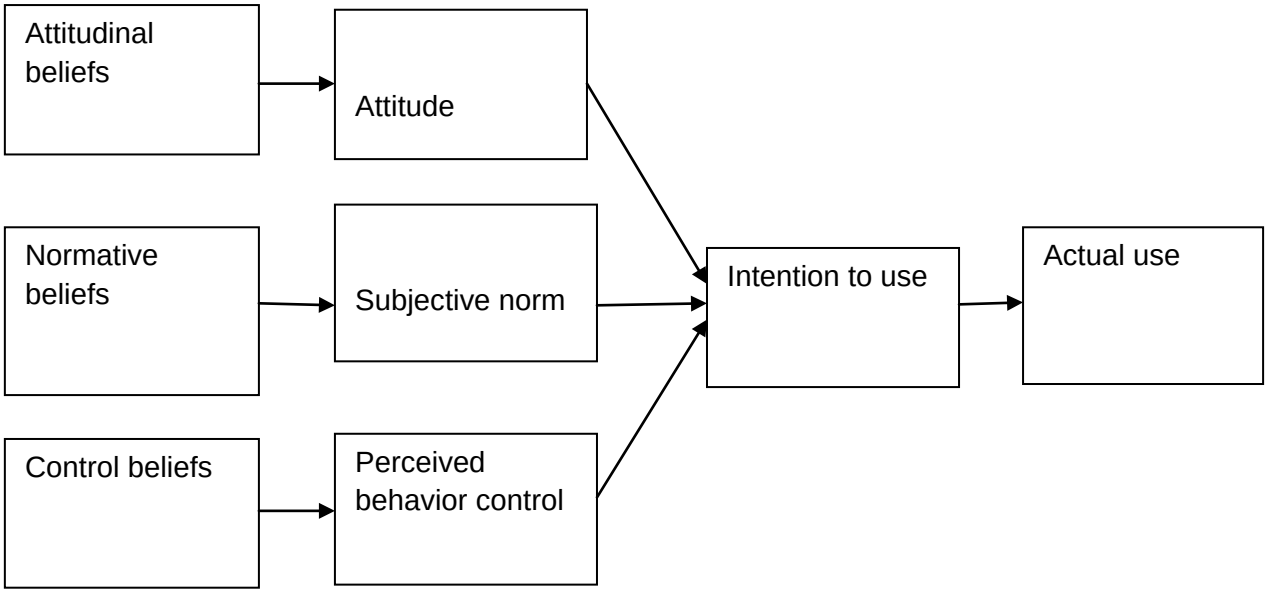

Figure 1: Theory of Planned Behavior

Making the transition to an EMR requires individual behavior changes that many organizations do not take the time to address. The most common reasons employees resist change are concerns about learning something new, concerns about their ability to adapt to a new system, and fear that the EMR requires more effort than the old system. Some individuals have a low tolerance for change, even when they agree with the concept. Senior executives—including, whenever possible, the CEO—must be involved to demonstrate their own commitment and seriousness to keeping the EMR transition moving forward. Senior management must also be able to educate employees on what the EMR means to the organization in terms of better patient care, efficiency, competitiveness in the market, and compliance [23].

III. Technology Acceptance Model

TAM is an adaptation of the Theory of Reasoned Action (TRA) to the field of IS. TAM posits that perceived usefulness and perceived ease of use determine an individual's intention to use a system with intention to use serving as a mediator of actual system use.

Perceived usefulness is also seen as being directly impacted by perceived ease of use.TRA and TAM, both of which have strong behavioral elements, assume that when someone forms an intention to act, that they will be free to act without limitation. In practice constraints such as limited ability, time, environmental or organizational limits, and unconscious habits will limit the freedom to act [24, 25]

The technology acceptance model has limitation because it does not include the social environments in which the technology is launched [26].

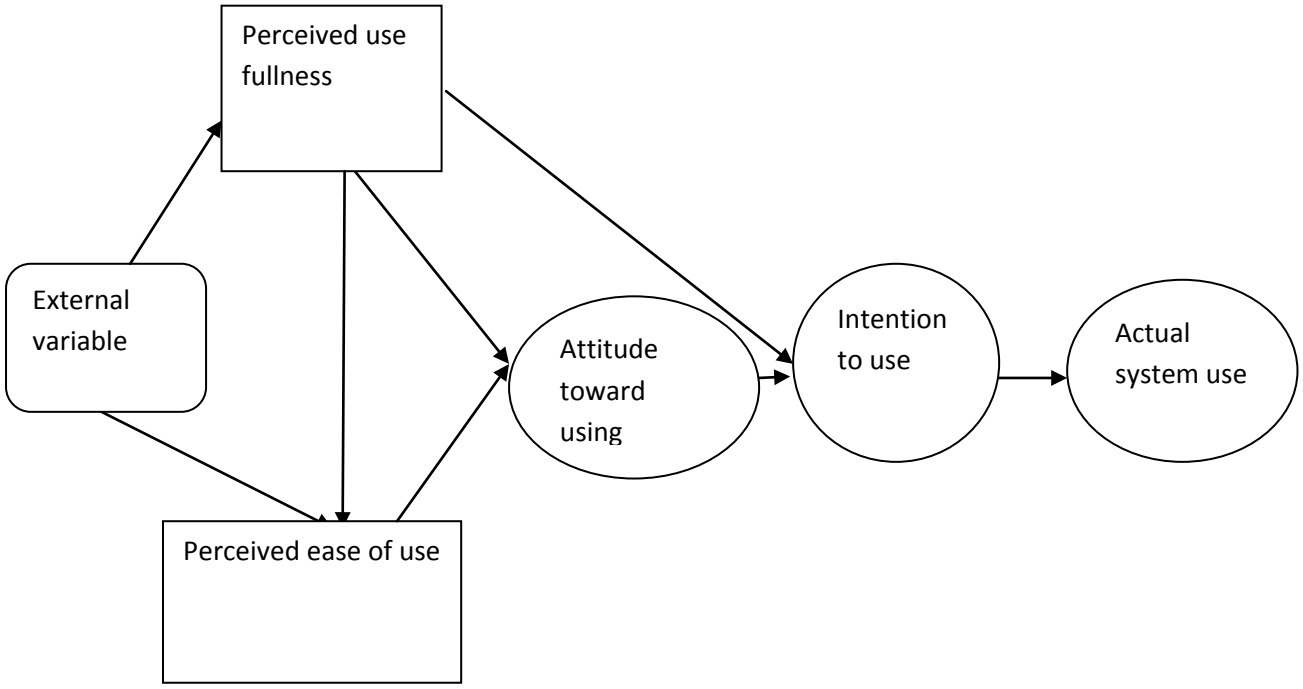

Figure 2: Technology Acceptance Model

In a study done in USA to predict consumer acceptance of e-commerce, technology acceptance model (TAM) variables (perceived usefulness and ease of use) are posited as key drivers of e-commerce acceptance [27].

Given the complexity of the health care industry and its unique occupational dynamics, we feel that the TAM in and of itself may not be adequate for explaining technology acceptance as it applies to medical practitioners. Advocates of the theory of planned behavior (TPB) suggest that all behavior is motivated by individual decisions based on an individual's intention to perform that behavior. Intention to perform a behavior, in turn, is influenced by the individual's perceived control over the performance of that behavior, his or her attitude toward performing the behavior, and his or her perception of social norms.

The theory of planned behavior asserts that behavioral control reflects an individual's belief regarding the ease of performing or completing a task. Behavior control is similar to the technology acceptance model's perceived ease-of-use construct.

Indeed, the TAM was derived in part from the theory of planned behavior. However, the theory of planned behavior incorporates the individual's past experience as well as a sense of control into choosing a behavior [28].Therefore, a model combined TAM and TPB was conducted also by Taylor and Todd (1995). TPB indicate that behavior intention also affected by subjective norm (SN) and perceive behavior control (PBC). Subjective norm means peer or superior influence in their social group [29].

IV. Unified Theory of Acceptance and Use of Technology

UTAUT is a model that unifies eight prominent compelling IS acceptance and use model. It was developed in the western industrial developed countries country's especially in the business context. Subsequent validation of UTAUT in a longitudinal study was able to explain 70% of technology acceptance behavior and it contains four core determinants of the intention and usage, those are: performance expectancy, effort expectancy, social influence and facilitating condition**.** Performance expectancy is defined as the degree to which individuals believes that using IS will help him or her to attain gain in the job performance, Effort expectancy is defined as the ease of associated with the use of the system, organizational facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructures exists to support the system, whereas social influence is the degree to which an individual perceives that important others believe he or she should use the system. Age, experience, and voluntariness of use are posited to mediate the impact of the four key constructs on usage intention and behavior [17].

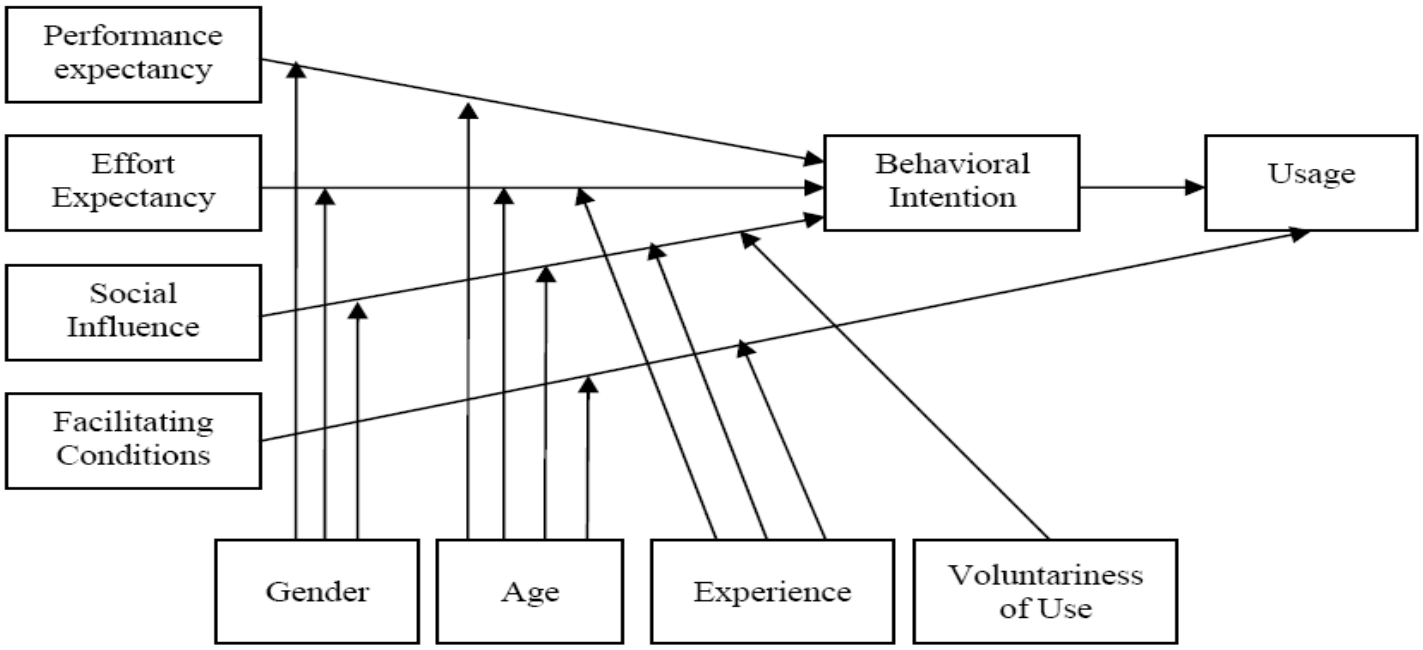

Figure .3 Unified Theory of Acceptance and Use of Technology [source 17]

1.2.4 Factors affecting technology acceptance and utilization

1. Performance expectancy**:** People's intention to use computer in the work place are influenced by their perception of how useful the computers are for their job performance and the degree of enjoyment experience during using the computer [30].In a research done related technology acceptance model, there is 40-60 % difference in usefulness perception towards usage intention and is significantly support the user's acceptance of the technology [31].

H1: Performance expectancy will have positive influence on health professionals' behavioral intention to use EMR system.

2. Effort expectancy: Effort expectancy and Performance expectancy have significant impact on physicians' intention to use clinical decision support system, and further influence their actual utilization behavior [32].Effort expectancy is similar with the ease of use associated with health IT or its concept is similar with perceived ease of use construct in TAM and IDT model. Ease of use and availability of the required technology are important factors in predicting doctor's intention to adopt the e-medicine [33]. Technologies that are perceived as user friendly will be more appealing to both patients and practitioners or if the technology is easy to use there will be an easy to obtain data, send data and generally utilization of the system can occur [34].

H2: ***Effort expectancy will be positively influence health professionals' behavioral intention to use EMR system***

3. Social influence: Social influence is defined as the degree to which an individual perceives that important others believe he or she should use the new system. Its root constructs include subjective norm, social factors and image. Subjective norm is defined as "the person's perception that most people who are important to him think he should or should not perform the behavior in question. Social factors are defined as "the individual's internalization of the reference group's subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations where as images defined as "the degree to which use of an innovation is perceived to enhance one's image or status in one's social system [17].

Social influence emphasizes the role of social influence in people's decisions to undertake certain behaviors. In other health care delivery contexts social factors have been found to predict acceptance of information technology. In a research done to understand information technology acceptance by individual professionals it was found that physicians' acceptance of a personal digital assistant, a handheld computer that was used to support clinical practice, was significantly affected by subjective norm [35].

H3: Social influence will positively affect the intensity of health professionals' behavioral intention to use EMR system.

4. Organizational facilitating condition : The degree to which an individual believes that an organizational and technical infrastructure exist to support the system. Facilitating condition are comprised three root constructs: perceived behavioral control, facilitating condition and compatibility [36].

H4: Organizational facilitating conditions will have a significant influence on health professionals' use behavior of EMR system.

5. Attitude to EMR: In a research done in Indonesia on midwifes, intention regarding use of EMR, it was found that there was a statistically significant association between attitudes to EMR software. Based on this research midwives who had positive attitude where about three times more likely to have intention to use EMR soft ware [37].

A research was done also at Taiwan related to physicians intention in adoption of electronic medical records and it was found that four variables (perceived usefulness, attitude, subjective norm, and computer self efficacy) significantly positively impact the intention to adopt EMR. Among those four variables attitude has the most significant positive impact on the adoption of intentions [38].

H5: Computer attitude will positively affect the intensity of health professionals' behavioral intention to use EMR system.

6. Perceived time risk: ICT acceptance and use among the academic staff of university was done a research at Malaysia. Here, even though using the ICT is mandatory, the level of adoption among the academic staff was found very low. This research indicates that time problem is the main barrier to use the system for the majority (38%) of the academic staff of the university [39]. A qualitative study was done in southwestern Ontario in order to explore the perceived barriers and facilitators of electronic medical record adoption in the family practice. Time emerged as underlining barrier because the participants indicated as there was not enough time available to reflect and apply their knowledge acquired through training for EMR usage [40].

H6.Perceived time risk negatively influence health professionals actual EMR usage.

7. Behavioral intention: Different studies have been done to examine health professionals' acceptance and usage of electronic medical records using UTATU model. Based on this, it was found that behavioral intension has significant influence on actual use of the system [41].

H7: Behavioral intention will have a significant positive influence on health professionals' actual EMR usage

1.2.5 Moderators of UTAUT

The moderators found on the original UTATU model are age, gender, experience, voluntariness. These all moderators are not included on this proposed research model. This is not due to oversight but it is due to the scope of the research. In addition to this voluntariness and experience is due to that health professionals who are working on the selected hospitals bare using the EMR under voluntary or they are not enforced to perform EMR system. When I look at the experience,since this research is cross-sectionals study this might not bring difference on the analysis of the result.

Experience is incorporated on UTATU original model because it is longitudinal study. Incentives and barriers that influence clinical computerization on Hong Kong was done from physicians' survey and it was not found significant difference based upon the gender, work experience or type of medical specialty [42].

A survey of clinical working groups was done to determine what futures of computer based on documentation might be improved on the next generation system, based on this study, there were no tests for age and gender difference based up on these characteristics[43].

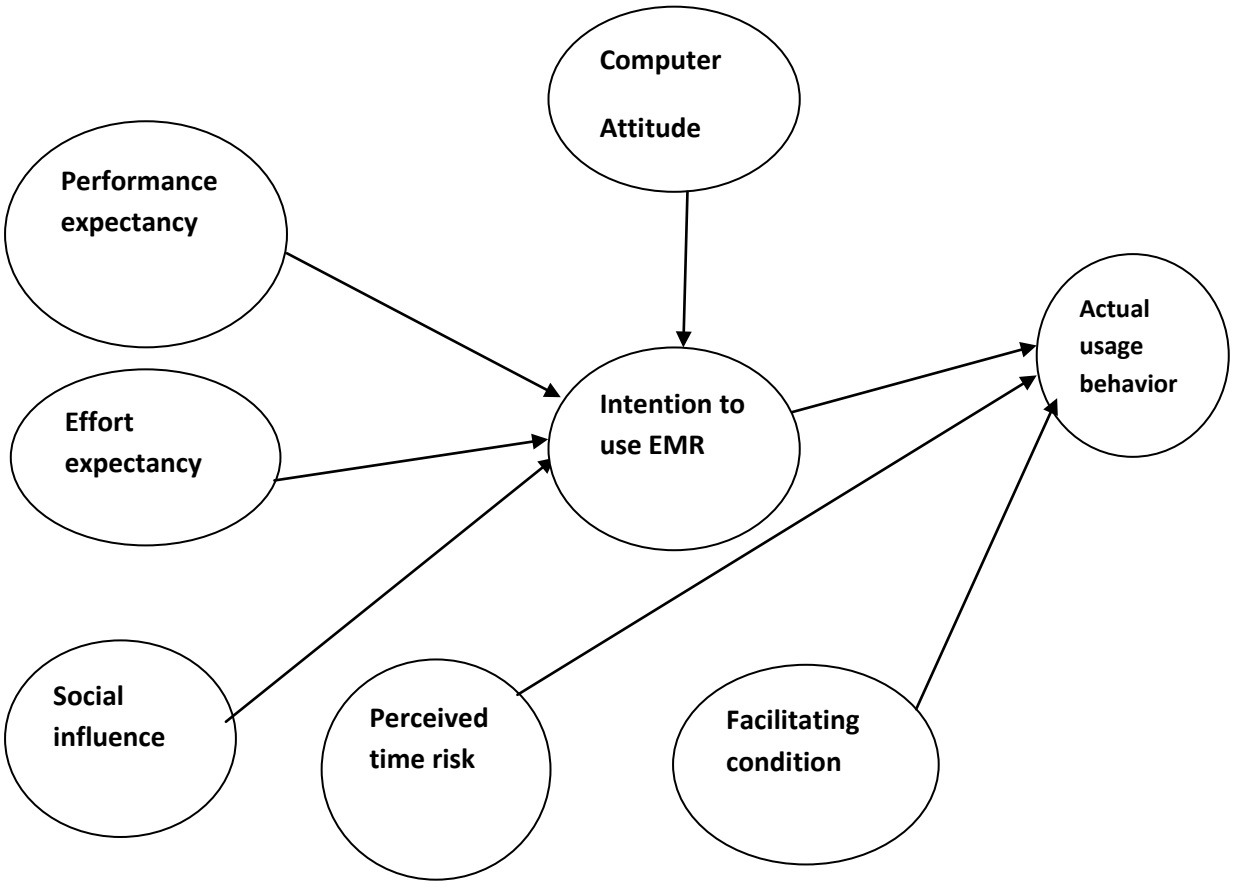

Figure 4: Proposed Research Model

1.2. Justification of the study

Health care industry lags in terms of information system adoption. EMR have great benefit to health care organization and the patient they serve. EMR has great potential to reduce medical error and improve over all the quality of care provided. But health care professionals are neither utilizing the EMR which is implemented at their hospital nor properly adopting on their daily activity due to different individual and organizational factor [44].

Challenges associated with adoption should be addressed in a manner that facilitate or hinder the adoption and behavioral intention to use EMR. Though few related study has been done on this area, little is known about the factors associated with the behavioral intention and usage behavior using modified UTAUT model, in my knowledge there is no any study done in Addis Ababa.

This study is believed to yield information on factors associated with the behavioral intention and usage behavior using modified UTAUT model such information enables program planners to know the degree adoption and associating factors and thereby they can plan tailored interventions. The information obtained from the study is also helpful for researchers who are interested to conduct further study on this area.

CHAPTER TWO: OBJECTIVES

2. Objective

2.1 General objective

To evaluate the factors influencing the acceptance and usage of electronic medical record System of among health professionals staffs working in public hospitals in Addis Ababa.

2.2 Specific objectives

- To Examine the level of health professional usage status the of electronic medical records system.
- To Determine the factors affecting behavioral intention to use of electronic medical record system by health professionals
- To Identify the factors that affect the actual usage behavior Among health professionals
- To Test the UTAUT at health care industry

CHAPTER THREE: METHODOLOGY

3.1 Study area

The city is located at 9.03 degree north and 38.74 East at an altitude of 2220-2800 meter above sea level. Almost all the Ethiopian ethnic groups are represented in Addis Ababa due to its position as capital of the country. The major ethnic groups represented are the Amhara (47.5%), Oromo (33.09%), Guragei (16.34%), and Tigre (1.8%), while others constitute 1.27% of the population (45). 74.7% of the populations are Orthodox Christians, 16.2% Muslims, 7.8% Protestants, 0.5% Catholics, while the remaining 0.8% is followers of other religions (e.g. Hindus, Jews, Bihai's, Agnostics, etc.). The population of Addis Ababa was 2,738,248 in 2007, of which 52.4% are females, and women between 15 and 49 years of age constitute 34.6%f the age composition population . Addis Ababa consists of 10 sub cities. The city administration has 5, 26 & 6 public hospitals, health centers and clinics respectively which provide different health services [45].

This study was conducted in all public hospitals under Ababa city administration health bureau namely, Yekatit 12 hospital, zewditu Memoral hospital, Menelik II referral hospital, Ras Desta memoral hospital hospital& Gandhi Memorial hospital. All the hospitals mentioned above are under the AACAHB. All those hospitals have implemented the electronic medical record on the same time and also they have the same type of soft-ware known as Smart care for the electronic medical record system. So the basic assumption is that there is no dependence or difference on the soft-ware system. More or less, the soft-ware is same in all the hospitals.

3.2 Study design and duration

A cross sectionals study design was carried out using quantitative method from june20 to June 30 to identify the factors affecting the adoption of EMR on public hospitals among health professionals at Addis Ababa city administration. Self-administered questionnaires were used to collect the required data from the participants.

3.2 Source population

The study populations are all health professionals employed in those public hospitals which are under Addis Ababa city administration health bureau (Menelik, Ganghi, Rasdesta, Yekatit 12, Zewiditu memorial hospitals. All those hospitals have the same type soft ware that is Smart care which is implemented by Tulane University in collaboration with Health bureau.

3.3 Study population

The source populations were the health professionals whom are working in public hospitals and those who have taken the computerized health information system training/ smart car training based up on the inclusive criteria

3.5 Study elements

3.5.1 Inclusive criteria: Health professionals working in those hospitals having implemented Electronic Medical Record system software above one year. The participants were included in the study unit if and only if they take the training on EMR system software known as Smart care. The five hospitals were selected and those health professionals was selected from those five hospitals. Specifically, the health professionals who take the training and appear at the date of data collection were included in the study elements.

3.5.2 Exclusive criteria: The new employees which join after the training has provided were excluded from the study unit.

3.6. Sample size Determination

Since there is no similar study on the prevalence of the use of electronic medical record, pilot study was undertaken among health professionals who adopt electronic medical records system in Gandhi memorial hospital, and the prevalence was found 57%. Assuming this survey, the sample size was estimated using open Epi with absolute precision of 5% and confidence level of 95%.

$$n = Z_{(\alpha/2)}^2 \frac{P(1-p)}{d^2}$$

n=number of study subject

Z (α/2) =1.96(critical value)

Precision (d) =0.05 , P=prevalence of electronic medical record usage

$$= (1.96)^2 x \frac{.57(1-.57)}{(.05)2}$$

=376 with 15% non response rate= 432. Therefore a total of 432 eligible health professionals were needed. This sample size was further divided b/n hospitals included based on proportion to population size.

3.7. Sampling procedure

List of all respective human resource profile of health professionals who are working in hospitals included in the study was retrieved from AACAHB to calculate the proportional allocation of sample size in each hospital as shown In the figure 5. The number of respondents was allocated to each hospital using probability proportional to size sampling technique. List of respective human resource profile of health professionals was retrieved from human resource management and development department of the selected hospitals and used as a sampling frame. SPSS version 16 soft ware was used for selection of health professionals using simple random sampling.

3.7.1 Sampling chart for the study.

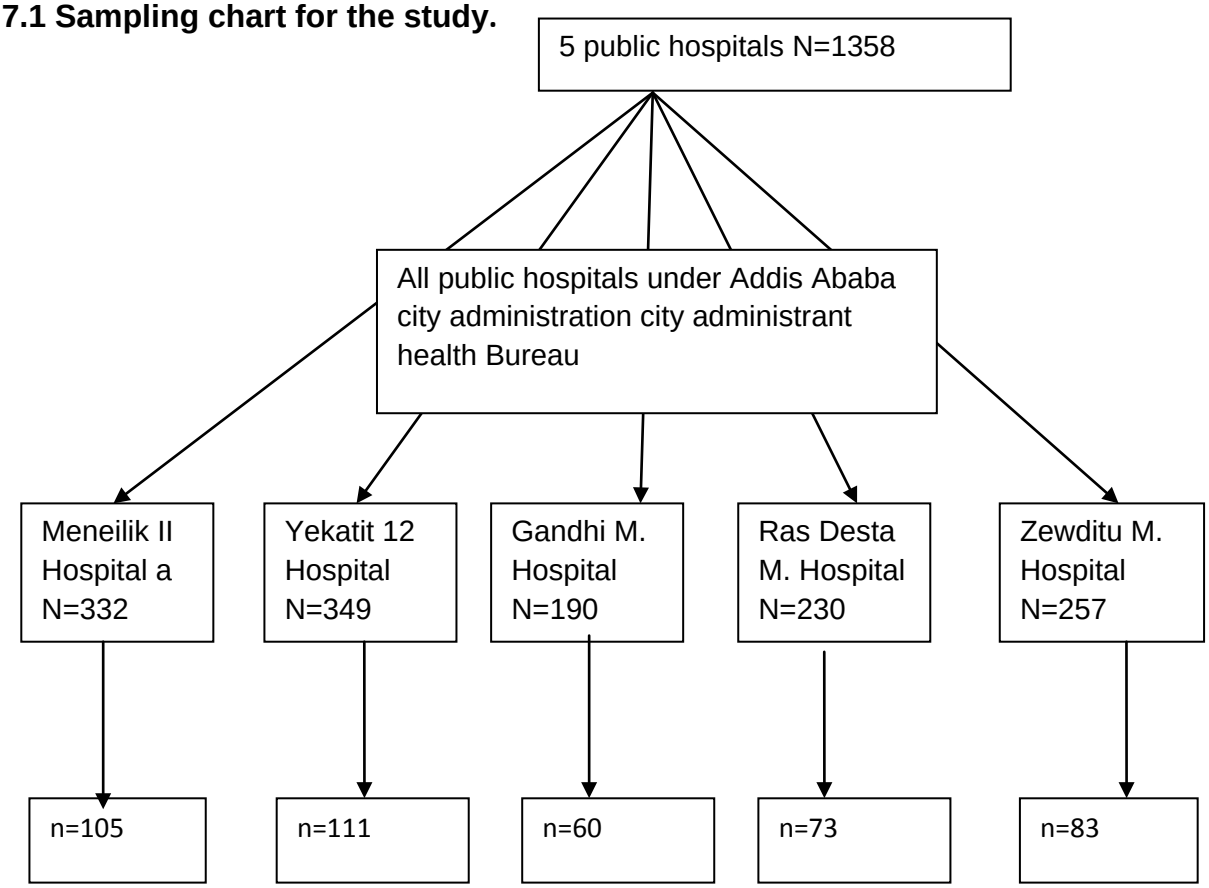

Figure 5: Schematic representation of sampling procedure among five hospital in Addis Ababa.

3.8. Data collection tools and procedure

Pre-tested structured self administered questionnaires were used to collect data from the study participant questionnaires were collected from different papers to keep quality of data and also pretest was conducted**.** After the study subjects identified from department, selected study subjects were gathered .Appropriate orientation and further explanation on some of the definitions of common terms, as well as on the purpose and usefulness of the study was explained. After getting verbal consent from the participants the anonymous questionnaire was provided to be completed seating arranged to assure privacy. After being filled, the questionnaire was confidentially returned by study subjects to specially arranged collection box near to their department. Seven data collection facilitators who had experience on coordination were selected and trained to be involved in the data collection process in order to assist the supervisor and principal investigator for the non-technical facilitation activities. The facilitators were trained for one day on how to manage the data collection process. The principal investigator also supervises the process to ensure that standard procedures are followed, check all completed questionnaires immediately and mistakes were picked up as early as possible.

3.9 Variables of the study

- **Independent Variable**
  - Health professionals Socio demographic characteristics
    - ✓ Age, Sex, Marital, status Work experience
    - ✓ Computer experience
    - ✓ Profession
    - ✓ Educational level
  - Performance expectancy (PE)
  - Effort expectancy (EE)
  - Social influence(SI)
  - Facilitating condition(FC)
  - Perceived time risk (PTR)
  - Computer Attitude (CA)
- **Dependent Variables**
  - Behavioral intention to use EMR
  - Statues of EMR usage ;

3.10 Operational definitions

Performance expectancy: The degrees to which individuals believe that using a system will help them improve their job performance.

Effort Expectancy: The degree of ease associated with the use of the system; effort expectancy is made up of: perceived ease of use, complexity and actual ease of use.

Social influence: The degree to which peers influence use of the system, be it positive or negative.

Facilitating condition: The degree to which an individual believes that an organizational and technical infrastructure exist to support the system.

Behavioral Intention to adopt: Intention is an immediate predictor of behavior towards an innovation.

Adoption Behavior: The actual use and associated behavior of the innovation.

Perceived time risk: the degree to which a person believes that he /she may lose time using a particular system

EMR is computerized legal medical record created by organizations delivering health care, Such as a clinics and hospitals. Electronic medical records tend to be a part of health Information system, allowing for the storage, retrieval and manipulation of records [46].

***E* Health: E-Health architecture** is the overall structure of the health information system, comprised of components such as electronic medical records systems, laboratory information systems, monitoring and evaluation systems, and other HIS components, the technologies upon which those components depend on, the data formats used to exchange information between the components, and the circumstances of that information exchange[47].

3.11. Data analysis procedure

After the data collection, data was checked for completeness and errors and then the data entered by Epi data version3., data was cleaned and analyzed using SPSS version 16 . Data was double entered by the principal investigator and experienced data clerk. Descriptive statistics such as frequency tables in the form cross tabulation was computed to determine prediction of adoption health professional towards the electronic medical records in the hospital and other variable. Five public regional hospitals which have implemented the EMR system were selected by considering their use on EMR system and organizational structure which are governed by AACAHB. The health professionals who are working on a system as the end users were selected using simple random sampling to fill the questionnaires.

A total of 431 questionnaires were distributed in June 20 up to June 25 of which 408 questionnaires were properly filed and returned. The data was analyzed using descriptive statistics, figures, tables, correlation coefficient and linear regression. Correlation coefficient was used to investigate the association between dependent and independent variables while linear regression was used to examine the strength of the model explaining the variation BI to adopt EMR.

3.11.1 Reliability and validity of the research

Using SPSS version 16 Crobach's alpha reliability coefficient were computed to determine the internal consistency of all research construct: Crobach's alpha of 0.7 or above indicates high reliability, between 0.5-0.7 indicates moderate reliability and less than 0.5 indicates low reliability[48,49]. Because each crobach's alpha was mostly above 0.7 for most constructs (table 1).

Table 1: Research reliability of measurement

Construct	N	Number of item	Crobach's alpha	Type
EE	408	4	0.888	High reliability
PE	408	3	0.813	High reliability
SI	408	4	0.736	High reliability
FC	408	4	0.848	High reliability
CA	408	4	0.871	High reliability
PTR	408	4	0.848	High reliability
BI	408	3	0.915	excellent reliability

Validity is used for measuring the relevance of tools content. The questionnaires were complied with the guidance of both current literature and advice of EMR practice experts, who helped to ensure questions content was clear and held high content validity. Analysis was used to measure construction validity, How ever first KMO(Kaiser-Meyer-Olkin, sampling relevance magnitude was performed in order to insure variables were suitable for factor analysis(table 2). A KMO value lower than 0.5 implies factor analysis may be inappropriate. Here, the KOM result of 0.871 is greater than 0.5 with suggests that the data is suitable for factor analysis(50).

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0 .871
Bartlett's Test of Sphericity	Approx. Chi-Square	5.814E3
	Df	325
	Sig.	.000

Factor analysis using principle component with varimax rotation was used to evaluate construct validity. All items loaded properly is the construct discemint validity loaded at least 0.40(51) and no cross loaded of at least than 0.40 and the factor analysis results satisfied analysis. The collected data and the findings were obtained from instrument are valid and reliable except the variables of computer attitude and perceived time risk.

3.12. Data quality assurance

To ensure the external validity (generalization) of the study, appropriate sample size and representative type of study units were selected, and to ensure the internal validity (accuracy and precision) of the study, appropriate study design, sampling, questionnaire development, data collection, and data entry and data analysis was applied to minimize bias and errors. The questionnaires were also pre tested and checked for its face validity by health care providers and other technical and higher official managers. Adequate training and orientation was provided to the facilitators and data collectors. The data was checked for completeness and supervised the actual data collection procedure daily by the principal investigation.

3.13 Ethical consideration

Prior to data collection, ethical clearance was obtained from school of public health and school of information science. The hospitals are governed under Addis Ababa city administration health bureau and ethical clearance was found from the ethical committee of the health bureau and support letter was written from it to each hospitals. In addition the concerned bodies in each hospital were informed about the study.

During the data collection each respond ant was informed about the purpose, expected outcomes of research and for this oral informed consent was taken from the respondent. Participation was under voluntary and participants may withdraw from the study at any stage/time without explanation and without penalty or loss of benefit.

The autonomy and privacy of each participant was assured unless they needed assistance in filling out the questionnaire. The name and other identifying numbers of the study subject was not included in the questionnaire. In such cases, confidentiality was assured and no personal identity was recorded or produced on any documentation related to the study.

3.14. Dissemination of result

After the study is completed, the result will be disseminated to Addis Ababa university, FMOH, AACAHB and other governmental and nongovernmental that organizations that potentially could benefit from the study outcome. The finding of the study will be published in relevant scientific and popular journals as appropriate.

CHAPTER FOUR: RESULTS

4.1 Socio-demographic characters

Of the total 432 health professionals who are working under the five hospitals who take the training of electronic medical records, 408 health professionals completed the interview making the response rate 94.44 %. Among the total of 408 respondents 98(24%) were from menelik II hospital, 106 (26%) from yekatit 12 hospital, 80(19.6%) from zewditu memorial hospital and 62(15.2) were from Gandhi hospital.

The age of the respondent ranged from 20-59 with mean of 31.82 years (SD=8.536). Based on this result the largest percentage of the respond ants were in the age group of 20-29 (52.7%) followed by the age group of 30-39 constituting around 28.2% of the total respondents. The age group of 40-49 consisted of 13.5 %, while the age group of 50-59 comprised of 5.6 of the total population.49 %(200) of the health professionals were married while the remaining51 %(208) were single. Relating the respondents gender 55.1 %(225) of the 408 usable responses were female while 44.9% the total respondents were males.

Out of the total 408 respondents, majority 217(53.2) were clinical nurses, 31(7.6%) were midwifery nurses, and the rest 32(7.8%) were the other health professionals like health officers, occupational health , psychotherapy, and environmental health professionals, dental etc. (table 3) regarding the work experience most of them 280(68.6) have less than 5 years ,81(19.9) are 6-15 year service while the remaining 47(11.5) of them have greater than or equal 15 years professional year service.

Of the total 408 respondents most of them 243(59.6%) are degree graduates , 142(34.8%) are diploma graduates and 23(5.6 %) are post graduates and specialist(table 3).

Table 3:socio-demographic characteristics of health professionals working at public hospitals in Addis Ababa, June 2012.(n=408)

Variable characteristics	Frequency	Percentage (%)
Name of hospital		
Menelik II hospital	98	24%
Yekatit 12 hospital	106	26%
Zewditu hospital	80	19.6%
Gandhi memorial hospital	62	15.2
Rasdesta Memorial hospital	62	15.2
Health professionals age a (M= 31.82 ; SD= 8.536)		
20-29years	215	52.7
30-39years	115	28.2
40-49 Years	55	13.5
50-59 Years	23	5.6
Educational status		
Diploma graduates	142	34.8
Degree graduates	243	59.6
Masters and specialist	23	5.6
Marital status		
Married	200	49.0
Single	208	51.0
Work experience		
Less than or equal 5	280	68.6
6_15	81	19.9
Greater than or equal 15	47	11.5
Gender		
Female	225	55.1
Male	183	44.9

Profession		
Clinical nurse	217	53.2
Midwifery nurse	31	7.6
Medical doctor	49	12.0
Laboratory	48	11.8
Pharmacy	31	7.6
Other**	32	7.8
Total	**408**	**100%**

Others **(radiology, dental, psychotherapy, health officers, occupational health, environmental health)

4.2. Computer experience

Based on the study, most of the health professionals 290 (71.1%) had responded they have basic computer applications, while the rest 118 (28.9) do not have basic computer experience. The respondents were asked if they have experience of exploring different web-site, e-mail and face book, patient medical information. Based on this finding 168 (41.2%) have experience of using e-mail and face book while 240 (58.8%) don't have this experience. 112 (27.5%) of the respondents explore different websites but the rest 229 (72.5 %) didn't explore websites. Regarding the patient medical information 206 (50.5%) have experience and 58 (14. 2%) have other experiences out of the above listed computer experiences (table 4).

Table 4: Frequency table on Computer experience of health professionals working at public hospitals in Addis Ababa, June , 2012. (n=408)

Computer experience categories		**Frequency**	**Percentage (%)**
Basic computer	yes	290	71.1
	No	118	28.9
Email& face book	yes	168	41.2
	No	240	58.5
Exploring website	yes	112	27.5
	No	296	72.5
Patient medical information	yes	206	50.5
	No	202	49.5
Others	yes	58	14.5
	No	350	85.5
Total		**408**	**100%**

4.3. Magnitude of electronic medical record adoption/ utilization

Out of the total respondents of 408, the 88.5% them tried the Electronic medical records, but the rest 47(11.5%) never tried the Electronic medical records at all (table 5).

Table. 5: Magnitude of health professionals who tried EMR voluntarily use of EMR of the respondent at Addis Ababa public hospitals June, 2012(n=408)

EMR usage voluntarily	Frequency	Percent (%)
Yes	361	88.5
No	47	11.5
Total	408	100.0

Based on this study, out of the total respondents 408 the around 21(51.7%) are current users and those are considered as the adopters/users. But 197 (48.3%) of the total are not using the electronic medical record (Table 6).

Table 6: Magnitude of health professionals who adopt electronic medical record at public Hospitals in Addis Ababa June, 2012(n=408)

EMR	**Current users/adopters**	Frequency	Percent (%)
	Yes	211	51.7
	No	197	48.3
	Total	408	100.0

Table 7:The Mean scores and standard Deviation of each item in the questionnaires related to the research model constructed among health professionals working at public hospitals in Addis Ababa June, 2012. (n=408)

Variable	Mean	Std. Deviation	N
EE1	3.82	.988	408
EE2	3.83	.978	408
EE3	3.77	1.087	408
EE4	3.87	1.009	408
PE1	3.91	.953	408
PE2	3.67	1.089	408
PE3	3.71	1.073	408
SI1	3.23	1.072	408
SI2	3.50	1.025	408
SI3	3.33	1.186	408
SI4	3 .63	1.087	408
PTR1	3.10	1.215	408
PTR2	2.92	1.202	408
PTR3	2.79	1.132	408
PTR4	2.62	1.093	408
CA1	3.87	1.053	408
CA2	3.77	1.028	408
CA3	4.01	.969	408
CA4	4.10	.975	408
FC1	3.37	1.199	408
FC2	3.63	1.071	408
FC3	3.03	1.141	408
FC4	3.47	1.099	408

Variable	Mean	Std. Deviation	N
BI1	3.48	1.036	407
BI2	3.58	1.008	408
BI3	3.59	1.054	408

4.4. The Association between Socio- demographic variables with actual usage behavior

Among the 211 who are the current users 45(21.5) where from Menelik II, with the same magnitude 45(21.5%) were also from Zewditu Hospital. Yekatit 12 and Gandhi Hospital have the same actual usage behavior which is 44(20.9%). Majority of the respondents 118(55.9) were female and 107(50.7) were single including divorced and widowed. Majority of the current users 115(54.5%) were degree graduates, 141(66.8) were nurses and most of the respondents have less than 5 year professional experience. In contrast to the age goop majority of the age group 119(56.4) were between 20-29.

In chi-square analysis the actual usage behavior was found to have relationship with the organization, educational level and professional qualifications. However sex, age, professional work experience and marital status were not found significant (table 8).

Table 8:**The association between socio- demographic variables and Actual usage behavior among of health professionals working at public hospitals in Addis Ababa June, 2012. (n=408)**

Hospital name	Electronic medical records usages		
	Yes=211	No=197	x^2 (p-value)
MenelikII hospital	45(21.3)	53(26.9)	**15.659(<0.05)****
Yekatit12 Hospital	44(20.9)	62(31.5)	
Zewditu Hospital	45(21.3)	35(17.8)	
Rasdesta hospital	33(15.6)	29(14.7)	
Gandhi hospital	44(20.9)	18(9.1)	
Sex of the respondent			0.107(0.744)
Female	118(55.9)	107(54.3)	
Male	93(44.1)	90(45.7)	
Marital status			0.013(0.010)
Married	104(49.3)	96(48.7)	
Single ***	107(50.7)	101(51.3)	
Educational level			**15.663(<0.001)****
Diploma	90(42.7)	52(26.4)	
Degree	115(54.5)	128(65.0)	
Masters and specialists	6(2.8)	197(8.6)	
Profession			**68.843(<0.001)****
Clinical nurse	141(66.8)	76(38.8)	
Midwifery nurse	24(11.4)	7(3.6)	
Medical doctor	10(4.7)	39(19.8)	
Laboratory	18(8.5)	30(15.2)	
Pharmacy	3(1.4)	28(14.2)	
Others ***	15(7.1)	17(8.6)	

Work experience			0.238(0.888)
<5year	146(69.2)	134(68.0)	
6-15	40(19.0)	41(20.8)	
>15	25(11.8)	22(11.2)	
Age in group			4.877(0.181)
20-29	119(56.4)	96(48.7)	
30-39	50(23.7)	65(33.0)	
40-49	31(14.7)	24(12.2)	
50-59	11(5.2)	12(6.1)	

Single ** (widowed, divorced, not married)

Others *** (Radiology, Dental, Psychotherapy, Physiotherapy, Health officer, Environmental health, Occupational health)

4.5. The Association between computer experience and the actual usage behavior.

Among the respondents 211 who support actual usage behavior of EMR 146(69.2%)had basic computer application, but 124(58.5%) did not have experience on using e-mail and face-book. 124(58.8%) had patient medical information experience and 157(74.7%) did not explore websites for different purposes and 27(12.8) of the respondents had other types of computer experience. In chi-square analysis the actual usage behavior was found to have relationship with patient medical information system, however basic computer experience, e-mail and face book experience, experiences on exploring websites and other experiences were not found significant.

Table 9: The association between computer experience and the actual usage behavior among health professionals in public hospitals of Addis Ababa June 2012(n=408)

Variables	**Electronic Medical Records usages**		**X2 (p-value)**
	Yes (N=211) Freq (%)	**No (N =197) Freq (%)**	
Basic computer experience			0.755(0.389)
Yes	146(69.2)	144(73.1)	
No	65(30.8)	53(26.9)	
Email and face book			0.001(0.981)
Yes	87(41.2)	81(41.1)	
No	124(58.8)	116(58.9)	
Exploring website			0.785(0.384)
Yes	54(25.6)	58(29.4)	
No	157(74.4)	139(70.6)	
Patient medical information			**11.978(0.001)****
Yes	124(58.8)	82(39.8)	
No	87(41.2)	115(56.9)	
Others *			0.722(0.395)
Yes	27(12.8)	31(15.7)	
No	184(87.2)	166(84.3)	

4.6 Linear regression analysis

Regression analysis was performed with behavioral intention as dependent variable and performance expectancy, effort expectancy, and social influence as the predictor variables**.**

4.6.1 Regression analysis I: examining the relationship between the overall performance expectancy (PE), effort expectancy (EE), and social influence (SI) compared to the Behavioral intention (BI).Bi-variate correlation test was conducted to examine the association between performance expectancy, effort expectancy, social influence and computer attitude with behavioral intention to adopt EMR. The correlation is significant to all factors: Effort expectancy (0.371), performance expectancy (0.336), and social influence (0.400) with P-value less than 0.001

Table: 10 Correlation between the overall performance expectancy, effort expectancy, social influence compare to the BI.

		BI	PE	SI	EE
BI	Pearson Correlation	1	.336**	.400**	.371**
	Sig. (2-tailed)		.000	.000	.000
	N	408	408	408	408
PE	Pearson Correlation	.336**	1	.483**	.594**
	Sig. (2-tailed)	.000		.000	.000
	N	408	408	408	408
SI	Pearson Correlation	.400**	.483**	1	.388**
	Sig. (2-tailed)	.000	.000		.000
	N	408	408	408	408
EE	Pearson Correlation	.371**	.594**	.388**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	408	408	408	408

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

A Regression Analysis was performed with behavioral intention to adopt EMR as dependent variable and PE, EE, SI, predictor variables. A total of 408 cases were analyzed. A significant model emerged (F (3, 408)=37.008, p<0.001 with adjusted R square being 21.2% (table 11). The significant variables are shown in table (13, a) that includes effort expectancy (=0. 221 ,P< 0.001), social influence (=0.281), on behavioral intention to adopt/use EMR. In contrast performance expectancy =0.069,p=0.0.240 was not considered to be significant predictor in this model Because multi co linearity was found on performance expectancy which the tolerance value is (0.572) and it should be greater than 0.59, unless it will negatively affect the predication of the model.

Table 11: Linear regression analysis I: model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.466[a]	.217	.212	2.54713	1.671

a. Predictors: (Constant), social influence , performance expectancy, Effort Expectancy

b. Dependent Variable: Behavioral Intention

The measure of R square usually written as R^2 is the square of R, representing the proportion of variation in the response variable, explained by the regression model and consists of value between 0 and 1. High R square value may be seen as evidence of good fit of the model tested. In this test, R^2 explained 21.2 % of the change in the behavioral intention to use EMR was due to the social influence and effort expectancy.

Table: 12 Linear regression analysis I: ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	728.076	3	242.692	37.407	.000
Residual	2621.101	404	6.488		
Total	3349.176	407			

The acceptability of the model with ANOVA (table 12) indicates that the model is acceptable which is statistically significant at 95% confidence interval. The sum square for regression in smaller than the residual which indicates the presence of other more important factors that can affect BI to adopt EMR soft ware syste

Table: 13, A. **Linear regression analysis I: Coefficient**

	Un standardized Coefficients		Standardized Coefficients			95%Confidence Interval for B	
Variables	B	Std. Error	*B*	T	Sig		Tolerance Value
SI	0.247	0.045	0.281	5.536	0.000	0.159-0.334	0.751**
EE	0.187	0.045	0.221	3.996	0.000	0.092-0.269	0.634**
PE	0.074	0.063	0.069	1.178	0.240	-0.049-0.197	0.572

SI=social influence, EE= Effort Expectancy, PE=Performance Expectancy are independent variables and BI = Behavioral Intention is dependent variable

(**) Positively influence the Behavioral Intention of EMR

According to the table (13, A) the tolerance value of each variables was analyzed and the Performance Expectancy has the tolerance value of 0.572 which is beyond the minimum value of 0.59, indicates multi co linearity that can negatively affect the predication power. So Performance expectancy was analyzed separately and causing the following result shown on table (13, B)

Table: 13, B. Linear regression analysis I: Coefficient

	Un standardized Coefficients		Standardized Coefficients			95%Confidence Interval for B
Variables	B	Std. Error	*B*	T	Sig	
SI	0.265	0.042	0.302	6.313	0.000	0.182-0.347**
EE	0.207	0.039	0.254	5.312	0.000	0.130-0.284**
PE	0.362	0.050	0.336	7.181	0.000	0.263-0.461**

SI=social influence, EE= Effort Expectancy, PE=Performance Expectancy are independent variables and BI = Behavioral Intention is dependent variable

(**) Indicates that the social influence, effort expectancy, and performance pxpectancy Positively influence the Behavioral Intention of electronic medical record system.

The magnitude of variation in performance expectancy was analyzed and it was significant at 0.336, p<0.001 and R^2 11.3 % proportion of variation explained by the performance expectancy. So generally the model explained 32.5 % change in Behavioral intention to use EMR. About 67.5% is explained by the other factors which need further research to indentify the factors.

4.7.2 Logistic regression analysis II.

Adoption Behavior is categorical in nature and is represented by “yes” or “no”. number 1 represents “yes” and number 0 represents “No”. If an individual health professional is currently using EMR it is coded as “yes”, if the individual health professional is not currently using EMR it is coded as NO. Logistic regression analysis II is used to test the relationship between the facilitating condition and behavioral Intention as the independent variable and EMR adoption/utilization behavior as dependent variable. Logistic regression analysis had been chosen as a result of the limitation of linear probability model which might predict probability beyond the “0” and “1”. Logistic regression analysis was conducted with EMR adoption/usage as the dependent variable and facilitating condition, BI as predictor variable. The full model was considered to be significantly reliable (Chi-square(2,N=408)=71.354, P<0.001(table 14).

Table 14: Logistic regression analysis II: Omnibus Tests of Model Coefficients

	Chi-square	D.f	Sig.
Step 1 Step	71.354	2	.000
Block	71.354	2	.000
Model	71.354	2	.000

Generally this model accounted for between 16.0% and 21.4% of the variation in EMR adoption(table 15).

Table: 15 Logistic regression analysis II: Model Summary

Step	-2Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	493.774[a]	.160	.214

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

As this study indicates on the classification (table 16) 70.6 of the EMR adopters were successfully use the EMR system. 77.7 % of the prediction for non EMR users were accurate by 70. 6 %.

Table: 16 Logistic regressions II: Classification table

Observed	Predicted EMR adoption behavior			
		Yes	No	**Percentage correct**
Are you currently using EMR?	Yes	164	47	77.7
	No	73	124	69.9
Overall Percentage				70.6

The over all prediction were accurate by 70.6%. Facilitating condition did not reliably predict the EMR usage behavior but the coefficient value expose that an increase in the facilitating condition score is associated with an increase in the odds of EMR adoption by factors 0f 1.042. in addition to this BI to use EMR reliably predict the EMR usage /adoption. The coefficient value indicates in an increase in behavioral intention is associated in turn, leads, to an increase in odds of EMR adoption by 0.167(table17)

Table: 17 Logistic regressions II: Variables In The Equation

	B	S.E	Wald	DF	Sig	Exp(B)	(95% CI)
BI	-1.791	.232	59.741	1	.000	.167	.106-0.263**
FC	.042	.246	.028	1	.866	1.042	.643-1.689
Constant	.964	.175	30.378	1	.000	2.622	

BI=Behavioral Intention and FC=facilitating condition as independent variable and actual Usage or adoption status as Dependent variable.

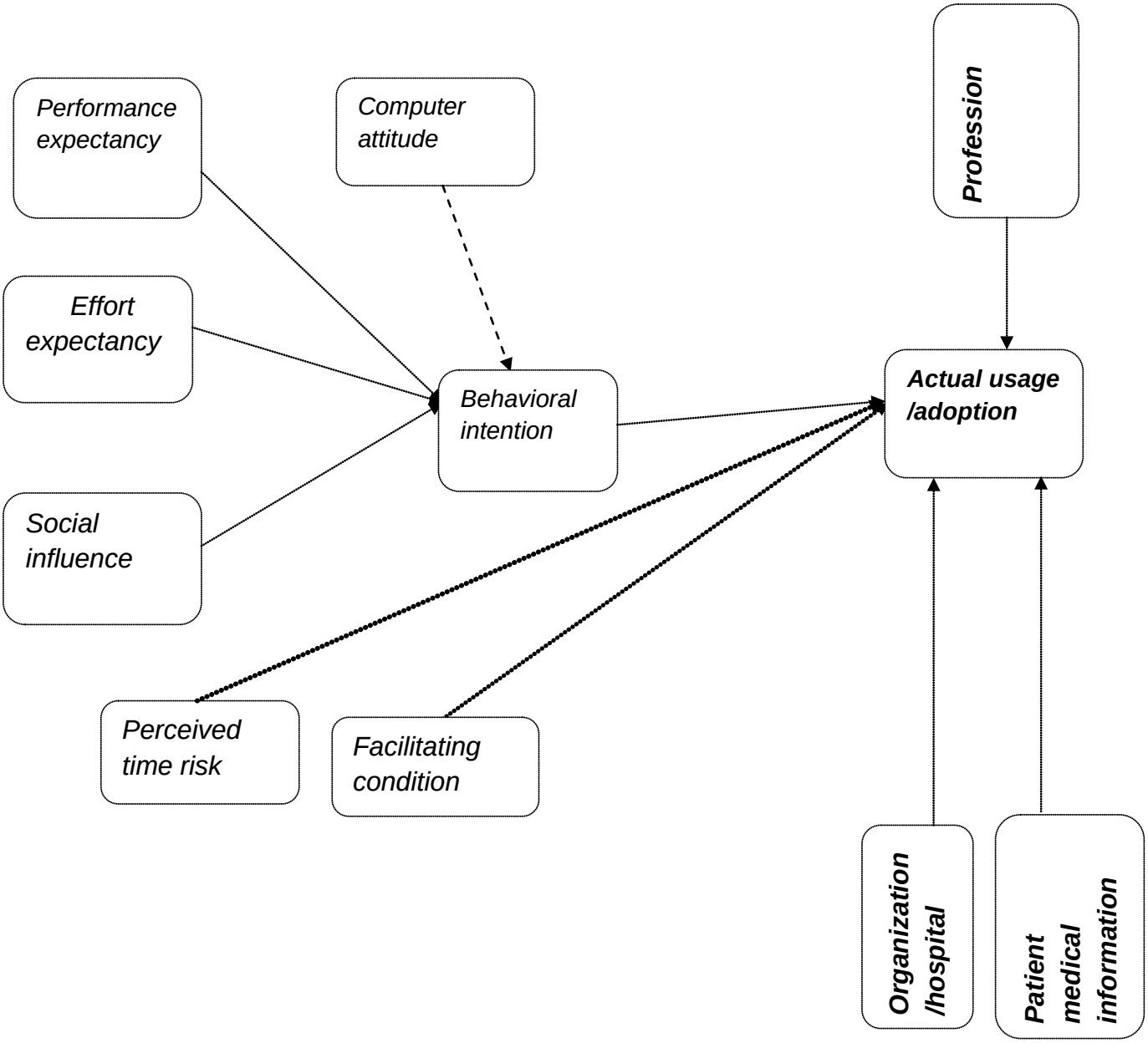

Figure 6: The schematic representation of factors that positively influence on the behavioral intention and use behavior.

Key/legends

---------- Significant Associate

_____ Insignificant Association

4.8 Hypothesis testing: seven hypothesis was suggested on chapter two and the following (table 18) shows whether the research hypothesis are supported or not. A total of seven research hypothesis that were tested to examine whether independent variable significantly explain the dependent variables**.**

Table 18:**Hypothesis testing end result.**

Hypothesis	***Result***
H1*: Performance expectancy will have positive influence on health professionals' behavioral intention to use EMR system.*	***Yes***
H2*: Effort expectancy will be positively influence health professionals' behavioral intention to use EMR system*	***Yes***
H3*: Social influence will positively affect the intensity of health professionals behavioral intention to use EMR system.*	***Yes***
H4*: Organizational facilitating conditions will have a significant influence on health professionals' use behavior of EMR system****.***	***No***
H5*: Computer attitude will positively affect the intensity of health professionals' behavioral intention to use EMR system.*	***Not tested***
H6*.Perceived time risk negatively influence health professionals actual EMR usage.*	***Not tested***
H7*:Behavioral intention will have a significant positive influence on health professionals actual EMR usage*	***Yes***

CHAPTER FIVE: DISCUSSION

Several implications can be readily obtained from the study result. Based on this study the model predicts 32.5 % of variation in intention of EMR adoption, this study was different from a research done on Australia regarding ICT adoption and use by Allied health therapists which predicts 63 % BI to adopt ICT adoption(52). This result indicates this model generally explained 32.5 % change in behavioral intention to use EMR. The reaming factors 67.5% are other unidentifiable factors that can affect the behavioral intention to adopt EMR. The original UTAUT of longitudinal study able to explain 70 % with is greater than this finding (17). This might be due to this research is cross-section which is one time research.

The finding from the study provides that the performance expectancy factor was considered a significant at 0.336, P –value =0.00 which influences on behavioral intention to adopt EMR. This finding was similar with the Intention to adopt clinical decision support systems in a developing country among Malaysia physicians in which there significant positive relationship between performance expectancy and intention to use, in which standardized B coefficient = 0.403, p-value= 0.00 < 0.05(53). People's intention to use computer in the work place are influenced by their perception of how useful the computers are for their job performance and the degree of enjoyment experience during using the computer [30].

Effort expectancy is significantly associated with correlation coefficient =0.4, p <0.001 with behavioral intention to use electronic medical record. This is with path coefficient 0.20, R^2=0.12is one of the functions of behavioral intention of information technology and significantly associated with the behavioral intention to use IT among health professionals (55). Technologies that are perceived as user-friendly will be more appealing to both patients and practitioners or if the technology is easy to use, there will be an easy to obtain data, send data and generally utilization of the system can occur (34). Effort expectancy is similar with the ease of use associated with health IT or its concept is similar with perceived ease of use construct in TAM and IDT model. Ease of use and availability of the required technology are important factors in predicting doctor's intention to adopt the e-medicine [33].

Based on this analysis, effort expectancy factor has a significant positive influence on the behavior intention to adopt EMR. It is consistent with the UTAUT model which suggests that the presence of constraints might inhibit the behavioral intentions to adopt EMR which implies health professionals should equipped with the skill that enable them to use the EMR use.

Social influence (*SI*) is defined as the degree to which an individual perceives that important others believe he or she should use health information technology [17].

Social influence was significantly associated with behavioral intension to adopt EMR with standardized B coefficient=0.302 , p<0.001 and this result is similar with (55) and standardized beta coefficient (= .100, p < .001) on Behavioral Intention to adopt e-government in state of Qatar (56). Senior executives—including, whenever possible, the CEO—must be involved to demonstrate their own commitment and seriousness to keeping the EMR transition moving forward. Senior management must also be able to educate employees on what the EMR means to the organization in terms of better patient care, efficiency, competitiveness in the market, and compliance [23].

In this study, it was found that the behavioral positively influence the usage behavior of electronic medical records with odds of 0.167 at p-value <0.001 which is similar with (56) with the odds of 0.584. Different studies have been done to examine health professionals' acceptance and usage of electronic medical records using UTATU model. Based on this, it was found that behavioral intention has significant influence on actual use of the system [41]. Previous technology adoption studies indicate positive effect of facilitating conditions on innovation use [57, 58]. But there was no significant influence of facilitating condition on the actual usage behavior of electronic medical records. This might be due to the fact that the participants were those who have already trained which is one of the facilitating condition for the usage EMR.

The significant association of socio-Demographic characteristics difference was also found on the organization in which the health professional working, their educational level, and their professional back ground. The result indicates the usage behavior of electronic medical record at public hospitals differ significantly in terms of the profession, educational level, and organizations. It was suggested that the research should not adhere blindly to one of the polar extreme paradigm rather it should include both qualitative and quantitative to solve the problem(54). Generally, this study indicates the factors that affect EMR adoption. EMR adoption factors are highly contextual and the need for more in-depth investigation with qualitative research method the quantitative research counter.

CHAPTER SIX: STRENGTH AND LIMITATIONS

6.1 Strength of the study

✓ The research was used adequate sample size and include all health professionals.

✓ As baseline information, the findings of this study will have great contribution for further studies.

✓ Reliability and Validity was tested

6.2 Limitation of the study

The sample was only recruited from Public hospitals under the government of Addis Ababa city Administration health Bureau in Addis Ababa, where as other private hospitals were not included. Hence it could not generalize to the overall public and private hospitals.

This study was done using only quantitative research, for more in-depth investigation with qualitative research method further research should be done using both the mixed quantitative and qualitative research methods.

The moderators of the UTAUT models were not assed due to the scope of the study.

CHAPTER SEVEN : CONCLUSION AND RECOMMENDATION

7.1 Conclusion: This study sought the factors that predict survey respondents to adopt EMR and actual adoption of EMR in the public hospitals at the Addis Ababa by applying modified UTAUT model. The focus of the study was the predication of the two theoretical constructs the intention to use the EMR and actual usage behavior or status of usage. The result showed that performance expectancy, effort expectancy, social influence exhibits significant influence on the behavioral intention to use the electronic medical records. Among the three influencing factors the social influence has more significant predication power than effort expectancy and performance expectancy. For the second constructive model behavioral intention has significant influence of the actual usage but that facilitating condition with not influencing the actual usage. Number of factors such as performance expectancy, effort expectancy, social influence and intention to use EMR and Usage behavior were identified from the existing literature and considering important for understanding of health professionals decision for utilizations of the electronic medical records at the hospital setups. Three constructs: performance expectancy, effort expectancy, social influence significantly influence the behavioral intention to use of health professionals for adopting EMR. Behavioral intention also significantly influences for the actual usage /adoption but facilitating condition remains insignificant with actual electronic medical usage.

The key findings of this study are:

✓ When the health professionals' awareness increases on the usefulness and advantage of electronic medical records, there is an increase in the behavioral intention of using electronic medical system.

✓ Health professional's level of usage is determined by complexity or simplicity of the electronic medical record system.

✓ Health professionals" behavioral intention to use electronic medical record system increase with an increase in the in the organizational and top managers support.

✓ Actual utilization is determined by behavioral intention of health professionals which implies as the behavioral intention of health professionals increase the actual utilization will also increase.

✓ Based on this study, the proposed research model can explain 32.5% of the variance on the health professionals' behavioral intention to adopt Electronic medical records.

✓ The utilization rate of EMR among health professionals working at the public hospitals 51.7%

7.2 Recommendation

- ✓ This study found that the health professional's prior experience in using patient medical information was found that have significant influence with the adoption or usage of EMR. So the government of AACAHB should provide and organize on the job training or work shop for all health professionals in the hospitals in order handle them experience in using EMR soft ware and improve their knowledge in EMR system.
- ✓ The moderators of the UTAUT model was not included in this study and further investigation needed if there is a relationship between these moderating variables with behavioral intention to adopt the EMR.
- ✓ This study clearly indicatives social influence will have positive influence on behavioral intention to use EMR. Therefore colleagues, chief executive officers, medical directors of the hospital and higher officials who matter on the daily practice of health professionals need to accept and appraise to use EMR.
- ✓ In order to obtain mere comprehensive information about the adoption of EMR, qualitative techniques are also recommended to generate in depth information.
- ✓ This research was conducted only on public hospitals, further study should be done on private hospitals
- ✓ Hospital which didn't implement EMR yet but plan to implement should create awareness on the advantage of the electronic medical records, should implement user friendly EMR soft ware and the top managers should be frontline supporter for the adoption phase, and equip skill to their employees through training.
- ✓ Future research model should be address the linkage the relationship between organizational and individual levels of electronic medical records to develop more complete model there for modification of the research model with other factors could be conducted in the future.

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Annex I: Information Sheet

1.1. Participant information sheet

School of public health and information science, department of health informatics, Addis Ababa University, Addis Ababa, Ethiopia

Title: Adoption of electronic medical record at public hospitals by health professionals in Addis Ababa city.First of all we would like to thank you in advance for your cooperation and consent in participation in this study. Please read about the general information of the stud. If you have any question regarding the study please ask freely

1.2. Back ground information

Health care industries with out information communication technology is impossible to provide efficient and effective health care service. Continues adopting is very important for the sustainable utilization information communication technologies to assure the quality of health care. Health professionals are not fully adopting even though huge amount of money is invested for ICT infrastructure, human resource development on ICT, etc due to different factors. It is very important if the factors that affect the adoption of ICT like EMR so as to manage and plan on those associating factors.

1.3. Aim of the study

The purpose of the study is to identify the factors that influence the behavioral intention to adopt and usage behavior of electronic medical records at public hospitals in Addis Ababa**.**

1.4. Benefits for the participants

Study participants will not have any financial incentives or other inducements from participating on this study. However, participations of health professionals in this study with honest response to the questions is important to improve the adoption and utilization of EMR system so as to improve the patient care and safety.

1.5 Risk and complication

There is no any risk and hidden idea on the study subjects due to participating. No other than the investigator and responsible advisors can access the collected data from the study participants of the study area. No need of writing participants' name to secure the confidentiality of the data or study participants. It also gets ethical clearance from Addis Ababa University Medical Faculty research ethical reviewing board(RIRB).

1.6 Assurance of principal Investigator

I put my signature below to confirm you that I take over the responsibility for the scientific ethical and technical conduct of the research project and for provision of progress reports for all stakeholder of the research project.

Semere Gebremariam (PI)

Signature ----------Date ----------

Note: If you have any questions about this study, you should feel free to ask now or any time through out the study by contacting:

PI Address: ***Semere Gebremariam***: Addis Ababa University School of public health and information science, department of health informatics, Addis Ababa , Ethiopia.

E-mail: semeri98@yahoo.com

Tel: +215912120014

APPENDIX II: Consent Form

Addis Ababa University school of public health and school of Information science Health Informatics program Self administer questionnaire adoption of electronic medical records system by health professionals in public hospitals in Addis Ababa, Ethiopia, 2012

Consent form : That certify the respondent agreement

1. Name of hospital ----------

2. Questionnaire identification number----------Date------/------/2012

Introduction: Hello. My name is----------and I am here to collect electronic medical record related data for the purpose of research for a study being conducted in public hospitals which are governed under Addis Ababa city administration health bureau .I would like to ask you to fill this questionnaire that is related to you perception and status of usage on electronic medical records or smart care soft ware. The information you provide will help us improve the adoption and implementation of electronic medical records, which is vital in this hospital and other hospital which implemented the smart care soft ware as well as for those hospital which are preparing to implement electronic medical record software system. You are selected to be one of the participants in the study .The study will be conducted through self administer questionnaires. The information you give us is confidential and will be used only for study purpose. A code number will identify every participant and no name will be documented .Your participation is on voluntary basis. If you choose not to answer a particular question, that is your right. You have a full right to withdraw from the study at any time without any problem. However, your participation is important to fulfill the study and design mechanism to develop good implementation model of EMR.

Are you willing to participate in the study?

1=yes 2=no

Facilitator ----------signature----------

Thank you

Annex III: self administered questionnaires

Electronic Medical Record/ Smart care soft ware survey questionnaires

Questionnaire on Electronic Medical Record for health professionals working in Ras Desta, Yekatit12, Menelik II, Gandhi Hospital and Zewditu memorial hospital. Please fill out the following questionnaires, your comments are very important for further improvements in effective adoption of electronic medical records system. Thank you in advance for your time.

Hospital Name _____

1.Background Information

1. Age (in years) _____

2.sex

1. Female ☐ 2. Male ☐

3. Marital status married 1 ☐ 2. single ☐

4. Profession

1. Nurse ☐ 5. Laboratory ☐ 9.radiography ☐
2. Mid wife ☐ 6.pharmacy ☐ 10.enviromntal health ☐
3. Health officer ☐ 7. Dental ☐ 11. Others (specify)----------
4. Medical doctor ☐ 8.occupational health ☐

5.Work experience in year _____

6.Educational level

1. Diploma ☐
2. Degree ☐
3. Post graduate /masters ☐
4. Specialist ☐
5. Other (specify) ----------

7.Work experience with computer use:

1. Basic computer application use yes ☐ No ☐
2. Email face book yes ☐ No ☐
3. Exploring web site for different use yes ☐ NO ☐
4. Patients medical information yes ☐ No ☐
5. others (specify)----------

Part two------ fill in the following using (√) right mark on your preference

Strongly disagree =1, disagree =2, neither agree or disagree=3, agree=4, strongly agree=5

Social influence						
Indicator	Question	Strongly Disagree	disagree	Neither Agree/ Disagre	Agree	Strongly Agree
SI 1	People who influence my behavior thinks that I should use the EMR system	☐	☐	☐	☐	☐
SI 2	People who are important to me think that I should use the EMR system	☐	☐	☐	☐	☐
SI 3	Hospital mangers has been helpful in the use of EMR system.	☐	☐	☐	☐	☐
SI 4	In general, the health care organization has supported the Use of EMR	☐	☐	☐	☐	☐

Facilitating condition						
Indicator	Question	Strongly Disagree	disagree	Neither Agree/	Agree	Strongly
FC 1	I have the resource necessary to use the EMR system at this hospital	☐	☐	☐	☐	☐
FC 2	I have the knowledge necessary to use the EMR system	☐	☐	☐	☐	☐
FC 3	The EMR system is not well matched with the other system I use	☐	☐	☐	☐	☐
FC 4	A specific person (or group) is available for assistance with the system difficulties	☐	☐	☐	☐	☐

Computer attitude						
Indicator	Question	Strongly Disagree	disagree	Neither Agree/	Agree	Strongly Agree
CA 1	EMR technology support the health worker to providing better patient care	☐	☐	☐	☐	☐
CA2	I prefer to use EMR because it raises my performance	☐	☐	☐	☐	☐
CA3	I am interested in an EMR implementation	☐	☐	☐	☐	☐
CA4	Generally, my attitude about EMR usage is positive	☐	☐	☐	☐	☐

Effort expectancy						
Indicator	Question	Strongly Disagre	disagre	Neither		Strongly
EE 1	My interaction with the EMR system is clear and understandable	☐	☐	☐	☐	☐
EE 2	It easy for me to be for me to be skillful at using EMR system	☐	☐	☐	☐	☐
EE 3	I find EMR system easy to me	☐	☐	☐	☐	☐
EE 4	Learning to operate the EMR system is easy for me	☐	☐	☐	☐	☐

Performance Expectancy						
Indicator	Question	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
PE1	I would find the EMR System useful in my job.	☐	☐	☐	☐	☐
PE2	Using the EMR system enables me to accomplish tasks more quickly	☐	☐	☐	☐	☐
PE3	Using the EMR system increases my productivity/ outcome.	☐	☐	☐	☐	☐

Perceived Time Risk						
Indicator	Question	Strongly Disagree	disagree	Neither Agree/ Disagree	Agree	Strongly Agree
PTR 1	If I begin to use EMR, the chances that I will lose time due to having to witch to a different filing method are high.	☐	☐	☐	☐	☐
PTR2	It is probable that my signing up for and using EMR would lead to a loss of convenience of me because I would have to waste a lot of time entering the data.	☐	☐	☐	☐	☐
PTR3	Considering the investment of my time involved to switch to EMR makes it very risky.	☐	☐	☐	☐	☐
PTR4	The possible time loss from having to set-up and learn how to use MR makes it very risky.	☐	☐	☐	☐	☐

Behavioral Intention						
Indicator	Question	Strongly Disagree	disagree	Neither Agree/ Disagre	Agree	Strongly Agree
BI1	I intend to use the EMR system in the next 3 months.	☐	☐	☐	☐	☐
BI 2	I predict I would use the EMR system in the next 3 months.	☐	☐	☐	☐	☐
BI 3	I plan to use the EMR system in the next 3 months.	☐	☐	☐	☐	☐

Part three ----------EMR use status

	Statues of EMR usage	
Number	*Questions*	
1	*Have you ever use EMR voluntarily?*	
2	*Are currently using EMR system ?*	

***Thank you for your participation*!!!**

Social Influence

Indicator	Question	Strongly Disagree	disagree	Neither		Strongly
SI 1	People who influence behavior think that I should use the EMR system	☐	☐	☐	☐	☐
SI 2	People who are important to me think that I should use the EMR system	☐	☐	☐	☐	☐
SI 3	The hospital manager has been helpful in the use of the EMR system.	☐	☐	☐	☐	☐
SI 4	In general, the healthcare organization has supported the use of the EMR system	☐	☐	☐	☐	☐