A COMPREHENSIVE MODEL TO EXPLAINING USERS' ACCEPTANCE AND INTENTION TO USE ELECTRONIC HEALTH RECORDS (EHR) IN REHABILITATION FACILITIES IN SAUDI ARABIA

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This study provided a literature-based model that was developed by using a general and cumulative approach to explain user attitudes toward EHR. The model embodies the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), and the barriers that hinder users from proper use of the EHR system. Dimensions related to Human, Technological, Organizational, Professional, Legal, and Financial sources of influence were identified and tested in a special care setting. Because rehabilitation care setting requires an interdisciplinary (interactive) and multidisciplinary (additive) care approach, they pose an extra challenge.

The current situation of the Saudi healthcare system demands a transition to a more connected and integrated system among different facilities of a single provider and across different providers. This situation underscores the need to have EHR in place and demands that particular attention be paid to user acceptance of the system. Thus, current and potential users of EHR in Saudi Arabia were targeted and asked to rate the importance of each source of influence on their attitudes toward EHR. The sample size was 319, comprising respondents from more than 20 hospitals and rehabilitation care facilities, and 263 responses were eligible for statistical analysis.

Examining the model revealed that human, technological, organizational, and professional dimensions are the necessary and sufficient predictors for users in the tested settings. This calls for

raising awareness of EHR and its anticipated benefits and difficulties. Continuous learning and ongoing training sessions are key aspects in attaining users' acceptance of EHR. The findings of this study also call for developing policies and legal procedures to regulate the use of EHR in Saudi Arabia by establishing a national regulator and enforcement bodies to oversee issues related to system security and patient privacy. Furthermore, it is worth proposing an act or policy (stimuli) to promote the adoption and meaningful use of EHR and to keep costs of EHR low, especially for the private sector.

Regarding future directions, the proposed model is to be taken to different levels and examined in different care settings, geographic areas, and with different technologies, including but not limited to mHealth, cloud computing, and telehealth.

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PREFACE

This work is dedicated to my mother and the soul of my father, who kept repeating 'I leave satisfied that you have not let me down'. He passed away 184 days before this journey brings to an end. Remembering some of you quotes, daddy, "Lend a hand and don't wait for a thank," and "this is a neighbor, boy," would tear my heart apart for losing you. I wish if you are here. Don't you know that would break me down in tears each time I breathe? The only moment you hurt me was when you left. I know I cannot make you prouder, daddy, as your blaze and light have been enough to guide other's feet and enlighten their paths.

This man needs not be buried in a graveyard, need not to be buried.

No ones buries the light; no one buries the love, the generosity, and the nobility

*He is my father**

** Translated and used with a permission of it's author "Ahmed Abodehman, Saudi novelist"*

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1.0 INTRODUCTION

1.1 BACKGROUND

Currently information technology (IT) is considered an indispensable tool across a wide range of activities in our lives, including healthcare. E-health has been defined as the application of Information and Communication Technologies (ICT) to carry out a large span of health care functions. Across the spectrum of healthcare services, IT has been used to capture, collect, send, process, retrieve, and store data and information about patients. Thus, IT is used to improve care accessibility and availability for underserved and needy areas through facilitating dissemination of clinical expertise across distance (telemedicine)(W. R. Hersh et al., 2006). Furthermore, it can be used to guide the clinical care process either through general guidelines (Shiffman, Liaw, Brandt, & Corb, 1999) or specific patient-tailored alerts (Holdsworth et al., 2007; Kuperman et al., 2007).

On the other side, IT can be used to empower patients to manage their own health by different means, from education to monitoring personal health (consumer health informatics). At the population level, E-health applications have been used for reporting population health management and other epidemiological purposes, including assessing population health outcomes though public health informatics applications and Health Information Exchange (HIE) networks (Pagliari et al., 2005).

The wide variety of E-health solutions range from simply capturing patient history notes applications to more comprehensive Electronic Health Record (EHR) systems; EHR is the hub of all E-health solutions. These applications include but are not limited to Computerized Provider Order Entry (CPOE); Computerized Decision Support Systems (CDSS); Medication Administration Records; (MAR); Bar-Code; ePrescribing, pharmacy systems; Picture Archiving and Communications System (PACS); Pathology Solutions, Telemedicine applications and many others. A recent systematic review conducted by Li et al, accessed literature from 1993 to 2011, and found that literature references Electronic Health Record (EHR) as a topic in 57 studies out of 93 (63%). The next most frequently addressed topics were applications that facilitate the delivery of healthcare services across distance (Telemedicine), representing seven percent of the collected literature. The remaining portions of literature targeted different aspects of the care process: Anesthesia, Intensive care, Radiology information system, Picture Achieving and Communication System (PACS), Pharmacy Information System, E-prescribing, Computerized Order Provider Entry (CPOE), E-discharge, and logistics information system (Li, Talaei-Khoei, Seale, Ray, & MacIntyre, 2013).

Although IT has demonstrated its potential to improve the healthcare process, the adoption rate has not been high enough to realize fruitfully the full benefits of the EHR. According to the 2012 survey of the National Center for Health Statistics (NCHS) in the United States, 78.4% of physicians report using the EHR system, which represents an increase of 18% from 2001. Nonetheless, about 48% of those systems are considered to be basic systems with neither high-level entry capabilities nor decision support features (See Table 1). Furthermore, only 13% reported that their current systems have the capability of supporting only 14 of the stage 2 core sets objectives for meaningful use (Chun-Ju Hsiao, 2014).

Table 1: Basic and Comprehensive EHR

Functions	Basic EHR	Comprehensive EHR
Electronic Clinical Information		
Patient demographics	☑	☑
Physician notes		☑
Nursing assessments		☑
Problem lists	☑	☑
Medication lists	☑	☑
Discharge summaries	☑	☑
Advance directives		☑
Computerized Provider Order Entry		
Lab reports		☑
Radiology tests		☑
Medications	☑	☑
Consultation requests		☑
Nursing orders		☑
Results Management		
View lab reports	☑	☑
View radiology reports	☑	☑
View radiology images		☑
View diagnostic test results		☑
View diagnostic test images		☑
View consultant report		☑
Decision Support Systems		☑

Rehabilitation facilities lag behind other healthcare facilities in adopting EHR. Less than 25% of the acquired EHR systems in 2004 reported functions that support rehabilitation services ("Sixth Annual Survey of Electronic Health Record Trends and Usage for 2004.," 2004).

Furthermore, according to the 2009 American Hospital Association (AHA) survey, only 4% among the 109 rehabilitation facilities surveyed had basic EHR systems and not a single rehabilitation hospital had a comprehensive EHR.

The Inpatient Rehabilitation Facility (IRF) is considered a Long-Term & Post-Acute Care (LTPAC) facility. LTPAC is a concept that describes services provided over extended periods of time to individuals with functional or cognitive incapacities as a result of chronic diseases or post-trauma that limit the individual's daily life activities. IRFs, as well as other LTPAC, are not eligible for the EHR incentive program that is presented by the Center of Medicare and Medicaid Services (CMS) regardless of their ongoing need to share data with other health professionals and their potential participation in the Health Information Exchange Network (HIE Network). This exclusion was due to funding constraints, as the CMS focused its financial incentives mainly on providers of core health services rather than distributing them more widely across the healthcare system. One contributing factor was that the CMS was uncertain about the readiness of all providers to adopt EHR systems (Leonard, 2011; Wolf, Harvell, & Jha, 2012).

Essentially, having coordinated healthcare services to provide continuity of care, as a policy goal cannot be assured if appropriate technology is not accessible to all providers in the network (hospitals, physician's offices, rehabilitation facilities, skilled nursing facilities, psychiatric care and other behavioral care specialists). The goal of establishing patient-centered healthcare and minimizing healthcare disparities can be thwarted by the growing number of patients that are transferred each year from an incentive-eligible acute-care provider to a non-eligible sub-acute or long-term care facility. Over a third of Medicare's patients are discharged every year to LTPAC facilities. Additionally, temporal trends show that the number of transferred

patient from acute care to LTPAC increased from 20% in 1997-2000 to around 35% in 2004-2006 (Kahn, Benson, Appleby, Carson, & Iwashyna, 2010).

Considering the cost of this type of services, which accounted for more than 40% of Medicaid and 21% of Medicare expenditure in 2011, the need for better coordination and continuity of sharing patient information seems clear (Dougherty & Harvell, 2011; Michelle Dougherty, 2013; Mor, Intrator, Feng, & Grabowski, 2010; Wolf et al., 2012).

Currently, most IRFs provide their services as units within more comprehensive (hospital-based) healthcare services providers. A nine-month-long study conducted for the Department of Health & Human Services (DHHS) by the American Health Information Management Association (AHIMA) interviewed over 41,000 care providers and revealed that 80% of the IRFs are affiliated with providers eligible for incentives. More than one thousand inpatient rehabilitation providers treated about 400,000 patients, resulting in more than six billion dollars of Medicare expenditures for rehab services (Michelle Dougherty, 2013). Nevertheless, only 5% of the rehabilitation hospitals that responded to the 2009 AHA survey were able to exchange data electronically with other providers, and only 1.4% of rehab hospitals were able to fulfill the meaningful use core functions (However, if the information exchange criterion is excluded, the percentage increased to 2.8%). For the meaningful use menu functions, 7.1 % of rehab hospitals were able to meet this criterion, but overall no rehab hospital was able to satisfy the core and menu functions required by the CMS's meaningful use incentive program (Wolf et al., 2012) .

To realize the full value of information systems, physicians should be willing and eager to use the systems. These systems should be incorporated into the care process, and efforts to measure the impact of those systems on quality, efficiency, and cost of healthcare services should be feasible and sustainable (Davidson & Heineke, 2007).

1.2 THE STATUS OF E-HEALTH IN SAUDI ARABIA

The Kingdom of Saudi Arabia has a national health care system in which governmental agencies provide about 78.9% of total health services. The Saudi Ministry of Health (MOH), the primary governmental provider and financier of 60% of the governmental-based health services, has taken serious steps toward incorporating information technology in its healthcare process. In the beginning of 2011, the MOH has launched an ambitious national E-health strategy. The vision for this initiative was to provide "a safe, quality health system, based on patient centric care guided by standards, enabled by E-health." A budget of SR 4 billion (US $1.1 billion) has been allocated for this strategy to overcome the slow transition to IT and improve the quality of healthcare services (MOH, 2011b; Qurban & Austria, 2008).

Other governmental agencies have followed suit and have already started adopting information technologies in their settings. The National Guard Health Affairs (NGA), Ministry of Defense Health Affairs, King Faisal Specialist Hospital and Research Centre, and Teaching Hospitals of Ministry of Higher Education are considered to be more flexible from financing and change-acceptance perspectives. Furthermore, they have inclination toward technology and quality improvement efforts, and thus, less difficulty to incorporate such extensive change is anticipated.

Pronounced efforts are evident throughout the kingdom to foster E-health adoption and promote its anticipated impact on the quality of healthcare services. The Saudi Association for Health Informatics (SAHI) has held many conferences emphasizing the capabilities of different information technology solutions, exploring national and organizational strategies, best practices through policies and procedures, and assessing current and desired infrastructure.

The Saudi healthcare system, as with healthcare systems worldwide, faces many challenges: the disparity among the systems, the proliferation of data, and the fact that current records are organization-focused rather than patient-focused (MM Altuwaijri, 2010).

1.3 THE DEPLOYMENT AND ACCEPTANCE OF INFORMATION TECHNOLOGY

Deployment of information systems is defined as the processes that take place between acquiring and using software and hardware. This phase of the IT-lifecycle encompasses interrelated activities including installing, activating, and testing software in particular environments for intended end-users (Carzaniga et al., 1998; Dearle, 2007). Deploying E-health entails preparing the operating environment for carrying out the specific E-health functions by the intended users. Thus, the proper method for testing user acceptance of a system requires simulating the real environment where the end user would be using that particular system in practice ((IF4IT), 2012). However, all users may not necessarily accept the deployed information system. Therefore, hospitals and users may not attain the anticipated outcomes of E-health unless the deployment is followed by acceptance of the system (Venkatesh, Morris, Davis, & Davis, 2003). Once E-health is deployed, accepted, used, and evaluated, it can be expected to improve the whole process of health care delivery (Walter & Lopez, 2008).

The technology acceptance literature has developed along three streams: individual acceptance; organizational-level acceptance; and task-technology fit models (Venkatesh et al., 2003). Based upon the majority of the literature, individual or user acceptance was reported as the most important aspect in the process of accepting technology (Fred D Davis, 1993; Fred D Davis,

Bagozzi, & Warshaw, 1989; Igbaria, Guimaraes, & Davis, 1995; Kottemann & Davis, 1991). Other factors can play important roles in the technology acceptance process, however. Technology maturity, IT literacy, availability of sound standards, availability of adequate resources, legal issues, workflow changes, adequate training, users' involvement, as well as social and organizational issues can affect uses' attitudes either individually or in combination. Therefore, setting proper strategies for deploying information technology should consider all these factors in order to design for successful adoption (Ajami & Arab-Chadegani, 2013; Bates, 2005; Boonstra & Broekhuis, 2010; W. Hersh, 2004; Mair et al., 2007; McAlearney, Sieck, Hefner, Robbins, & Huerta, 2013; Sprague, 2004).

1.4 RESEARCH PROBLEM

Despite the perceived advantages of health information technology in healthcare and the growing body of knowledge in leadership and management, the failure rate of IT projects is still high. According to Whittaker, any IT project that is "overrunning its budget by 30% or more, or overrunning its schedule by 30% or more, or failing to demonstrate the originally specified functions" is considered an unsuccessful project (Whittaker, 1999). Greenhalgh stated that healthcare organizations still struggle with IT projects and up to eighty percent of projects fail because of their complexity (Manos, 2009). The Standish Group CHAOS, an IT knowledge base for IT projects in real-life environments, classifies IT projects based on their resolution type. Successful IT projects are ones that deliver on time, on budget, and with the required original features. However, if an IT project is delivered later than expected, is over budget, or have fewer

features or functions than promised, it is considered to be a challenged IT project. Of course, if a project is cancelled or delivered and never used, it should be considered a failure.

The 2012 CHAOS report cites that about 43% of IT implementation in the healthcare industry failed partially, and 18% failed completely and were abandoned. Only 39% of projects were delivered on budget, on time, and achieved the planned features. Remarkably, the failure rate in the public sector is even greater. According to the Royal Society of Engineering and British Computer Society, the failure rate has reached 84% in the public sector. Project failure not only represents misuse of resources (about $150 billion US in the USA and $140 billion US in the European Union), but also leads to unwanted consequences such as delay of care, flaws that generated by uncompleted projects, opportunity waste of under-utilizing IT as a tool for competitive advantage and, the diminished creditability of the IT champions and potential of information technology in general (M. M. Altuwaijri, Bahanshal, & Almehaid, 2011; "The challenges of complex IT projects.," 2004; "CHAOS MANIFESTO 2013; Think Big, Act Small," 2013; Dalcher & Genus, 2003; Gauld, 2007; Kaplan & Harris-Salamone, 2009).

E-health projects in Saudi Arabia are not an exception to the risks of IT project failure. In a study by Khalifa (2013), hospitals in Saudi Arabia have many barriers that hinder successful adoption of IT. Accordingly, human factors, those related to users' attitudes and beliefs, and financial factors were the greatest barriers. This finding is consistent with a body of literature that cites users' resistance to technology as an important variable in implementing any new system (Ajami & Arab-Chadegani, 2013; Robert H Miller & Sim, 2004; Valdes, Kibbe, Tolleson, Kunik, & Petersen, 2004). Users' acceptance of the system entails that they should accept all changes that are required and incorporate them into their day-to-day work to gain the proposed benefits (Walter & Lopez, 2008). The Saudi E-health initiative has called for establishing an enterprise E-health

change management office to create a climate for change by encouraging users to evolve from change avoidance to change acceptance. The E-health initiative and the Change Management Office (CMO) jointly aim at raising the level of IT adoption by initiating more IT projects and ensuring the success of ongoing projects in MOH hospitals.

The majority of Saudi hospitals still rely on paper-based records but are in transition to adopting IT, which may require a major transformation of organizational culture as well as individual and team behaviors (MM Altuwaijri, 2010). Therefore, there is a need to understand and predict how the intended users will interact with information system in order to create more receptive attitudes toward EHR. Furthermore, the current implementation of EHRs has been low, and the MOH initiative for creating a national integrated EHR system has been adversely impacted by human, resource, social, and cultural factors (S. Alanazy, 2006; M Altuwaijri, 2008; Hasanain, Vallmuur, & Clark, 2014; Khalifa, 2013).

1.5 THE OBJECTIVES OF THE STUDY

Since the failure in IT projects is so prominent, its contributing causes must be identified and addressed. Until IT and the EHR could be the cause of failed implementation, we should consider failure of the whole adoption process, including factors related to users, organizational aspects, technology design, and change management approaches.

In this research, a comprehensive approach will be proposed to understand users' interactions with IT in rehabilitation facilities and to explain their intentions to use IT. Acceptance of EHR in rehabilitation facilities embraces extra challenges, as the rehabilitation care process requires both an interdisciplinary care approach and special documentation requirements of

rehabilitation care. The acceptance model is intended to include dimensions related to human, technical, organization, professional, finance, and legal issues that influence individuals' intentions to use EHR.

The specific objectives of this study are:

1. Developing a framework to explain individual's intention to use EHR focusing specifically on the rehabilitation context.
2. Determining variables that play influential roles in the acceptance of EHR (e.g. human, technical, organization, professional, financial, and legal).
3. Determining the impact of political process and other environmental variables on the acceptance process.
4. Determining factors unique to the rehabilitation environment that affect a) intention to use, and b) actual use.

The current research project aims at providing a better understanding of how users interact with EHR, considering the possible variables that influence the context of information technology usage in the healthcare system. It is hoped that providing such a framework and applying rigorous research methods would foster our understanding and add to the EHR acceptance body of knowledge and eventually, increase the likelihood of successful adoption (Dadayan & Ferro, 2005).

1.6 STUDY FRAMEWORK

Developing a model to explain individual's intention to use EHR requires understanding how humans actually act with EHR. According to the Theory of Reasoned Action (TRA), undertaking

a certain behavior is predicted by the individual's intention to perform that particular behavior; intention is defined as a person's readiness to perform a behavior. Subsequently, intention is mediated by attitudes toward behavior and subjective norms. Thus, using EHR can be predicted by a user's intention, which in turn is mediated by the user's attitude toward using EHR and their beliefs and motives (Ajzen, 1985, 1991, 2002).

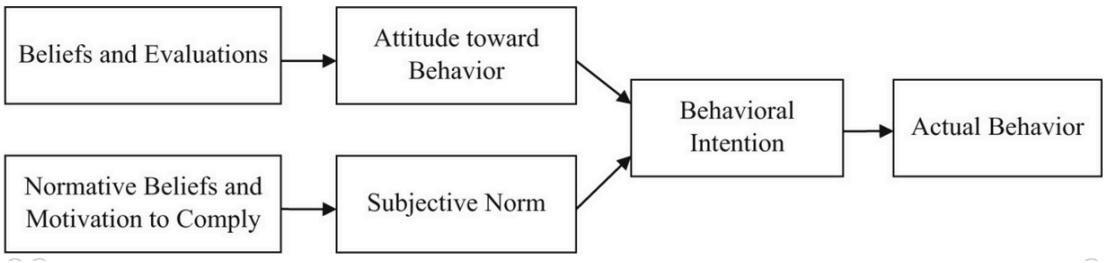


Figure 1: The Theory of Reasoned Action (TRA)

As TRA neglects the environmental context of an individual's behavior, Ajzen (1991) proposed the Theory of Planned Behavior (TPB) in which he added perceived behavioral control to TRA. The added construct reflects the individual's perceptions of how a behavior can take place by considering the context surrounding the individual.

Nevertheless, behavior can be influenced by other determinants since TRA and TPB only explain 40% of a given behavior. (Werner, 2004) Further, the intention to perform a certain behavior is not necessarily followed by performing that behavior because intention may change over time. Thus, assessing intention should happen at the same time or near the time of performing that behavior. Measuring behavior of interest like EHR acceptance requires specifying certain definition to determine what is considered a proper EHR usage, e.g., meaningful use objectives. Furthermore, behavior is not always predicted or explained by a model, such as when certain situational variables cause inconsistency between intentions and behavior (Allan, 2008; Cote Jr, 1983; Sheeran, 2002; Werner, 2004).

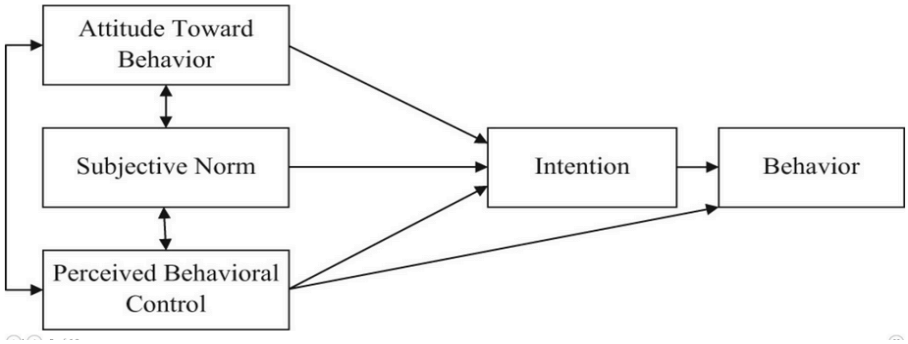


Figure 2: The Theory of Planned Behavior (TPB)

Users' acceptance of the EHR and their extent of usage are hindered by barriers pertaining to the adoption of E-health. A set of barriers pertaining to the Saudi Arabia's E-health journey was provided by M Altuwaijri (2008), S. Alanazy (2006), and Alkraiji, Jackson, and Murray (2013) Khalifa (2013). The barriers can be identified across studies as the following consistent themes: 1) Human-related barriers pertaining to users' beliefs, attitudes, and behaviors; 2) Profession-related barriers raised by the nature of medical staff members working in hospitals; 3) Technical barriers related to IT knowledge, skills, and IT-past experience; 4) Organization-related barriers relevant to organizational aspects of the EHR procurement and deployment; 5) Financial barriers pertaining to the cost of IT, personnel, and systems; 6) Legal and regulatory barriers related to difficulties resulting from a lack of appropriate policies and procedures, national regulators, and enforcement bodies.

Due to the above-mentioned barriers, the adoption of EHR has been slow across Saudi Arabia (Khalifa, 2013; Khudair, 2008). Additionally, acceptance of EHR by individuals within the same hospital has varied based on how individuals perceive EHR. According to the theory of diffusion of innovation, adoption can be accelerated if EHR exhibits relative advantages over the traditional medical record, individuals perceive it as easy to use and compatible with their values and standards if they realized the benefits of EHR (Rogers, 2003).

In general, diffusion of technology within a community or an industry requires intended user to accept that technology; this is has a special importance for non-discretionary use in particular. i.e. Adopt technology as planned by intended users (Dillon, 2001). This basic concept is the core of most of the modern theories that attempt to predict user attitudes toward technology (Fred D Davis, 1993; Fred D Davis et al., 1989; Igbaria et al., 1995; Kottemann & Davis, 1991). The technology acceptance model (TAM) is the most influential and parsimonious model in predicting user attitudes toward technology and their intentions to use technology. Davis introduced TAM in 1986 with two endogenous constructs: Perceived Usefulness (PU), which reflect the beliefs that the system will enhance performance, and Perceived Ease Of Use (PEOU), which is the belief that use of the system will be free from effort.

Considering the EHR barriers, the theory of Reasoned Action (TRA), and the Technology Acceptance Model (TAM), the proposed framework is the following:

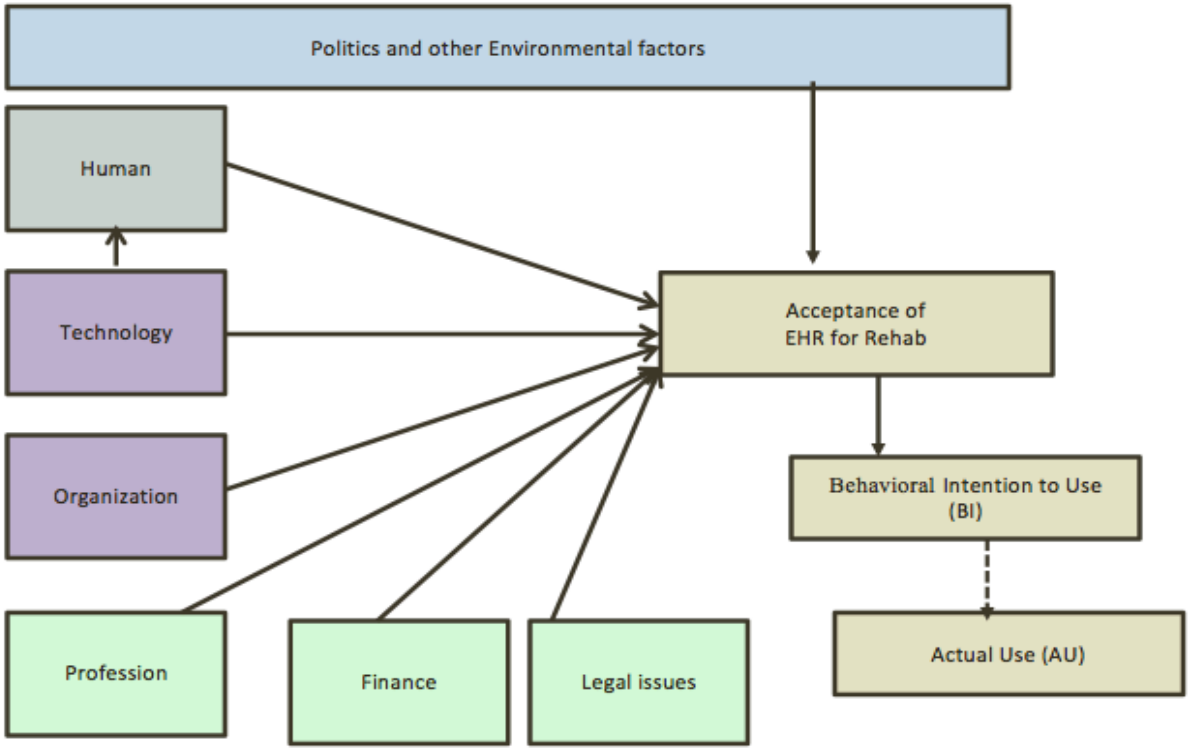


Figure 3: A Comprehensive Approach to Explain User's Intention to Use EHR

1.7 DEFINITION OF CONSTRUCTS

Actual Use (AU): indicates (‘how often’) and the volume of system use (‘how much’) by a user.

Behavioral Intention to Use (BI): is a person's subjective probability that he/she will perform a specific behavior; it represents hereafter the intention to use EHR.

Acceptance of EHR: individual perceives EHR as appropriate to their facilities and hence accepts it.

Human-related dimension: includes individual’s beliefs, attitudes, and behaviors toward EHR.

Technical-related dimension: relates to EHR technology, user's IT knowledge, skills, and past experience.

Organizational-related dimension: encompasses organizational aspects of EHR procurement and deployment.

Profession-related dimension: relates to the nature of the profession being working in the healthcare system.

Finance-related dimension: pertains to cost of EHR and its impact on reimbursement.

Legal dimension: includes concerns resulting from legal enforceability and liability.

Politics and other Environmental dimension: (External factors) include availability of national policies, public regulators, public education, and awareness, incentives and penalties, and other.

1.8 RESEARCH QUESTIONS

The research questions to be addressed in the research are as following:

RQ1: What are the factors that affect user acceptance of EHR?

RQ2: What is the relative influence of the following dimensions on user acceptance of EHR: human, technological, professional, financial, organizational, politics and environmental?

RQ3: What factors are unique to the rehabilitation environment affecting user acceptance of EHR and user intention to use EHR?

1.9 SIGNIFICANCE OF THE STUDY

Although the literature in this field focuses on the level of adoption of EHR, little attention has been paid to determining the user's acceptance of EHR (Simon et al., 2007). Recent emphasis has been placed on determining the extent of EHR user acceptance and what factors affect actual use of EHR (Richard J Holden & Karsh, 2010; W. R. King & He, 2006; Simon et al., 2007). Considering the need for research in this area and the low penetration of IT in rehabilitation hospitals, the author believes that providing and testing a comprehensive framework that aims to explain users' acceptance of EHR and identifies factors that influence the acceptance process in rehabilitation facilities will add value to the existing body of knowledge. This research will extend our understanding of the EHR acceptance process by considering the context of use. Furthermore, the research will inform managers and key decision makers about the requirements for EHR acceptance and effective use of EHR in the rehabilitation settings, especially in the context of the public institutions in developing countries.

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

Rigorously reviewing the relevant literature establishes the foundation of knowledge, research findings, and informed judgment in a science field. This should advance the knowledge formation by identifying needed areas for research and providing the basis for new theories and principles (Webster & Watson, 2002). This chapter provides a concept-centric literature review of studies relevant to the acceptance of EHR in healthcare facilities, focusing specifically on rehabilitation facilities.

2.2 E-HEALTH TECHNOLOGIES

E-health is a term used to represent the capabilities and potentialities of information communication technology (ICT) in the healthcare setting. The vast variety of technology solutions and the different uses have led to a dispute on a universal agreement of what constitutes E-health. Many researchers have been using different definitions to characterize the attributes of information technology applications in health care under the term E-health. This has been defined as “the application of information and communications technologies (ICT) across the whole range of functions that affect healthcare, from diagnosis to follow-up. It is the means to deliver responsive healthcare tailored to the needs of the citizen”(Silber, 2003)

Adapting the conceptual themes that were provided by Black et al. (2011), E-health

technologies are categorized into the following themes: 1) data storage, management, and retrieval systems; 2) supporting clinical decision making systems; and 3) systems to facilitate remote care. Although this model is based on the application's functionality, these categories are overlapping. For example, the telemedicine system is used both to facilitate care across distance and to manage and store data. Additionally, it may complement or facilitate the decision support process. Despite this deficiency in Black's framework, the first two categories are used in this literature review to present a summary of E-health technologies-relevant literature.

The first category encompasses systems that serve functions related **to data storage, management, and retrieval.** The Electronic Health Record (EHR) is the backbone of all E-health technologies. The Healthcare Information and Management Systems Society (HIMSS) defines EHR as "a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting." Similarly, the US Institute of Standards & Technology describes it as "a longitudinal collection of patient-centric, healthcare information, available across providers, care settings, and time. It is a central component of an integrated health information system." Nevertheless, EHR has no single or standard definition. This is due to its wide set of functions and multiple dimensionalities. The level of clinical detail, the timeframe of the records, the scope of EHR, and the data sources determine the definition of the EHR.

Actually, using EHR key criteria is the standard way to describe an EHR system. (Black et al., 2011). The EHR should possess the ability to collect and deliver health information about patients with the potential to be accessed by multiple eligible users in different settings. Furthermore, EHR should have the capacity to be integrated or aided with decision support tools and empower patients in maintaining and advancing their own health. In an illustrative manner, the Institute of Medicine (IOM) in 2003 established core functions of the EHR system: the system

should be able to collect health information and data; manage results and orders; support decision making processes; serve as a means for communication and connectivity; empower and support patients; manage administrative processes; generate reports and serve public health interests. ("Key Capabilities of an Electronic Health Record System: Letter Report," 2003) Furthermore, EHR systems should be able to integrate with other clinical, e.g., Picture archiving and communication systems (PACS), Computerized Provider Order Entry (CPOE), ePrescribing, Computerized Decision Support Systems (CDSSs), and administrative systems, e.g., Billing, Enterprise Resource Planning (ERP).

In 2005, the Certification Commission for Health Information Technology (CCHIT) began the certification of ambulatory EHR systems and later added the certification of inpatient systems with regard to three aspects: functionality, interoperability, and security. Regarding functionality, EHR systems should support patient care and any functions that a provider need for process care efficiently, safely, and electronically with high quality. Regarding interoperability aspects, EHR systems should be able to use only approved standards and support data exchange. As for security aspects, systems should keep patient information secure and safe. CCHIT requires vendors to comply with over 400 criteria to achieve a certified EHR system ("Certification Handbook: CCHIT Certified® 2011 Certification Program," 2011).

Although the certification is not mandatory, healthcare providers should ensure that their EHR systems meet the requirement of patient safety. One study showed that EHRs could be a threat to patient safety if improper features, inadequate assessment or poor implementation occurs in health organizations (Koppel et al., 2005).

Along with capturing and retrieving data, the intended purpose of the EHR system is to improve the overall quality of patient care. EHR can contribute to quality and patient safety in

various ways: allowing remote access to patient data; alerting clinicians regarding abnormal laboratory results; detecting medication errors; minimizing disparities; and allowing for continuity of care among similar and multiple specialties. One study found that EHR allowed 78% of physicians to improve their overall care process, 81% of physicians to access their patient chart remotely, 65% to be alerted for serious medication errors, and 62% to be alerted for abnormal lab results. Also, 30-50% of physicians acknowledged that EHR was associated with clinical benefits by providing them with best practices regarding communication, ordering, and recommended care (J. King, Patel, Jamoom, & Furukawa, 2013). Similarly, The National Center for Health Statistics (NCHS) reported that 74% of physicians agreed that EHR improves overall patient care; encourages compliance in ordering only formulary medication; and decreases unnecessary lab tests (E. Jamoom et al., 2012).

The second category of E-health systems is that of **supporting clinical decision-making processes**. The Clinical Decision Support System (CDSS) is defined as a system that aims at "providing clinicians or patients with computer-generated clinical knowledge and patient-related information, intelligently filtered or presented at appropriate times, to enhance patient care"(Osheroff, Pifer, & JM, 2005). This objectives can be achieved by many means: patient-monitoring devices, introducing order-sets, check-ups and alerts for medication errors and laboratory findings, accessing knowledge-base resources, and many other preventive interventions. The CDSS can be used not only to prevent overdosing, for example, or alerting for interactions but also to suggest best practices. For example, the system can suggest a blood thinning medication to prevent future developing deep vein thrombosis (DVT) in patients at risk such as those with hip fracture. Evidence for benefits of CDSSs are widespread in the literature. A systematic review by Kawamoto et al. (2005), reveals that CDSSs improved clinical care processes

in 68% of the seventy reviewed studies. Furthermore, many other studies show the positive impact of CDSS on drug-drug interactions and other care processes (Jaspers, Smeulers, Vermeulen, & Peute, 2011; Lobach et al., 2012).

The third category of E-health is **systems of improving remote care**. It includes telemedicine, telecare, telerehabilitation, and many tele-based solutions. This category is excluded in this literature because the scope of this study is related to on-site health systems.

In conclusion, evidence in the literature demonstrates that using E-health is associated with significant improvements in quality of care, efficiency, and, most importantly, patient safety (Delpierre et al., 2004; Grieger, Cohen, & Krusch, 2007; Schade, Sullivan, De Lusignan, & Madeley, 2006; Thakkar & Davis, 2006). Therefore, it is important to encourage information technology adoption in healthcare, and subsequently users' acceptance.

2.3 FOCUS ON EHR IN REHABILITATION FACILITIES

As the Electronic Health Record (EHR) supports the continuity of care through promoting communication and care coordination among multidisciplinary providers, it has special importance in the rehabilitation care process. Rehabilitation care needs both multidisciplinary and interdisciplinary (integrated) care approaches in order to serve the needs of patients and their families. Rehabilitation care aims to restore physical activity, cognition and mobility of patients that can be provided through inpatient, outpatient, and home heath care services. This includes but is not limited to stroke, neurological, musculoskeletal, orthopedic, vocational and vestibular rehabilitation. Enhancing physical and functional activities requires an integrated care plan that should be consistent with the medical and social needs of patients with disabilities. This entails an

integrated care approach, which provides better delivery of care than individual, uncoordinated therapies, in isolation, to achieve better outcomes. (Bokhour, 2006; S. Carter, Garside, & Black, 2003; Strasser, Uomoto, & Smits, 2008) Furthermore, a review of the literature shows that multidisciplinary team care is proven to improve the effectiveness of rehabilitation interventions (Momsen, Rasmussen, Nielsen, Iversen, & Lund, 2012). A study by Körner showed that team development should be shifted from the multidisciplinary to the interdisciplinary approach in which all providers are at the same hierarchical level, and effective coordination and communication are achieved (Körner, 2010). In some instances, forming a multidisciplinary team and acting in an interdisciplinary approach is challenged by the reality that rehabilitation care is provided by working across professional role boundaries with different roles and skills sets across different multiple organizational providers (Griffiths, Austin, & Luker, 2004).

Another aspect that distinguishes rehabilitation facilities from other healthcare settings is the procedure of proper documentation. The Functional Outcomes (FO) approach is the dominant theme of documentation in rehabilitation facilities. FO focuses on the consequences of rehabilitation's interventions and includes documentation components related to initial evaluation, disability and social history, functional status, impairment, assessment, diagnosis, goals, intervention plan, and other specialized documentation (Quinn & Gordon, 2003).

Due to the interdisciplinary care approach and the different procedures of documentation in rehabilitation care, EHR systems provide value to all healthcare facilities, especially to rehabilitation facilities. Using EHR in a rehabilitation facility was documented first by Texas Institute for Rehabilitation and Research (TIRR) in the early 1970s. By using main-frame IT, TIRR was able to automate treatment plans, monitor laboratory data, and support decision-making processes by assessing physical therapy outcomes and eliminating time required for admission

orders through automating a scheduling model (R. E. Carter & Jackson, 1972; Spencer, Moffet, & Baker, 1973; Sterling T, 1974). Likewise, researchers found that EHR had improved their reporting capabilities through improving documentation and enhancing their abilities to assess the outcomes of interventions (Savander GR, 1973). Furthermore, one study concluded that EHR was able to reduce documentation time by 30% compared to handwritten entries (Shields, Leo, Miller, Dostal, & Barr, 1994). The authors of two other studies found that EHR in rehabilitation facilities had improved interdepartmental communication and allowed more time to be dedicated to patient care management (M. Brown & Gordon, 1986; Kaur, Forducey, & Glueckauf, 2004). Many studies show that EHR was able to improve data accuracy significantly. For example, a study by Swop (2000) revealed that EHR improved efficiency among the rehabilitation staff and enhanced their compliance with Medicare regulations. Studying the impact of EHR in physical therapy and rehabilitation facilities was conducted by (Vreeman, Taggard, Rhine, & Worrell, 2006). Reviewing 18 studies, the authors concluded that EHR was able to realize the following benefits: improving the documentation process and reporting in 11 out of 13 studies (85%); enhancing operational efficiency in 11 out of 13 studies (85%); improving communication in 7 out of 13 studies (54 %); improving data accuracy in 6 out of 13 studies (in 46 % of the studies); and supporting future research in 5 out of 13 studies (in 38 % of the studies).

Nevertheless, few EHR systems address the specific requirements of rehabilitation facilities. Only 26% of EHR systems implemented in 2004 had components related to physical, respiratory, or occupational therapy. Meanwhile, only 25% of providers plan to implement these components in the near future ("Sixth Annual Survey of Electronic Health Record Trends and Usage for 2004.," 2004). Furthermore, an explanatory study conducted in 52 multiple- disciplinary facilities in Boston and Denver showed that rehabilitation facilities are considered lax in the

adoption of basic functionalities of information technology in their setting. The following are functionalities deemed lacking in rehab facilities: results viewing in 92%, inpatient EHR in 99%, inpatient CPOE in 99%, claims handling in 23%, eligibility checking in 83%, and patient-provider communication in 99% of surveyed facilities (Poon et al., 2006).

The main barriers to implementing EHR in rehabilitation facilities was identified in a systematic review by Vreeman et al. (2006), where behavioral changes were cited as the primary barrier in 5 out of 7 studies (71% of the studies that identify EHR barriers in rehab). Subsequently, technological immaturity and inadequate staff training were the two other barriers (each was cited in 30% of the studies). Consequently, Vreeman et al recommended increased user involvement in decision-making processes, acquiring adequate education and training, and implementing proper change management practices for successful EHR systems deployment in rehabilitation facilities (Vreeman et al., 2006).

At this point, acceptance of EHR has been studied considerably across different healthcare settings, and variables that influence acceptance are always worth investigating. Acceptance of EHR in rehabilitation facilities presents extra challenges because of multidisciplinary and interdisciplinary care approaches and the differences in documentation formats and processes that occur in rehabilitation facilities.

2.4 HEALTHCARE IN SAUDI ARABIA

Healthcare in Saudi Arabia is a national health care system in which governmental agencies provide 78.9% of total health services. The total number of hospitals in Saudi Arabia is 420 (58696 beds) and the Ministry of Health (MOH), the primary healthcare provider (58.9% of health

services), operates a total of 251 hospitals (34,450 beds) and 2,109 primary health care (PHC) centers. Other governmental agencies are responsible for 20% of services provided through 39 hospitals and 10,948 beds. Those other agencies include National Guard Health Affairs, Ministry of Defense Health Affairs, King Faisal Specialist Hospital and Research Centre, Teaching Hospitals of Ministry of Higher Education, the Ministry of Interior Health Affairs, Commission for Jubail and Yanbu Health Services, Health Services of Ministry of Education and the Red Crescent Society. The remaining health care services (21.1%) are provided by the private sector through 130 hospitals with 3,298 beds (Almalki, Fitzgerald, & Clark, 2011; MOH, 2011b).

The demand for health care services in Saudi Arabia is challenged by the diverse and enormous geography of the country, the high population growth rate (3.19% annually between 2004 and 2010), the disparities among healthcare providers across the country, the variety in the workforce components (31% are expatriates, comprising at least 100,000 expats from each of 13 different countries, and many others from elsewhere), the immaturity of the deployed information technology, and the struggle in managing information technology projects and resources in the past decade (Almalki et al., 2011). Notably, the lack of resources is not considered to be among the most significant barriers in light of the huge governmental spending on health care in Saudi Arabia. (Health expenditure represents 6.9 % of the GDP as of 2011) (Almalki et al., 2011; M Altuwaijri, 2008; MOH, 2011a)

2.5 IT IMPLEMENTATION IN SAUDI HOSPITALS

Recently, the Saudi government has taken serious initiatives toward the adoption of E-health applications. The national E-health project was kicked off in 2011 with a promising E-health strategy and roadmap plan. The envisions "a safe, quality health system, based on Patient Centric Care guided by standards, enabled by E-health" (MOH, 2011b). The drivers behind the E-health project are the benefits that could be attained for patients, providers, and the health system in general. The MOH conducted a study in 2008 to assess the impact of E-health projects. It revealed that the E-health project would save 10-15% of the MOH annual budget in addition to other benefits, such as enhancing the healthcare delivery process (*SAHI, SR 4 billion for e-Health project'*, 2008). Thus, MOH has aligned its strategies setting patient care at the heart of the E-health project's objectives. For example, the MOH strategic plan of creating integrated and comprehensive health services is aligned with improving care for patients. This objective embraces providing connected care at point-of-service with standardized data and modules. Due to the complexity of the national E-health project, financial challenges and the lack of both trained personnel and supplies, the objectives have been prioritized and projects will be delivered in a phased manner. For example, automation of care is set to take place in the first three years of the project, followed by the creation of basic EHR (iEHR) and allowing for advanced EHR (iEHR) to take place within ten years of the project kick-off. The automation process will also be implemented in phases. It is planned to begin with building systems for primary care centers, then establishing integrated health information systems with more emphasis on deploying Picture Archiving and Communications Systems (PACSs) and providing portals for care providers. Standardization of data will be initiated by creating data centers and working toward data integration within five years and will end with vertical integration and data warehousing within 10

years of the start date. Furthermore, the national E-health project involves acquiring clinical innovation solutions, improving infrastructure, building disease registries, and empowering Telecom-based care services (MOH, 2011b).

Beside MOH, National Guard Health Affairs (NGHA) has been involved in E-health since its first IT initiative in 1999. Their integrated system is a vendor-based QuartaMed EMR® system, with the first EHR module established in 2001 and on site by 2004. Since then, the Enterprise Resource Planning (ERP) system, PACS (2006), Radiology Information System (RIS), Lab Information System (LIS), Computerized physician order entry (CPOE) (2009 for Riyadh and in late 2011 for three other sites), and other automation systems were added incrementally. The fully integrated system was available in 2010 and, as a result, NGHA received the Middle East excellence award in electronic health records during the Arab Health conference in 2010 (Altuwaijri, 2011).

King Faisal Specialist Hospital and Research Centre (KFH&RC) is one of the first hospitals to introduce and implement Enterprise Resource Planning (ERP) into its healthcare operations. Furthermore, KFH&RC has been involved in a long partnership with Cerner® and acquired Cerner EMR®. HIMSS Analytics Asia announced that King Faisal Specialist Hospital & Research Center (KFSH&RC) in Riyadh and Jeddah, Saudi Arabia, achieved stage 6 on the Electronic Medical Record Adoption Model (EMRAM). "King Faisal Specialist Hospital & Research Center is clearly leading the way on EMR adoption," according to John Hoyt, Executive Vice President, Organizational Services, for HIMSS (HIMSS, 2012). Furthermore, the hospital management has enforced security and privacy measures based on the Health Insurance Portability and Accountability Act (HIPAA).

King Fahad Medical City (KFMC) is a giant healthcare provider in the Saudi capital city of Riyadh with a capacity of 1,095 beds distributed over four main hospitals. The main hospital has many outpatient specialized clinics with 459 inpatient beds. Other hospitals include: rehabilitation, women and children, and the largest surgical and intensive care center in the region. KFMC has deployed an electronic health record and clinic information system from CGM CORTTX EHR (Kortex EMR®). Further, KFMC has integrated their health information systems with other peripheral informatics solutions (PACS, Pyxiz, and others) and recently introduced a nurse informatics solution by CompuGroup Medical (CGM) and an incidence reporting system (Datix). Additionally, a homegrown system for patient referral was introduced to facilitate referral between hospitals ("KFMC Website," 2013). King Khaled Eye Specialist Hospital KKESH has been interested in health information solutions. Furthermore, it has been using CGM CORTTEX (Kortex EMR®) since 2006 and recently has discussed shifting to other health IT vendors ("KKESH Website," 2013). King Saud University signed a contract with Cerner in the beginning of 2013 to replace its legacy systems (McDonnell Douglas® plus In-house management system) to Cerner EMR® in its two affiliated hospitals King Khalid University Hospital (KKUH), and King Abdulaziz University Hospital (KAUH). Furthermore, the contract includes automation of all clinical processes and links it with knowledge bases("King Saud University Signs Strategic Agreement with Cerner for Two Major Hospitals in Saudi Arabia," 2013).

The rehabilitation services are provided through many general and specialized hospitals. According to MOH's yearly report, there were 277,000 cases treated through MOH hospitals in 2011 and over 139,000 cases through other governmental hospitals. Among specialized hospital in rehabilitation is Prince Sultan bin Abdul-Aziz Humanitarian City in Riyadh, which is a 400-bed

hospital and opened in 2002 to provide both in- and out-patient rehabilitation services. This hospital has a vendor-based EHR Intersystem (HBO) EMR®.

To assess the overall adoption of health information systems in Saudi hospitals, the following literature gives an overview of the Saudi status. In a recent survey conducted by Aldosari, in twenty-two (16 public and six private) hospitals in Riyadh, 67% of hospitals had not yet completed the requirements of basic EMR, and only one hospital (4%) had a comprehensive EMR. Additionally, more than 84% of hospitals have vendor-grown EMR (Aldosari, 2014). A study conducted by Bah in 2011 revealed that only three governmental hospitals in the eastern province of Saudi Arabia have EHR out of 19 hospitals surveyed (Bah et al., 2011). The third study shows that only 26% of respondents in six major hospitals in Saudi Arabia believe that they have fully implemented EHR, while 60% of respondents believe that they have partially implemented EHR. The remaining 14% have no EHR in their hospitals, nor do they believe it will be implemented soon (S. Alanazy, 2006).

Although the studies show a discrepancy in percentage of penetration of HIT in Saudi hospitals, the overall adoption rate is definitely less than 20% considering that MOH, the main health services provider in the country, is still in the early phases of acquiring HIT, in planning and readiness assessment. Additionally, determining the status of HIT in the Saudi health system is problematic since the level of care, type of services, hospital capacity, sophistication of infrastructure, and eligibility criteria for treatment in Saudi hospitals vary across hospitals. Consequently, more studies are needed to assess the status of EHR by type of provider (government or private), number of beds (small, medium, large hospitals), level of care (primary, secondary, tertiary), treatment eligibility of provider (referral, military, civilian), and other characteristics.

Nevertheless, healthcare providers have been showing positive perceptions toward E-health in Saudi Arabia. A study conducted in 2011 in King Abdul-Aziz Medical City (KAMC) revealed that healthcare providers support EHR systems and think is important and beneficial for both parties-patients and providers (Al-Harbi, 2011b). Furthermore, the extent of realizing EHR benefits was found to be dependent on the level of understanding the potentiality of IT, types of barriers, and personal skills and training.(Walston, Bennett, & Al-Harbi, 2013). Another study assessed the satisfaction of physicians toward using CPOE in National Guard hospitals. The satisfaction rate was high, and physicians believed that CPOE had positively impacted the care process by reducing errors and improving the ordering process, thus boosting efficiency and the quality of care (Saddik & Al-Fridan, 2012). Public perception of E-health solution were assessed in Qurban's study, which disclosed that the majority of respondents would like to have access to E-health solutions (Qurban & Austria, 2008).

Nevertheless, the Saudi health system is facing a struggle in adopting health data standards. Within and across healthcare organizations, many terminologies, messaging standards, content representations, and applications protocols are being used as a means of carrying out care across multiple providers. Sharing information about patients is especially important for Saudi Arabia for many reasons, among which are the purpose of continuity of care, the disparity in healthcare services, the vast distances between cities, and the multiple sites across the country for single provider. The MOH provides 60% of health services through 249 hospitals and 2094 primary care centers, followed by other governmental parties which provide 18% through the three main military hospitals with more than 19 sites across the country. Adapting health data standards in Saudi Arabia is still lagging behind most health systems in developed countries. The Saudi MOH has been using the International Classification of Diseases (ICD) for many decades to report

mortality rates to the World Health Organization (WHO). As of yet, the ICD is not incorporated into the health care system even in the advanced hospitals in Saudi Arabia (KFSH&RC, NGH and other). In 2005, MOH updated its reporting system from ICD-9 Clinical Modification (ICD-9 CM) to ICD-10 Australian Modification (ICD-10 AM). Furthermore, MOH required all other healthcare providers to shift to the newer coding system. Among the six biggest hospitals in Saudi Arabia, three hospitals are still using ICD-9 CM due to some compatibility issues (Alkraiji et al., 2013). Moreover, the classification of diseases is still considered a standalone process and encoder systems are used to create codes. As a result, there is still difficulty in standardizing care, accurately reporting the intensity and distribution of disease and reimbursement. Based on that, the planning process is constrained, especially in allocating resources based on the standardized disease reporting system.

The Saudi Council of Cooperative Health Insurance (CCHI) required all health insurance companies, claim processing parties, and private healthcare providers to introduce the coding system of AR-DRG/ICD-10-AM by April 15, 2013. The parties were not able to meet the date, and the CCHI had to delay the due date and grant more time for this transition. The CCHI requires all parties to achieve the required measures of applying the following classification into their practices: the sixth revision, Australian Modification (ICD-10-AM) codes, the Australian Classification of Health Interventions (ACHI), the Australian Coding Standards (ACS), and assign an intensity code (Australian Refined Diagnosis Related Groups AR-DRG) (CCHIT, 2013). Many observers are still doubt about the abilities of designated parties to fulfill the new timeline due to many difficulties related to the lack of skilled coders, the current status of clinic documentation, and the cost associated with acquiring systems and upgrading infrastructure.

Basic components of SNOMED-CT are used to uniquely identify medical data (and information) consistently and with a great granularity. This is "probably the single most important component for interoperability" as cited by (CCHIT, 2013) According to Alkraiji et al. (2013) five out of the six most advanced hospitals in Saudi Arabia use SNOMED (two hospitals use SNOMED-CT, and three hospitals use SNOMED-II). Nevertheless, hospitals mainly use SNOMED in the lab department and to report cancer cases to the Saudi Oncology Center. Furthermore, only one hospital uses the Current Procedural Terminology (CPT) codes to communicate information about medical and procedural services for administrative, analytical, and financial purposes. Considering that most hospitals recently implemented PACS systems in their Radiology departments, DICOM 3.0 standard is in use in all advanced hospitals (Alkraiji et al., 2013). Furthermore, the HL7 messaging standard is used in all advanced hospitals (Versions 2.2 and 2.3) to provide seamless transmission of health data in package form between different information systems.

In conclusion, the current status of E-health in Saudi Arabia is unclear in light of the variability in health services across the country, the maturity of information systems and IT infrastructure, the lack of a nation-wide survey, and differences in the methodologies of published literature.

2.6 SUCCESSFUL ADOPTION OF TECHNOLOGY AND ACCEPTANCE

Deploying EHR systems can be tedious as many issues can impair the process (Hage, Roo, van Offenbeek, & Boonstra, 2013). According to the survey by Aldosari, 57% of the respondents believe that physicians' resistance is the top barrier of EHR implementation, while 38% think that

acquiring the proper system that meets hospitals' needs, and lack of management support are the main barriers (Aldosari, 2014). Similar to Aldosari's findings, Bah et al. (2011) found that physicians' resistance was the main barrier in hospitals of the eastern region of Saudi Arabia. More comprehensive reviews of barriers pertaining to the Saudi healthcare system were provided by the following studies: Khalifa (2013), Altuwaijri (2008), Alanazy (2006), and Alkraiji (2013). The general themes in these literature-addressing barriers can be seen as the following:

1) Human/behavior barriers pertaining to users' beliefs, attitudes, and behaviors. Usually, attitudes, and consequently, behaviors are shaped based on personal beliefs and values, as well as awareness of the importance and benefits of EHR.

2) Profession-related barriers associated with the medical practice and culture within hospitals. This includes professional autonomy and the physician-patient relationship. Professional autonomy, for example, can play an important role in accepting EHR. Highly trained professionals, such as physicians and nurses, have a sense of autonomy about how they perform their jobs.(Berg, 2001) EHR may be perceived as interfering with their work, and may be seen as allowing for managers to take more control over the care process and health professionals' performance (M Altuwaijri, 2008; Khalifa, 2013). Providers may believe that EHR may adversely affect productivity in the early phases of implementation (Al-Harbi, 2011b).

3) Technical barriers concerning computer and IT. This dimension includes difficulties resulting from: system quality, complexity of EHR, system usability (S. Alanazy, 2006), lack of authentic knowledge and awareness of the nature of EHR and its benefits (Qurban & Austria, 2008); current IT infrastructure and availability of user's portals (Al-Harbi, 2011b); and instability of vendors (S. Alanazy, 2006).

4) Organization-related barriers, including difficulties resulting from misalignment of IT to organization's goals, poor project management, insufficient management support, lack of training, inadequate change management plan, and low user involvement in the decision of acquiring EHR (M Altuwaijri, 2008; Khalifa, 2013).

5) Financial barriers, pertaining to the cost of IT, return on investment, impact on reimbursement, and other costs of personnel and infrastructure (S. Alanazy, 2006; Khalifa, 2013).

6) Legal and regulatory barriers including lack of appropriate policy and procedures, ineffective national regulations, and law enforcement bodies (S. Alanazy, University of, & Dentistry of New, 2006; Aldajani, 2012; Alkraiji et al., 2013).

The previously mentioned barriers hinder the adoption of EHR and thus the rate of implementation has leveled off to some extent across the country. To explain this phenomenon, first we should understand how technology spreads over certain industries or societies. Rogers defines the rate of adoption of innovation as "the relative speed with which an innovation is adopted by members of a social system" (Rogers, 2003). The rate of adoption is varied based on how individuals perceive an innovation (Rogers, 2003). Based on the theory of diffusion of innovation, adoption can be accelerated if EHR exhibits a relative advantage over the traditional medical record. The perceived advantages of EHR by individuals (not necessarily realized), e.g., improving care and better utilization of resources, will result in better adoption. The second characteristic that leads to more adoption, based on the theory of diffusion of innovation, is the degree to which individuals perceive technology as compatible with their values, standards and experience. The third is the perceived ease of use of EHR. Simplicity of the EHR plays an important role in deciding whether to adopt or not as it would require learning new skills or

obtaining new understanding. Finally, the ability of individuals to test and practice using the EHR and to observe results and benefits are important aspects in the diffusion of innovation according to Roger's theory (Rogers, 2003).

In addition to these attributes that affect innovation, human and social variables play important roles in diffusion of innovation. According to Rogers, an individual experiences five stages before accepting any new innovation:

1. Knowledge, in which users identify the innovation but still lack information.
2. Persuasion, in which users start to seek more information about the innovation.
3. Introduction of the concept of change, in which users are on their way to making a decision by weighting advantages against disadvantages.
4. Implementation of innovation and assessing its usefulness.
5. Confirmation is the last stage, in which users accept and integrate the newly-introduced innovation into their work.

Accordingly, personality and social characteristics in addition to the social system norms usually impact users' acceptance of the innovation, in particular the first knowledge stage of Rogers's model. Similarly, communication has special importance in the diffusion of innovation according to Rogers' theory. This has special importance for innovations like EHR, which present a high degree of uncertainty about their usefulness and substantial risks. Such a process should take into account that users are highly trained professionals and that their autonomy should be preserved and watched.

Overcoming the barriers mentioned above and enhancing the means of spreading innovation should facilitate the adoption of EHR. Successful adoption of EHR requires individual

or user acceptance as it is cited as one of the most important aspects in accepting newly-deployed technology (Fred D Davis, 1993; Fred D Davis et al., 1989; Igbaria et al., 1995; Kottemann & Davis, 1991). Predicting users' acceptance requires determining (assessing) their intention to use the system. According to the Theory of Reasoned Action (TRA), using EHR can be predicted by user intention to use, which in turn is mediated by users' attitudes toward using the system and their beliefs and motives (Fishbein & Ajzen, 1975)

Adopting Fishbein & Ajzen's theory of Reasoned Action (TRA), attitudes (AT) toward using EHR are determined by users' beliefs toward the consequences of using EHR and their evaluations of these consequences. Accordingly, belief entails an individual's perception that specific a behavior will yield specific consequences. Furthermore, Fishbein & Ajzen reveal that behavioral intention to behave (using EHR in this context) is also influenced by Subjective Norms (SN), which represent an individual's normative beliefs and propensity to comply with the norms.

Later, Davis introduced the Technology Acceptance Model (TAM), in which he replaced TRA's variables (AT and SN) by two technical measures: perceived usefulness (PU) which is defined as the belief that the system will enhance performance, and Perceived Ease Of Use (PEOU) which is the belief that using the system will be free from effort (Fred D Davis, 1989). Further, Davis et al (1989) mentioned that system design and characteristics have the potential to play major roles in underlying the construct of PU, while self-efficacy plays a major determining role in forming the construct of PEOU (Christopher A. Harle, Gruber, & Dewar, 2014).

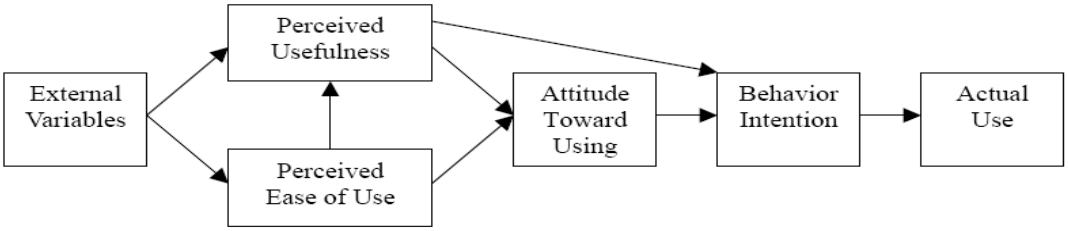


Figure 4: The Technology Acceptance Model (TAM)

The evolving number of studies in the health information management field and the different aspects considered in each study argue for a more comprehensive approach in which all aspects of EHRs' implementation are acknowledged, including the interdependencies that exist between variables— human, technological, and organizational— are understood before effective interventions or recommendations are implemented (Boonstra & Broekhuis, 2010; van Gemert-Pijnen et al., 2011).

3.0 THE PROPOSED COMPREHENSIVE APPROACH TO EXPLAIN USERS' ATTITUDES TOWARD EHR

Considering EHR barriers, diffusion of innovation, the theory of Reasoned Action (TRA), and the Technology Acceptance Model (TAM), acceptance of EHR can be determined as a result of the following variables:

Human dimension: includes beliefs, emotions, and perceptions toward EHR. Personal characteristics and awareness of the importance and benefits of EHR shape this dimension.

Technical dimension: relates to EHR design, user's IT knowledge, skills, and past experience.

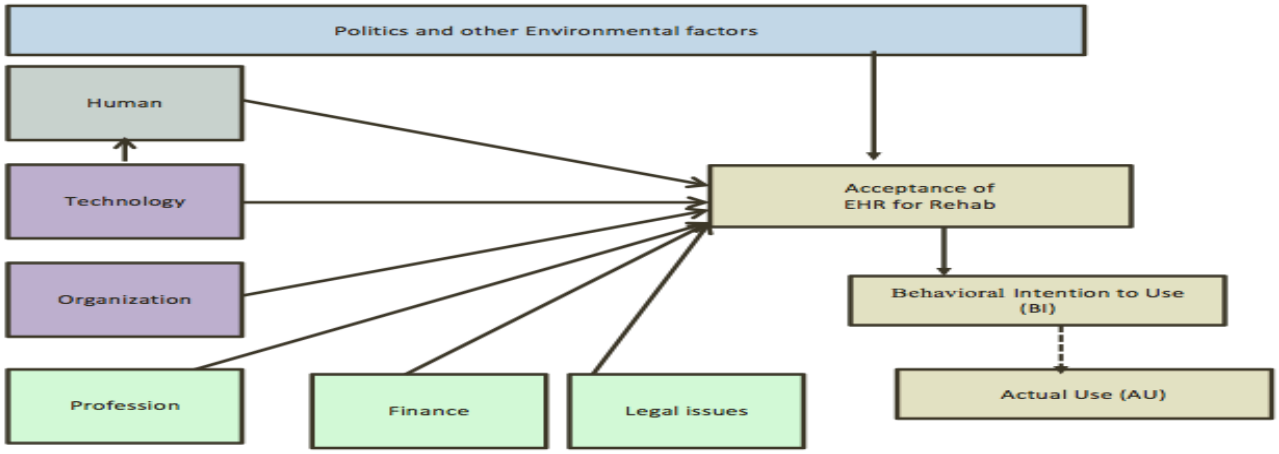
Organizational dimension: includes aligning EHR to the organization's vision and goals, high-management support, training, change management plan, and user involvement in the decision to acquire EHR.

Profession dimension: relates to the nature of medical staff members working in hospitals. This includes: professional autonomy and physician-patient relationship.

Finance dimension pertains to the cost of EHR, cost of personnel and systems, reimbursement, and possible ROI.

Legal and regulatory dimension: includes difficulties resulting from lack of compatibility of laws and regulations.

The following framework demonstrates the proposed acceptance model:



3.1 ATTITUDE "ACCEPTANCE" TOWARD EHR

Often, characteristics of personality and users' awareness—about EHR functions and anticipated outcomes—shape their attitudes toward EHR (Greenhalgh, Robert, Bate, Macfarlane, & Kyriakidou, 2008). Attitude is defined as the mental disposition that exerts influence on favoring or disfavoring an entity. Attitude can be seen as a mental folder that stores feelings, emotions, beliefs, and knowledge. It is an internal evaluation of the "attitude object" (LaPiere, 1934). Thus, it considers latent or hypothetical variables that cannot be directly observed. Therfore, measurable responses are used to give operational definition of the attitude (as a construct) (Pratkanis, Breckler, & Greenwald, 1989). A study by Rosenberg et al. shows different measureable responses and how to infer attitude based on that. The study proposed the ABC (tri-components, tripartite, trichotomy) model of attitude. The model has the following components: Affective responses that deal with emotion, feeling and values toward the attitude object; Behavior (conative) responses, including actions, commitments, intentions, and behavioral inclinations that are influenced by the attitude objective; Cognitive responses, which reflect perceptions, information, and facts about and

around the attitude object (Rosenberg & Hovland, 1960). As a result, the evaluative disposition (attitude) is shaped. Accordingly, the three components represent first order variables; hence, at a higher level of abstraction, the attitude is created as a second order single construct in this hierarchical model. In a later structuring of the model, Ajzen and Fishbein present attitude as a sole concept that represents the overall evaluative disposition, while the three components (affective, behavior, and cognation) are seen as antecedents of or subsequent to attitude (Ajzen & Fishbein, 1980).

Furthermore, Ajzen and Fishbein consider that behavior is determined by intention to perform that behavior and that it is a result of overall evaluation in an orderly manner (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). A causality exists between intention to behave and performing the behavior; and "overall, intentions have considerable predictive validity" of human's behaviors (Fishbein & Ajzen, 2011). Meanwhile, performing a behavior could provide new information, which may change existing perceptions and beliefs. This can be demonstrated by reversing the order from behavior (at far right), which results in changing subsequent behaviors. This can be seen as a cycle in which beliefs initiate the intention to perform action, and inversely, actions yield experiences, which possibly impact beliefs. This research regarding regards only causal relationships from affective, conative, cognition to attitude, intention, and behavior, rather than the other way around.

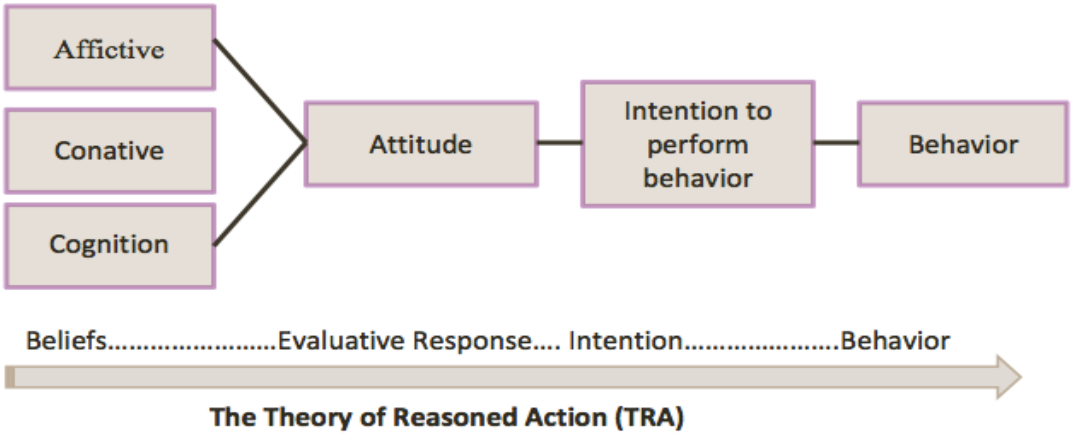


Figure 5: The ABC Model of Attitude and TRA

Besides the dispositional attribute (internal characteristics of an individual) and under the influence of social pressure, Ajzen and Fishbein emphasize that engaging in a behavior can be restrained by the approval or disapproval of an individual's peers. Furthermore, behavior can be impeded by the required skills and abilities to carry out a particular behavior. Therefore, Ajzen and Fishbein proposed their newer version of the theory of reasoned action "Theory of Planned Behavior" by positing that behavior is predicted by intention that results from favorable attitudes (behavioral beliefs), compatibility with social pressure (perceived norms or normative beliefs), and ability to perform the specific behavior (perceived behavioral controls or control beliefs) (Fishbein & Ajzen, 2011).

Ajzen and Fishbein introduced the perceived behavioral control, which is defined as perceived ease or difficultly in performing a behavior, in their previous model. Since then, many researchers have been conducting studies and reviews to test the validity and predictability of Ajzen and Fishbein's theories in health-related behaviors. Two meta-analyses were conducted to measure people's tendency to use condoms and to test the predictability of the TPB and the strength of intentions-behavior link (Albarracin, Johnson, Fishbein, & Muellerleile, 2001; Sheeran &

Taylor, 1999). The reviews reveal that behavior (condom use) was correlated with behavioral intention BI (weighted r = 0.45). Attitude was correlated more with intention AT (weighted r = 0.45 to 0.58) than perceived behavioral control PBC (weighted r= 0.25 to 0.35) and subjective norm SN (weighted r = 0.39 to 0.42). Similarly, another meta-analysis carried out by Armitage and Conner reviewed over 185 studies examining the predictive power of the TRA and TPB. They found that the TPB is more predictive, as it was responsible for 39% of variance in behavior as compared with 27% of the TRA (Armitage & Conner, 2001). Furthermore, behavioral intention was strongly connected to behavior (weighted r = 0.47) and attitude to intention (weighted r = 0.49), while both perceived behavioral control PBC and subjective norm SN (weighted r= 0.43 and 0.34, respectively) were also connected to forming behavioral intention but to a lesser extent than attitude. A number of other studies support the predictive power of intention in health-related behaviors. For example, testing the intention-behavior link in the decision to use dietary supplements revealed that intention is the best predictor of behavior (Odd Ratio OR=2.0) and that attitude is the best predictor of intention (OD=1.4) (Conner, Kirk, Cade, & Barrett, 2003). TPB was used to predict safe food handling behaviors and was found to be a strong tool in predicting 66% of variance in intention and accounted for 21% of variance in behavior (Mullan & Wong, 2009). The TPB was also tested across disciplines and yielded great predictability; it was tested to investigate entrepreneurial behaviors and was found to account for 41% and 39% in the variances in intention and behavior, respectively (Kautonen, Van Gelderen, & Tornikoski, 2013).

Because of the established stream of literature demonstrating the power of the TPB to predict behavior, management of hospitals acquiring IT, for example, should encourage users to form a positive intention by establishing a plan on how acceptance can be achieved (Gollwitzer, 1999; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004).

To sum up, the above studies show that the TPB can be used to predict intention as well as acceptance of the acquired EHR. Consequently, the TPB is adopted in the current study as the basis of predicting the intention to accept and subsequent acceptance and usage of EHR.

3.2 HUMAN-RELATED DIMENSION

As mentioned earlier, attitude can be seen as a construct that stores feelings, emotion, beliefs, and knowledge (Greenhalgh et al., 2008; LaPiere, 1934). Thus, human-related variables, including beliefs, attitudes, and behaviors, can be constructed as attitudes toward EHR. The technology acceptance model (TAM) has evolved as the most reliable and parsimonious model by researchers to predict users' acceptance of EHR systems and to explain variances in their usage. Furthermore, based on a solid body of literature, it is a robust and powerful model to measure attitude and is linked to users' perceptions of the system (W. R. King & He, 2006; Pai & Huang, 2011; Schepers & Wetzels, 2007; Yousafzai, Foxall, & Pallister, 2007a, 2007b).

Fred Davis introduced TAM in 1986; it is conceptualized around the mediating roles of two endogenous constructs, the perceived usefulness PU (the belief that the system will enhance performance) and perceived ease of use PEOU (the belief that use of the system will be free from effort); these two constructs form the behavior intention (BI) leading to actual use of EHR (Fred D Davis, 1989, 1993; Fred D Davis et al., 1989; Davis Jr, 1986).

David and his colleagues examined the predictability (validity) of TAM by measuring users' early perceptions and how that would predict their short-term and sustained use of a system. The three constructs that are underlined in the TAM (PU, PEOU, BI) were measured at the time

of a prototype, one month and three months after the system was used. They found that users are able to harmonize stable usefulness perceptions and sustain intentions over a period of time. However, users required on-hand experience to form a stable judgment regarding EOU over time. Therefore, early perceptions of users can be used as a basis to predict their future usage especially regarding their perceived usefulness and intention to use (Fred D. Davis & Venkatesh, 2004). TAM presumed a voluntary use of systems, and users made their decisions solely based on their perceptions. In such an environment, PU was found to be the main determinant of users' intentions (Fred D Davis et al., 1989). In contrast, PEOU was the main determinant when TAM was examined in a mandatory environment (S. A. Brown, Massey, Montoya-Weiss, & Burkman, 2002).

The simplicity and its reasonable predictability (40% of system use according to some sources (Chau & Hu, 2001; Venkatesh & Davis, 2000)) have encouraged researchers to continue developing extensions and more applications of TAM through years of research and experience. Venkatesh and Davis were driven by the determinant role of PU and cognitive instrumental processes that precede and influence the perception of usefulness reaching TAM2 (Venkatesh & Davis, 2000). Later, Venkatesh and Bala proposed TAM3, in which they suggested antecedents of PEOU. They identified two types of variables that influence the ease of use: general beliefs about IT (Anchors) and beliefs that are shaped after hands-on experience (adjustments) (Venkatesh & Bala, 2008).

Other researchers argue that significant improvement in TAM rather than incremental changes is needed as some controversy is seen regarding TAM's theoretical assumptions and practical applications (Chuttur, 2009). Furthermore, growing evidence indicates the need for including more variables in the core variables of TAM. The flow of research continues to reveal influential variables and coming up with acceptance model remains a sought-after goal (S. A.

Brown et al., 2002; Richard J Holden & Karsh, 2010; Ketikidis, Dimitrovski, Lazuras, & Bath, 2012; Lee, Kozar, & Larsen, 2003; Legris, Ingham, & Collerette, 2003; Pai & Huang, 2011; Turner, Kitchenham, Brereton, Charters, & Budgen, 2010; Wixom & Todd, 2005; K. Wu, Zhao, Zhu, Tan, & Zheng, 2011).

Nevertheless, other literature supports the power of TAM and implies unexplored applications for TAM, especially if it is used in its proper context. Otherwise, an insightful validation and reconsideration of influential variables are warranted and further improvement in the predictability of the model should be pursued (S. A. Brown et al., 2002; Turner et al., 2010)

TAM has notable serious flaws regarding its overlooking of some variables related to the context of decision-making and usage processes. Contextual aspects of using EHR (e.g., cultural, social, and organizational variables) may play important roles in shaping individuals' attitudes toward technology (Bagozzi, 2007; Chuttur, 2009). Furthermore, the link between attitude and intention is contested by the fact that TAM treats the attitude as an end-goal, while in fact it is just a means to a more essential goal (actual use). Accordingly, attitude should be followed by more planned actions such as overcoming barriers, monitoring progress, and positively managing change processes (Lee et al., 2003; Legris et al., 2003).

Even though a plethora of TAM versions exists, the model is challenged by being a standalone model to predict users' acceptance and, as a result, the author envisions TAM as part of a broader model in which other constructs related to context of use are important and should be included. Thus, the basic constructs of TAM (PU and PEOU) will be used to measure the human-related variables in which these perceptions have been validated and examined to represent users' beliefs and attitudes.

Perceived Usefulness (PU)	Human-related Dimension
Perceived ease of Use (PEOU)	

Figure 6: Human-related Variables

3.3 TECHNICAL-RELATED DIMENSION

Technical-related variables are related to EHR design, users' IT knowledge, skills, and past experience. EHR as a system encompasses many functions, hardware, software, data presentations, and data-flows (source-oriented, time-oriented, and problem-oriented). Thus, such a technical build requires users to have a certain level of skills and technical capabilities. Beside those competencies, the technology itself cannot be considered mature in light of the fact that EHR systems are not designed based on users' unique needs and a pronounced effort is needed to customize the acquired EHR system.

As most physicians are not technical experts, nor are EHR systems built around their preferences, physicians can be reluctant to accept EHR. The IT ability and technical training play roles in predicting user attitudes toward EHR. Sometimes, hospitals and organizations underestimate the importance of such skills and training given that insufficient skills and training can result in poor acceptance and resistance (Joos, Chen, Jirjis, & Johnson, 2006; Lærum, Ellingsen, & Faxvaag, 2001). Furthermore, inadequate IT skill was seen as a potential barrier for adopting EHR among 53.4% of pediatricians in one study (Kemper, Uren, & Clark, 2006). Hence, having the capability to use EHR is the first step in seeking the widespread adoption of EHR.

Meade et al carried out two national surveys for General Practitioners (GPs) in Ireland and found that 63% of respondents reported that lack of IT skills was an important barrier that interfered with the computerization of their practices, and 46% shared that typing ability was an additional struggle (Meade, Buckley, & Boland, 2009).

Complexity of the EHR format and multi-functionalities are another facets that impact user attitudes toward EHR. Users have to learn how to use the acquired EHR because it is their day-to-day work. Due to system complexity, most of the respondents in one study deemed that using EHR systems is a challenge because most of the current products have many functions, screens, and navigation options. Considering the users' limited time and learning curve, productivity was impacted, and initial quality promises were unfulfilled (Robert H Miller & Sim, 2004). Thus, users should invest more time in learning effective and proper ways to use EHR. One study by Yan et al revealed that 77.5% of physicians perceived lack of training and the negative impact on productivity as the most important barriers to adopting EHR. (Yan, Gardner, & Baier, 2012) Additionally, impact on productivity was considered a major barrier among 59% of the non-EHR adopter respondents and among 37% of the EHR adopter respondents in the 2011 NCHS Physician Workflow Survey (E. W. Jamoom, Patel, Furukawa, & King, 2014).

Perceived capabilities of the EHR system are another important aspect shaping user attitudes toward EHR systems. Physicians have expressed fear of EHR's becoming outdated. This was found to be a major barrier especially in solo/small practices either because of the volatility of the IT market or simply because the vendors do not adequately update their products. In one study, 54% of a sample of over 5,000 family physicians expressed concerns that vendors may leave of the market after selling their EHR products (Valdes et al., 2004). A study by Rao et al found that as the number of physicians per practice increased, concern over obsolescence decreased, i.e.,

the percentage dropped from 47% in practices with one to two providers to 34% among respondents in practices with more than 11 providers (Rao et al., 2011). Another study considered obsolescence a major barrier among 27% of the non-EHR adopter respondents and among 44% of the EHR adopter respondents in a national survey conducted in 2007-2008 (DesRoches et al., 2008). Moreover, some clinicians felt that EHRs were IT machine-based products designed by IT vendors and that their technical capabilities could be obscured for settings like clinics. One study found that 76.3% of physicians perceived the technical limitations of EHR as a barrier to EHR adoption (Yan et al., 2012).

Customizability of EHR is related to the ability of the EHR system to be modified according to specific needs and paths. Thus, providers should be able to customize software, inputs, outputs, and reports, as well as the specialties-specific functions. Within the context of IT literature, customizability is seen as a "dynamically identification of the best process solution to the specific problem" (Bandinelli, Fuggetta, & Ghezzi, 1993; Nidumolu & Knotts, 1998). Furthermore, customizability is linked to process predictability and flexibility and indicates how efficient the organization would be in responding to any change in its environment. The findings of Nidumolu et al.'s study indicated that customizability would be able to explain 16% and 29% of variations in process predictability and flexibility, respectively (Nidumolu & Knotts, 1998).

Nevertheless, concern over customization was stated as a significant barrier to the adoption of EHR by physicians and technical staff in a qualitative study conducted by Vishwanath and Scamurra (2007); respondents expressly complained of the "inability to customize EHR and make it [do] what I want it to do;" "inability to customize software, output, and reports to my satisfaction;" " disruption of current practice due to new business process;" and "disruption of practice due to switching and software upgrades" as their main EHR adoption barriers (4.12, 3.67,

3.90, 3.68, respectively, on a scale from 1 to 5 with 1 being insignificant and 5 being extremely significant). Furthermore, a national survey of general pediatricians revealed that 80.5% of respondents expressed concerns over finding an EHR that met their specific practices' needs and 75% emphasized the lack of ability of EHR systems to be integrated with the practice's existing system (Kemper et al., 2006). Customizability requires deep understanding of the workflows and requirements of each practice. This cannot be accomplished unless a clear identification of the needs is recognized by observation and need assessment. As a result, an ideal tool needs to be developed to guide both clinicians and business leaders in adapting an EHR that meets their specific context use (Loomis, Ries, Saywell, & Thakker, 2002).

Reliability of EHR systems is a worthwhile variable to add in assessing users' attitude toward EHR. It impacts users' decisions over whether to accept EHR or not or to continue with the paper-based means of recording health information. Reliability of information system is defined as sustainability or the probability of failure-free operations of a system for a period of time in a specific setting (Lyu, 1996). Accordingly, reliability is eventually a quantitative measure of system's behaviors and the extent to which it demonstrates desired behaviors. It can be measured by observing samples of system behavior in the field and estimating the number of system downs/failures per specific period of time (Podgurski, 2010). Thus, reliability of EHR is the "dependability of the technology systems that comprise the medical record system" (Randeree, 2007). A study conducted by Menachemi et al. found that fear of temporary loss of access to EHR in case of system failure was considered a potential barrier to adopting EHR among 38.4% and 31.1% of rural and urban physicians, respectively, in Florida (Menachemi, Langley, & Brooks, 2007). Furthermore, system downtime was a potential barrier stated by 71.5% of pediatricians in Kemper's study (Kemper et al., 2006).

Compatibility of EHR systems pertains to users' interactions with the system in order to attain the anticipated benefits. Remarkably, a study for the American Academy of Family Physicians (AAFP) found at least 264 different EHR products and that only 0.4% of respondents reported using the same EHR product. Thus, they concluded that the lack of compatibility and standardization are major barriers for the proliferation of EHR (Valdes et al., 2004). The current EHR systems vary greatly in systems architecture, data capture and retrieval methods, and used data standards. Standardizing EHR functionalities and representations are indispensable for the current efforts of the Health Information Exchange networks (HIE networks) and other data exchange and interoperability purposes (Middleton, Hammond, Brennan, & Cooper, 2005). Yet, integration of systems and data exchange is difficult and seldom possible. In one study (Robert H Miller & Sim, 2004), systems' users in 50% of the surveyed solo/small practices (10 or fewer providers) users were not able to view lab results within their own EHR, 94% were not able to view hospital data, and 50% had EHR that was not able to exchange any data with other systems. Unlike solo/small practices, large groups (70 providers and more) tended to have more integrated systems and were often able to seamlessly exchange data with their EHR. Compatibility and lack of standards were considered a potential barrier according to 41.6% and 44.1% of rural and urban providers, respectively, in one study in Florida (Menachemi et al., 2007).

Standardization of EHR is especially important in the rehabilitation setting because the functional outcomes (FO) approach focuses on the consequences of rehabilitation interventions. Standardization of records is important for following up, especially with patients with lifelong disabilities and injuries. Furthermore, standardization is needed to enhance communication and enable aggregation of data, and to assess the impact of healthcare on populations and subpopulations (Friedman, Parrish, & Ross, 2013). Compatibility and standardization were among

the most important lessons learned by PeaceHealth health network when they deployed EHR. They stated that “before an EHR can be implemented, firm, high-quality standards for technology and processes need to be in place” (Haughom, 2011).

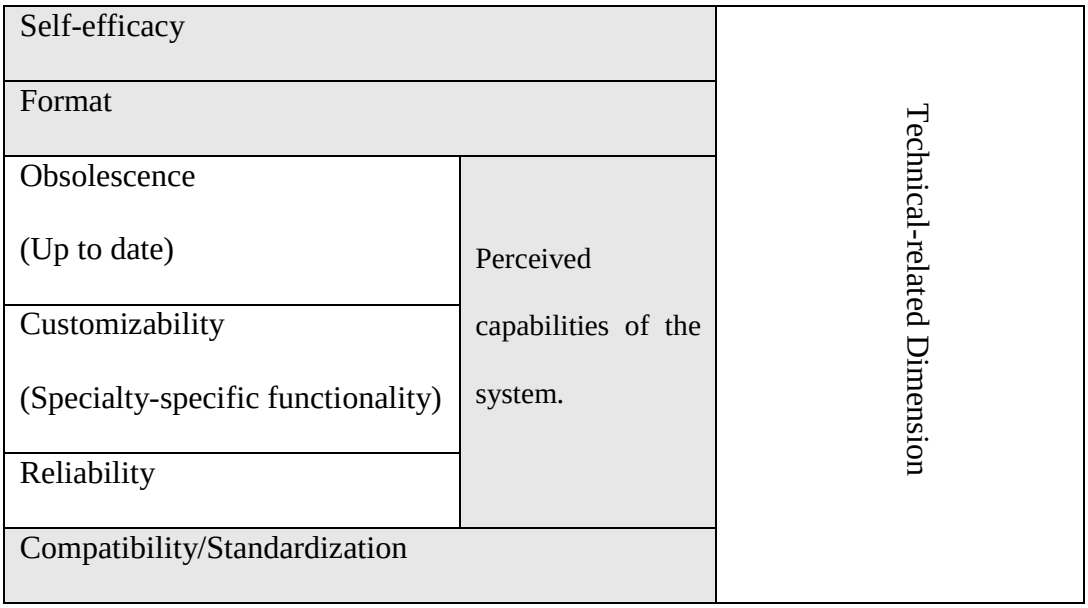


Figure 7: Technical-related Variables

3.4 ORGANIZATION-RELATED DIMENSION

A popular definition of IT implementation is “an organizational effort directed toward diffusing appropriate information technology within a user community.” This organizational perspective emphasizes the importance of aspects related to an organization’s attributes, such as organizational support and management, training, and resource availability.

Users across different organizations may perceive EHR differently. Larger organizations tend to have higher adoption rates in compared to small/medium-sized practices. As Robert H Miller and Sim (2004) found, initial costs and uncertainty about financial benefits of EHR were barriers for small-sized practices, unlike, larger practices, which invest more resources and

leadership and whose users have more technical and personnel support. Additionally, the initial cost and risk of uncertain financial benefits can spill over to physicians (Randeree, 2007). Thus, greater adoption of EHR was found to be associated with greater practice size (Burt & Sisk, 2005). Moreover, Loomis et al. (2002) and Simon et al. (2007) found that as the number of physicians per practice increased, so did the extent of usage of the EHR's functions. However, larger practices usually require more time to select a proper EHR system than small practices as the EHR implementation process tends to be more complex and requires more resources and expertise. It is worth mentioning that discrepancy in adoption rate based on practice size is found in the literature; therefore, more quantitative studies are needed to analyze the gap in the adoption rate (Boonstra & Broekhuis, 2010).

Physicians in practices that are affiliated with hospitals or have multiple specialties were found to be more likely to use EHR than physicians with their own practices. Similar to small practices, a standalone practice (owned by a single physician) has to confront all struggles related to adoption EHR unaided. Cost, leadership, and management of the change, time constraints, and legal issues are all major barriers that impact standalone practices to a greater extent than hospitals or multiple-specialties practices (Burt & Sisk, 2005; Simon et al., 2007).

The change-oriented attributes are organizational variables that have emerged as a result of acquiring EHR. Essentially, these include the following: organizational support and management, communication and user involvement, and training. Organization support can take two forms: 1) End-user support, and 2) Infrastructure support (Bhattacherjee & Hikmet, 2008). End-user support should be dedicated to the ultimate or final EHR users, usually those with low computer literacy. One hospital concluded that their success was due to the support that management conveyed to users that sufficient gain justified the cost of change (Keshavjee, Troyan,

Holbrook, VanderMolen, & Investigators, 2001). Other forms of support are related to providing the IT platform that is necessary for EHR implementation to take place, including hardware, software, and network technologies.

It has been found that the level of organizational support influences the users' attitudes toward EHR (Boonstra & Broekhuis, 2010; Dansky, Gamm, Vasey, & Barsukiewicz, 1998; Vishwanath & Scamurra, 2007). High support from top management was found to be associated with widespread adoption of EHR (Zanaboni & Wootton, 2012). Providing this support by stating clear objectives and showing commitment to users through proper communication means are believed to be the key factors for successful adoption (Denomme, Terry, Brown, Thind, & Stewart, 2011; Townes Jr, Benson, Johnston, & Vaughn, 2000); (Chiang & Starren, 2002; Studer, 2005)

Communication can play an important role in shaping user attitudes toward EHR systems. Communication is defined by Castillo, Martínez-García, and Pulido (2010) as "the act of interchanging thoughts, opinions, or information by speech, or writing." Many scholars have contend that more knowledge an objective tends to form "a fusion of the self with objective" (Pierce, Kostova, & Dirks, 2001). Thus, the more information is provided about EHR through exchanging thoughts, opinions, or information, the more self-attachment and improved attitudes there will be toward EHR (Paré, Sicotte, & Jacques, 2006). Clear communication is particularly indispensable for the assessment of users' needs, preventing redundant efforts, and facilitating resolution in EHR implementation (Yoon-Flannery et al., 2008). Ineffective communication among the EHR project team can delay EHR projects (Chiang & Starren, 2002).

Communication was found to be a critical factor in impacting user attitudes toward EHR in a systematic review conducted by Castillo et al. (2010). Considering the opinions of the potential users in all decisions related to the EHR system is a great way to obtain more user involvement in

the EHR project. User involvement is defined as “a subjective psychological state reflecting the importance and personal relevance of a system to the user” (Barki & Hartwick, 1989). User involvement helps to identify technical problems and provide suggestions, and therefore can contribute to project success (Harris & Weistroffer, 2009; Pagliari et al., 2003; Popernack, 2006; Verhoeven, van Gemert-Pijnen, & Hendrix, 2009). Furthermore, it was found to facilitate users’ acceptance (Galligioni et al., 2009) and to help in developing a feeling of ownership, which is also associated with a favorable perception of EHR (Paré et al., 2006).

Training is one of the most important factors in determining user attitudes toward EHR. As reported by Allen et al. (2000) 75% of physicians had increased their computer use after attending workshops. Training enhances EHR usage (Puffer et al., 2007) as shown by one study, in which 61% of respondents reported major improvements after one-to-one training (Kirshner, Salomon, & Chin, 2004). Lack of adequate training was cited as a major barrier of EHR adoption in substantial parts of the literature (Cheng, 2003; Lai, Macmillan, Daudelin, & Kent, 2006; Meade et al., 2009). Consequently, Zandieh et al conducted a qualitative study in which medical directors and managers in New York City were asked to prioritize their concerns or challenges during implementation of EHR. They revealed that adequate training and ongoing support are the most important approaches to overcoming EHR implementation challenges (Zandieh et al., 2008). Also, Castillo et al. (2010) in their systematic review cited training and technical support as one of six critical factors in the successful adoption of EHR. Furthermore, 59.4% of physicians consider access to technical support as an influential factor for adopting EHR (Yan et al., 2012). Training should minimize such newly introduced errors as EHR has introduced a new type of error, “typos” (Richard J. Holden, 2011; Shachak, Hadas-Dayagi, Ziv, & Reis, 2009). Deciding whether to use group or one-to-one training should be based on case based reasoning and should be dependent on

the setting and context of the EHR adoption process. Some suggest that initial training sessions and onsite support by providing the exact information at the time needed can be a fruitful approach (Ash & Bates, 2005).

<table>
<tr><td colspan="2">Provider attributes</td><td rowspan="4">Organization-related Dimension</td></tr>
<tr><td>Organizational support and management</td><td rowspan="3">Change-oriented attributes</td></tr>
<tr><td>Users’ involvement</td></tr>
<tr><td>Training</td></tr>
</table>

Figure 8: Organization-related Variables

3.5 PROFESSION-RELATED DIMENSION

Profession-related variables are those related to the nature of medical staff members working in clinics and hospitals. This includes professional autonomy, the physician-patient relationship, and contextual performance.

Highly trained professionals tend to believe that they should have control over their work’s conditions and procedures in accordance with their professional preferences. Professional autonomy is described as “professionals' having control over the conditions, processes, procedures, or content of their work according to their own collective and, ultimately, individual judgment in the application of their profession's body of knowledge and expertise”. (Walter & Lopez, 2008) Thus, it is reasonable to assume that physicians and nurses have developed a sense of autonomy about how they perform their jobs. Undeniably, IT solutions can be a threat to such autonomy; IT

also allows managers to exercise more control over work process and individual's performance in clinical situations. Additionally, IT has enabled managers to measure physicians' adherence to guidelines and best practices through their compliance with system alerts in the form of order sets and alerts. As a result, physicians have perceived that as "...dehumanizing and as a cookie cutter approach" (Ash, Sittig, Campbell, Guappone, & Dykstra, 2006; Luchetski, 2010). Consequently, professional autonomy may negatively influence users' intentions to use IT solutions; this was more obvious in using the CDSS and EHR systems (Walter & Lopez, 2008). Furthermore, the need for control and perceiving IT as a challenge or threat to professional autonomy were considered as a psychological barrier to accepting EHR in a systematic review conducted by Boonstra and Broekhuis (2010).

Another profession-related variable, which may influence users' acceptance is the perception that EHR may interfere with the provider-patient relationship. Mixed reactions were noted regarding the impact of EHR on quality of the provider-patient relationship. One study showed that 62% of surveyed physicians thought that using EHR in front of patients led to losing eye contact with the patient, while 31% considered that using a computer in front of a patient was disrespectful (Linder et al., 2006). Likewise, some physicians regarded browsing through menus and looking for certain buttons as disturbing clinical encounters (Ludwick & Doucette, 2009). One study showed that 37.3% of physicians reported that EHR interfered with their relationship with patients and was a barrier to adopting EHR in their pediatric clinical setting (Kemper et al., 2006). Another study conducted a six-month follow up after EHR implementation and indicated that physicians were dissatisfied with the impact of EHR on patient-centered issues (privacy and provider-patient relationship) as well as provider's time and control over the care process (Gadd & Penrod, 2001). However, Hamid and Cline (2013) studied acceptance factors and barriers to

adopting EHR and concluded that the provider-patient relationship was a neutral factor. Similarly, Morton (2008) stated that providers did not consider their relationship with patients to be compromised by introducing EHR.

On the other hand, perceptions of patients toward introducing EHR were positive according to Hsu et al. (2005) as patients conceded that providers' familiarity with patients, communication, and medical decision-making processes had improved upon implementing EHR in examination rooms. Nonetheless, another study showed that patients did not understanding the computer's functions and thus were more confused during clinical encounters when providers used computers (Als, 1997). Thus, providers need to pay more attention when they use EHR during clinical encounters as using computers influences some cognitive and social dimensions, and can produce both wanted and unwanted consequences. The providers' behaviors toward using computers during encounters are influenced by their communication skills and professional roles toward patients (Ventres et al., 2006). Similarly, Frankel et al. (2005) found that the provider-patient relationship was damaged when using computers by physicians with poor-communication skills.

As a result, the impact of EHR on the relationship between provider and patient may play a considerable role in predicting providers' responses to EHR systems. Thus, it should not be assumed that introducing EHR into clinics is an easy move when in fact, an unconscious process is taking place once EHR is implemented (Ventres W. , 2007).

Besides professional autonomy and the provider-patient relationship, contextual performance is the third profession-related determinant in predicting user attitudes toward EHR. Contextual performance (CP) is defined as a user's tendency to behave in ways (performance) to promote the social and psychological aspects of an organization. CP is seen as behaviors that are discretionary, and non-formally rewarded by the organization's rewarding system (Borman &

Motowidlo, 1993, 1997). Thus, this is in contrast to role-duties or task-performance, which is the application of knowledge and skills to perform a certain task. These extra-role, discretionary, beyond delineated role-expectation behaviors have been conceptualized by many scholars in considerably overlapping concepts: Contextual Performance (Borman & Motowidlo, 1993), Organizational Citizenship Behaviors (OCB) (Organ, 1988), and Extra-Role performance. (Vandyne, Cummings, & Parks, 1995) Contextual performance will be employed hereafter—according to interpersonal helping behaviors by Motowidlo (2000) because using EHR and associated behaviors are more associated with the context of providing care than with the actual care itself. In particular, providing care (the task) requires the clinical knowledge and skills to carry out the task, while, the contextual performance requires behaviors beyond the task-performing behaviors. Furthermore, CP behaviors include encouraging other colleagues, and praising them, treating them with fairness (interpersonal facilitation). Additionally, it includes behaviors like spending extra hours, working hard, taking initiative, and persisting in overcoming obstacles and problems (job dedication) (Van Scotter & Motowidlo, 1996).

To sum up, professional autonomy, the physician-patient relationship, and contextual performance are believed to play roles in predicting variances in users' attitudes toward EHR. Thus, adding those variables is worth investigating in this comprehensive approach.

Professional autonomy	Profession-related Dimension
Physician-patient relationship	
Contextual performance	

Figure 9: Profession-related Variables

3.6 FINANCE-RELATED DIMENSION

Finance-related variables can be divided into two important issues: availability of needed resource and the expected impact on reimbursement methods. The financial-related variables are the most frequently mentioned variables that shape user attitudes toward EHR (DesRoches et al., 2008; Gans, Kralewski, Hammons, & Dowd, 2005). Furthermore, it was included in all twenty two studies included in Boonstra and Broekhuis (2010) systematic review as the most important of users' perceived barrier for having EHR. Similarly, users in nineteen studies (36.5%) of McGinn et al. (2011) systematic review revealed concerns about EHR cost and availability of resources. Availability of monetary resources means more than the initial cost (acquisition) of EHR. It includes the cost of preparing required infrastructure, ongoing maintenance and upgrading cost, and the further cost of dedicated full-time equivalent (FTE) staff working on the system (Eastaugh, 2013). Thus, the exact cost of an EHR is hard to estimate as it needs to take into account both predictable (direct) and unpredictable (indirect cost as temporary drop in productivity) expenses. Nevertheless, some studies cite that the predictable cost for a physician's office to acquire a typical EHR is between $ 25,000 and $ 45,000 per physician and $ 3000- 9000 per physician per year for maintenance, while hospitals spend about $14,000 per bed as an acquisition cost and $2,700 per bed as maintenance annually (Garrett Blair; Robert H. Miller, West, Brown, Sim, & Ganchoff, 2005). Similar numbers were obtained by the 2007 report of the Medical Group Management Association (MGMA) as the cost per physician was greater than $15,000 75% of the time and maintenance costs were $250 per physician per month over 50% of the time. Furthermore, in the 2010 MGMA report, an average cost was $30,000 per FTE physician and operating cost was $550 per FTE physician per month ((MGMA), 2011; Esper et al., 2010). Nonetheless, the cost varies greatly according to— but not limited to—the sophistication of the EHR system, the number of

sites, geographic area, number of users and status of infrastructure and time for EHR deployment and so forth. Cost and uncertainty over return on investment have impeded the willingness of hospitals to adopt EHR systems. (Boonstra & Broekhuis, 2010; Jha et al., 2009) Moreover, it is necessary to regard such aspects when surveying attitudes toward EHR as availability of resources is considered among the most important facilitating conditions, and it has a positive impact on system usage (Chisolm, Purnell, Cohen, & McAlearney, 2010; Hamid & Cline, 2013).

The impact of EHR on reimbursement methods is another financial variable that shapes user attitudes toward EHR. Using EHR is likely to enhance care encounter' documentation; facilitate intra-providers' communication, and improve accessibility to patient information. These anticipated benefits of EHR could optimize billing and thus improve reimbursement for provided care and services (Yamamoto & Khan, 2006). In one study, 36% of private neurologists and 20% of academic neurologists agreed that using EHR has increased reimbursement (Esper et al., 2010). Mainly, the improved reimbursement gained is through the associated EHR quality improvements rather than simply introducing EHR (Esper et al., 2010; Robert H. Miller & West, 2007). Furthermore, a particular emphasis is placed on using health information technology as new reimbursement approaches are introduced. For instance, bundled payments of care and pay-for-performance are new payment methods to confront imbalance between cost and quality of provided care (Glaser, 2010). Additionally, some reimbursement schemes have started to empower physician-patient communication aiming to promote a more patient-centered care (Ambinder, 2005). After all, healthcare providers have to comply with all payers and governmental procedures that regulate health services and procedures reimbursement. In fact, many countries have started to mandate having EHR in place for quality, billing and reimbursement purposes (Congress, 2009; Iakovidis, 1998; Kierkegaard, 2013). It is worth mentioning that some providers, however, have

concerns regarding liability issues with reimbursement based on decisions made by computers and are thus hesitant to invest resources in this unsteady era of HIT industry. (Huryk, 2010)

Favorable Return on Investment	Finance-related Dimension
Anticipated impact on reimbursement method	

Figure 10: Finance-related Variables

3.7 LEGAL-RELATED DIMENSION

Health information is considered among the most important personal information (Fernández-Alemán, Señor, Lozoya, & Toval, 2013). Thus, preserving security and maintaining privacy of HIS are critical. The primary goal of security is to maintain the confidentiality, integrity and availability (CIA) of information for both patient and care encounter (Haas, Wohlgemuth, Echizen, Sonehara, & Müller, 2011). According to the ISO EN 13606 standard, confidentiality is defined as the process of ensuring that information is accessible only to authorized parties. Integrity is related to information accuracy and not being modified in unauthorized manners. Lastly, availability is the "property of being accessible and usable upon demand by an authorized party" (Fernández-Alemán et al., 2013). On the other hand, maintaining patient privacy is the other crucial legal requirement. It is related to access control and patients should be the only ones to determine who, when, and to what extent their personal information is communicated to others (van der Linden, Kalra, Hasman, & Talmon, 2009).

Security and privacy issues may interact with users' intention to use EHR. Such issues were pointed out as significant barriers for EHR implementation in many studies (Cusack, 2008; Gadd & Penrod, 2001; Hamid & Cline, 2013). Furthermore, McGinn et al found that security and privacy were mentioned as the second-most important issue in forming users' perceptions toward EHR in a systematic review of the literature covering relevant publications for the period from 1999 to 2009. Furthermore, they revealed that physicians and other allied health care professionals perceived security and privacy as a significant barrier unlike managers and patients, who were undecided as to whether it is a barrier or facilitator for EHR implementation (McGinn et al., 2011).

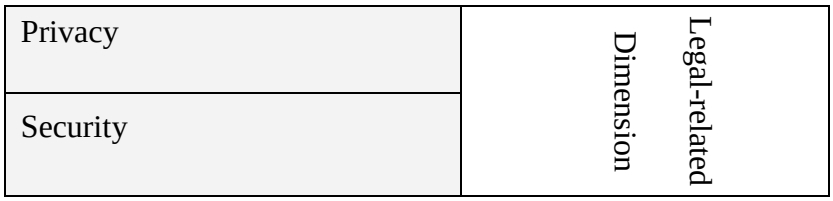


Figure 11: Legal-related Variables

3.8 POLITICS AND ENVIRONMENTAL DIMENSION

Politics and environmental factors impact the healthcare system in general and the adoption of EHR in particular. Availability of national policies, public regulators, public education, and awareness aimed at creating a more efficient health care system with the assistance of IT solutions are believed to enhance the adoption of EHR. Furthermore, users' acceptance and usage of EHR is believed to be influenced as well. Temporal trend in the country also influence the acceptance process, as for example, a recent medication error study or the annual report of the Saudi Legal Health Organization (LHO), which can strengthen the effort for more precautions, such as information technology solutions to decrease errors (Radley et al., 2013; Silow-Carroll, Edwards,

& Rodin, 2012). Other politics and environmental factors include the economic status of the country, the instability of the IT market (volatility) (Boonstra & Broekhuis, 2010), the availability of funding incentives provided by the government (Ash & Bates, 2005), and the status of the national information technology infrastructure.

Politics and environmental factors influence all six of the previously-mentioned acceptance- factors (human, technical, profession, organization, finance, and legal) as well as the intention to use and actual EHR usage as it appears in the study's proposed model (Figure 3).

4.0 RESEARCH METHODOLOGY

4.1 STUDY DESIGN AND POPULATION

The main aim of this study is to provide a comprehensive approach to assessing users' attitudes toward EHR. Human, technical, and contextual related variables are included in the hypothesized model, which will be tested for its applicability and usability for a specific- care setting. Rehabilitation centers will be the case setting for this study; EHR users in these facilities will be the research population. Quantitative methods will be employed to collect users' attributes and perceptions data to help to estimate users' attitudes toward EHR.

4.2 SURVEY INSTRUMENT

A survey instrument was developed based on a comprehensive review of the literature as well as validated and tested surveys. (Aldosari, 2003; Fred D Davis, 1989; Moeinedin, 2011; Morton, 2008) This instrument includes questions that address different aspects of the hypothesized model. The instrument is comprised of 29 closed-ended and 8 open-ended questions. It is classified into four parts, as follows: Part 1 collects information on respondents' socio-demographic characteristics (7 items); Part 2 collects data on IT knowledge, training, and frequency of IT usage (3 items); Part 3 explores users' perceived sources of influence associated with their intention to use EHR (19 items). Using response format with a 5-point item scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree); Part 4 assesses users' perceptions toward political and

environmental determinants and other determinants that may impact users' intention to use EHR. Part 4 has 8 open-ended questions covering the following aspects: the role of management in EHR implementation, the required technical training for using EHR, the political and environmental dimensions of EHR implementation, and the unique factors that influence users' acceptance of EHR in rehabilitation settings. Part 4 will use qualitative research techniques specifically content analysis. A total of 35 questions were written in simple language, and effort was made to ensure clarity and lack of ambiguity.

In order to test the instrument's face validity, first, three academic faculty members in the health informatics field examined the instrument for face validity then, a pilot study was carried out to test the validity and reliability of the instrument and its deployment. The survey was administrated to 12 EHR users (similar to the final sample) as a pilot study. De Vaus's validation method was used to test validity for both individual questions and the questionnaire as a whole (De Vaus, 2014). To validate the content of each question, the following criteria were used:

a) Ability of each question to produce variation in responses. Testing demonstrates a valid variation. For example, testing question number 12 produced unmatched answers, as users did not come to consensus on their perceptions toward the layout and format of EHR.

b) Comprehensibility of questions. This is clear from questions number 16 and 23, as respondents were able to understand the meaning of these questions and produced relevant answers.

c) Avoiding redundancy. This was seldom possible in the current questionnaire, as seen in questions 3 and 4. Nevertheless, some redundancy is permissible for effective communication and to ensure sufficient coverage of concepts.

d) Scalability of questions. Testing demonstrated that questions provided measurable and scalable responses on a five-point Likert scale used to record responses.

e) Reviewing of non-response rate for each question. This revealed that no question in particular was avoided. 42% of respondents did not answer an optional question about the name of their organization.

f) Assessing acquiescent response set. This revealed that reasonably varied response sets were produced, especially on question 10 and 11.

Furthermore, the questionnaire was evaluated for its flow and ability to retain respondents' attention and interest. Moving from one question to another seemed reasonably smooth as no comments were raised in this regard and similar question set were used in the literature.

The adopted survey had Chronbach's alpha score of (.88-.96), indicating high internal consistency; thus, its reliability is considered acceptable since a coefficient equal to or above 0.7 is considered acceptable based on the literature (Morton, 2008; Nunnally & Bernstein, 1994). The survey was uploaded in one of the online surveys (Qualtrics online survey through University of Pittsburgh). Delivering surveys online has advantage over the paper-based method as the targeted sample of this study is distributed over large geographic area. Furthermore, collecting responses online requires less time and can provide more honest responses as it preserves the anonymity of respondents. (Wright, 2005)

4.3 SAMPLING AND RECRUITMENT OF SUBJECT

Healthcare facilities in Saudi Arabia vary considerably and can be commissioned to either of the following strata: governmental or private facilities.

Table 2: Rehabilitation Facilities in Saudi Arabia

Type of Ownership	Affiliation	Facility Name
Governmental	MOH hospitals	King Fahad Medical City **(InPt/OutPt)**
		King Fahad Specialist Hospital **(OutPt)**
		Rehabilitation Hospital **(InPt/OutPt)**
	Military	King Abdulaziz Medical City, National Guard **(OutPt)**
		Prince Sultan Military Medical City of Riyadh **(OutPt)**
		The Riyadh Military Hospital (RMH) (Riyadh Armed Forces Hospital) **(OutPt)**
		Rehabilitation Hospital of Al-Hada Military Hospital. **(InPt/OutPt)**
	Referral	King Faisal Specialist Hospital and Research Center **(OutPt)**
	Ministry of Social Affairs (MOSA)	Comprehensive rehabilitation of disabled persons **(InPt/OutPt)**
	MOHE Teaching Hospitals	King Khalid University Hospital **(OutPt)**
		King Abdulaziz University Hospital **(OutPt)**
Private	Sultan Bin Abdulaziz Humanitarian City. **(InPt/OutPt)**	
	Riyadh Care Hospital **(OutPt)**	
	Abdulatif Jameel Rehabilitation Center **(OutPt)**	
	Suliman Alhabib Hospital **(OutPt)**	

Communication was initiated with facilities that have rehabilitation services. The targeted facilities were the following: Sultan Bin Abdulaziz Humanitarian City, the Rehabilitation Center of Al-Hada Military Hospitals, the Rehabilitation Hospital of King Fahad Medical City (KFMC), Riyadh Military Hospital, King Abdulaziz Medical City, King Faisal Specialized Hospital and

Research Center (KFSH&RC), King Khalid University Hospital (KKUH), Suliman Alhabib Hospital, and Riyadh Care Hospital (RCH).

An approval from the Institutional Review Boards (IRB) of the University of Pittsburgh was attained. A four-week window of time was allowed to collect responses and emails reminders were sent after a week to promote participation and a lower page drop-off rate.

As the proposed model has approximately 6 dimensions and 20 parameters (predictors), a recommended sample size should be equivalent to 10 per parameter according to the literature (Nunnally & Bernstein, 1994; Schreiber, Nora, Stage, Barlow, & King, 2006). Thus, the calculated sample size should be a minimum of 200 subjects. Further, Garver and Mentzer (1999); Hoelter (1983) pointed out that 200 is considered a critical sample size and can provide acceptable power for data analysis. Examining the literature for previous studies with similar objectives and number of predictors yielded a suggested sample size of between 150-240 (Fred D Davis, 1989; Gagnon et al., 2014; Morton, 2008).

Furthermore, using sample Size Calculators (Raosoft, Inc., and CheckMarket®) for an estimated population of 1200 clinicians at confidence level of 95% and 5% estimated margin of error, respectively, the minimum sample size came to 292. Using the worst-case scenario method, we assume that the proportion of clinicians with the intention to use EHR was likely to be 50% at a confidence interval of 5%, with a standard error of 2.55 (SE= 5/1.96 = 2.55). Thus, the sample size was $N= P (100-P)/(SE)^2$ ➔ $N= 50(100-50)/(2.55)^2 = 384.6 \approx 385$.

4.4 SURVEY ANALYSIS

The survey items were analyzed with IBM SPSS Statistics. The independent sample t-test and One- way ANOVA Analysis were used to determine if there were significant associations between socio-demographic variables of respondents and the frequency distributions of the responses at the conventional α =. 05 level significance. Each cluster of factors (sources of influence, human, technical, etc.) was composited by averaging and summarizing the scores using descriptive statistics (mean scores and 95% confidence intervals). A correlation test was conducted to test relationship between variables and to examine any presence of multicollinearity (i.e., where two or more explanatory variables are highly correlated > 0.8) that may pose problems in the structural model analysis. Because users' attitudes toward EHR are complex and encompass multiple dimensions, path analysis (Structural Equation Modeling) was used to examine relationships among variables, such as weather all or any continuous or discrete (Ullman & Bentler, 2003). The following are the variable data types and the proposed data analysis methods:

Table 3: Variables and Analysis

Variables	Data Type	Data Analysis
Demographics	Categorical	T-test and ANOVA
Dependent variables	Continuous	Path Analysis (SEM)
Comments and suggestions	Qualitative	Coding and Description

5.0 RESULTS

5.1 INTRODUCTION

This Chapter provides the results of the survey and includes screening data as well as descriptive and inferential analysis of responses related to respondents' criteria and model questions.

5.2 DATA SCREENING

Data screening is the process of ensuring that data is ready for statistical procedures by scrutinizing data for missing value patterns, ensuring that data follows a normal distribution pattern, and checking for the presence of unengaged respondents and outlier responses.

5.2.1 Missing data

Missing data is a challenge for most of the statistical analysis techniques and especially for Structural Equation Modeling. (Allison, 2003) Thus, missing data was evaluated in term of the following three criteria:

5.2.1.1 The number of variables missing per case This section evaluates the extent of missing values per case. Thus, each case is examined and sets a threshold where no more than 10% missing values are permitted. In the current response data set, 72.7% of the cases have no missing data whatsoever, and only 14.7 % of the cases have more than seven missing values. Thus, based on

De Vaus (2014) and Hertel (1976) convention which states that no more than 15% of responses should be omitted, theses 47 responses (14.7%) are omitted from any further analysis (De Vaus, 2014; Hertel, 1976).

Table 4: Number of Variables Missing Per Case

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	232	72.7	72.7	72.7
	1	23	7.2	7.2	79.9
	2	3	0.9	0.9	80.9
	3	2	0.6	0.6	81.5
	5	3	0.9	0.9	82.4
	6	5	1.6	1.6	84.0
	7	4	1.3	1.3	85.3
	27	3	0.9	0.9	86.2
	⋮	⋮	⋮	⋮	⋮
	93	23	7.2	7.2	100.0
	Total	319	100.0	100.0	

5.2.1.2 The number of cases missing per variable Each variable is evaluated to determine whether there are missing data in the response data set. In the table of frequencies, no variable has 10% or more missing cases. (Maximum is 5 out of 263, equal to 2 %).

5.2.1.3 Missing completely at random (MCAR) Analyzing missing values is important in order to discover any pattern of correlation that might suggest intentional nonresponse or selective omission of questions by subjects. Thus, a matrix of dichotomous missing/valid variables was examined for any pattern of correlation. Except for questions related Self Efficacy with EHR Specialty Specific Q2, Self Efficacy with Professional Autonomy Q5, and Self Efficacy with Finance Q4, the matrix reveals no statistical significant correlation between missing values.

Considering the table of missing values below, one may conclude that missing data occurred at random, and unintentionally.

Table 5: Pattern of Correlation

Correlation Matrix	Number of Missing Value
Self Efficacy (1,4) ➔ EHR Specialty- Specific Function (2)	**2***
Self Efficacy (3,4) ➔Profession Autonomy (5)	**2***
Self Efficacy (1,2) ➔ Finance (4)	**2***
Profession Autonomy (5) ➔EHR Specialty-Specific Function (2)	**2***
** Two values can not form a trend*	

5.2.1.4 Replacing missing data (imputation) As most of the responses were ordinal data and in the form of a 5-point Likert scale, median-based imputation was used to replace missing values, as it is more comprehended comparing to mean-based imputation since a replacements of 3.5 (between (3) Neither agree nor disagree and (4)Agree), for example, makes no sense. For continuous data, mean-based imputation was used.

5.2.2 Unengaged respondents

In some instances, respondents answered every single question with the same answer, for example '1, 1, 1, or 2, 2, 2, or 3, 3, 3 …'. Those respondents appear to be unengaged, and their responses therefore provided no useful information, as they show no variance. The Standard Deviation (SD) of each respondent was calculated, and any SD lower than 0.25 was omitted. As a result, 9 cases were excluded from further analysis. This yielded a data set with 263 responses.

5.2.3 Outliers

Exploring outliers is a useful technique in which scores that differ significantly from the central tendency of scores are identified and evaluated as they can affect the normality of the data (Skewness) and the accuracy of data analysis. As most of the responses in the current data set are represented on a 5-point Likert scale, the responses were visually inspected and all fall within the range of 1-5 except for the following variables (Age and Experience) responses were continuous. a boxplot graphs is provided and shows no outliers:

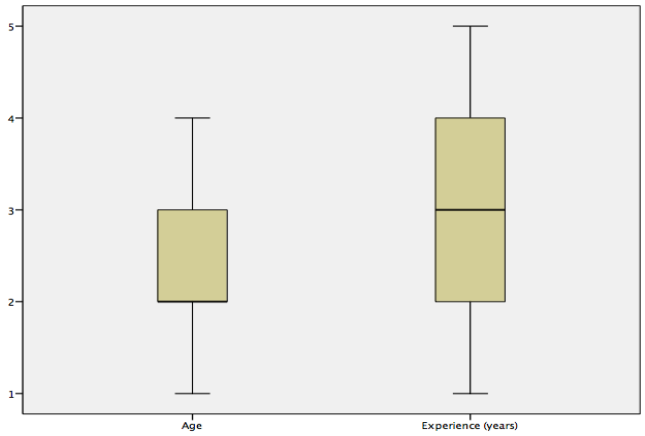


Figure 12: Outliers Cases

5.2.4 Normality: skewness & kurtosis

Since most statistical methods assume that samples are taken from a normally distributed population, it was essential to check the normality of the current dataset (Roystone,1991). Skewness (how skewed to one end the distribution is) and kurtosis (how peaked or flat the distribution is) are the main aspects of normality checks. Using a rule of greater than 1 or less than -1 for skewness and greater than 2 or less than -2 for kurtosis, all distributions are fulfilling the

normality requirements except for the following questions (Management Support 5, Management Support 6, PU 1) the deviations from the skewness and kurtosis are acknowledged for these three questions and the table below provides their values:

Table 6: Normality

	Management Support 5	Management Support 6	PU 1
Skewness	-1.221	-1.117	1.118
Kurtosis	1.325	1.473	2.125

In general, the data fulfill the requirements of skewness and kurtosis the symmetrical distribution matches the Gaussian distribution (George & Mallery, 2010, George, D., & Mallery, M. 2010).

5.2.5 Reliability of the constructs

The reliability of the study variables was assessed and Chronbach's Alpha was produced for each variable. All variables produced reliable results (0.7 or higher)

Table 7: Reliability of the variables

Variable	No of items	Cronbach's Alpha
Self-efficacy	4	.937
EHR Format	3	.920
EHR Compatibility	3	.936
EHR Specialty-specific	5	.951
EHR Reliability	3	.914
EHR Obsolescence (Up to date)	5	.886
Management Support	7	.935
Users' Involvements	5	.949
Training	4	.914
Profession Autonomy	6	.912
Provider-Patient Relationship	4	.890
Contextual Performance	15	.976
Privacy	4	.950
Security	4	.780
Favorable return on investment	2	.722
The impact of EHR on reimbursement	2	.724
Perceived Ease of Use	4	.935
Perceived Usefulness of EHR	7	.960
Positive attitude (Acceptance) EHR	6	.873

5.3 DESCRIPTIVE ANALYSIS

This section is to describe and organize the characteristics of the sample, allowing the collected data to be presented in a manageable form for reporting and for further analysis(Shi & McLarty, 2009).

5.3.1 Socio-demographic and IT knowledge of respondents

The original sample was 319 subjects came from more than 20 hospitals and rehabilitation care facilities across Saudi Arabia. Among these providers: 31% had no EHR, 2 hospitals had comprehensive EHR and the remaining had basic EHR The data screen phase yielded a sample size of 263, where 153 (58.2%) are male; 189 (72%) are 30-50 years old; 153 (58.2%) have 10-20 years of clinical experience; the respondents come from different specialties as 39.5% are physicians while the remaining are nurses (27.8%) and allied health care professionals (32.7%). One hundred forty two respondents (54%) provide direct services related to rehabilitation care and the remaining respondents provide services related to general care. Table (9) and figure (13) provide more details on the respondents' socio-demographic profiles:

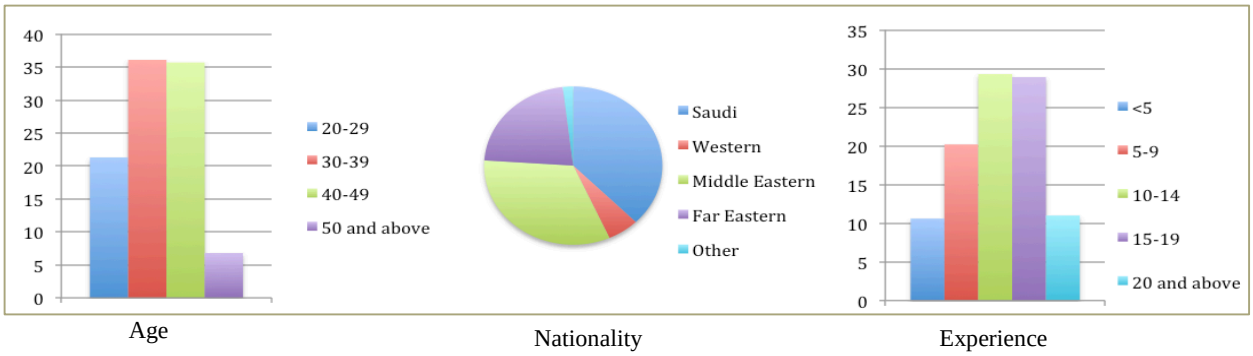


Figure 13: Respondents Age, Nationality, and Experience

Table 8: Respondents Sociodemographic Profile

Measure	Item		Frequency		Percentage %	
Gender	Male		153		58.2	
	Female		110		41.8	
Age (yrs.)	20-29		56		21.3	
	30-39		95		36.1	
	40-49		94		35.7	
	50 and above		18		6.8	
Nationality	Saudi		99		37.64	
	Non-Saudi	Western	15	164	9.1	62.36
		Middle eastern	86		52.4	
		Far Eastern	58		35.4	
		Other	5		3	
Experience	< 5		28		10.6	
	5-9		53		20.2	
	10-14		77		29.3	
	15-19		76		28.9	
	20 and above		29		11	
Specialty	Family Medicine		22		8.4	
	Medicine general		28		10.6	
	Physical med/rehab		62		23.6	
	Psychiatry		22		8.4	
	Neurology		14		5.3	
	Nurse		69		26.2	
	Occupational Therapy		8		3	
	Other		38		14.4	
Occupation	Medical		104		39.5	
	Nursing		73		27.8	
	Allied Health Professionals		86		32.7	
Involvement in Rehabilitation	Involve in Rehabilitation care		142		54	
	General care		121		46	

It is important to assess IT knowledge because it can empower users and thus affect the user's attitudes toward EHR. In the current study, only 30% of the respondents considered themselves novice or advance beginner in term of computer literacy level. The majority of respondents rated themselves as competent (49%) while 18% proficient and only as expert (3%).

Regarding IT training, 30% of the respondents reported that they underwent training in the form of IT workshops and self-guided learning approaches, 20% had formal training in addition

the previously two mentioned approaches, and only 5% of respondents claimed that they did not receive any form of IT training. Asking the respondents about their previous experiences with health information systems revealed that 69.5% of respondents had some experience (either always or use at some times) and only 7.2% had no experienced with any health information systems.

Table 9: IT Knowledge and HIS Experience

Measure	Item		Frequency		Percentage %	
Computer Literacy Level	Novice		6		2.3	
	Advance beginner		74		28.1	
	Competent		129		49	
	Proficient		47		17.9	
	Expert		7		2.7	
Computer Training	Formal training +Self-guided		59		22.4	
	Workshop +Self-guided		79		30	
	Formal training + workshop +Self-guided		52		19.8	
	Self-guided		54		20.5	
	Other		14		5.3	
	None		5		1.9	
Using HIS	Always	Use	89	183	33.8	69.60
	Sometimes		94		35.7	
	Rarely	Not use	61	80	23.2	30.40
	Never		19		7.2	

5.3.2 Sources of influence for EHR acceptance

The respondents perceived sources of influence differently. As the theoretical model provides six dimensions that shape user's attitudes toward EHR, the results are sorted accordingly.

In the technical dimension, the respondents perceived (Agree and Strongly agree) the following as sources of influence: Self Efficacy, EHR Format, EHR Compatibility, EHR Specialty-specific Functions, EHR Reliability, and EHR Obsolescence (66.2%, 50.5%, 40.7%,

42.6%, 49.1%, and 41% respectively), while other respondents (11%, 15.6%, 20.5%, 19.8%, 14%, and 9.1%, respectively) did not think that the above-mentioned variables influence their attitudes toward EHR.

In the organizational dimension, the respondents perceived Management Support, User Involvements, and Training as influential variables that shape their attitudes toward EHR (58.5%, 74.9%, and 46.8% respectively). However, 9.2%, 3.8%, and 7.6% of respondents, respectively, disregarded these variables as sources of influence.

In the professional dimension, the respondents reported that Professional Autonomy, Provider-Patient Relationship, and Contextual Performance were important variables (30.1%, 52.5%, and 58.6% respectively). However, only 20.6%, 13.3%, and 2.7% of the respondents, respectively, felt no influence from these variables.

In the legal dimension, 29.3% and 43.8% of the respondents rated concern over Privacy and Security as variables that shaped their attitudes toward EHR. Notably, 43% of the respondents neither agreed nor disagreed that these variables were influential.

In the Financial dimension, the majority of respondents reported that the favorable return on investment and the anticipated impact of EHR on reimbursement were variables that had an important affecting their attitude toward EHR (79% and 58.9%, respectively).

Finally in the human dimension, 51.3% and 57.4% of the respondents, respectively, felt that their Perceived Ease of Use of EHR and Perceived Usefulness of EHR were important variables regarding EHR acceptance. However, 38.4% and 40.3% of respondents, respectively, had no opinion on the role of these variables in shaping their attitudes toward EHR.

At the study's end, 72.6% of respondents revealed a positive (favorable) attitude toward EHR, while 25.9% were "middle-of-the-road" and only 1.5% had a negative attitude toward EHR.

Visualizations of these results are provided through the following figures:

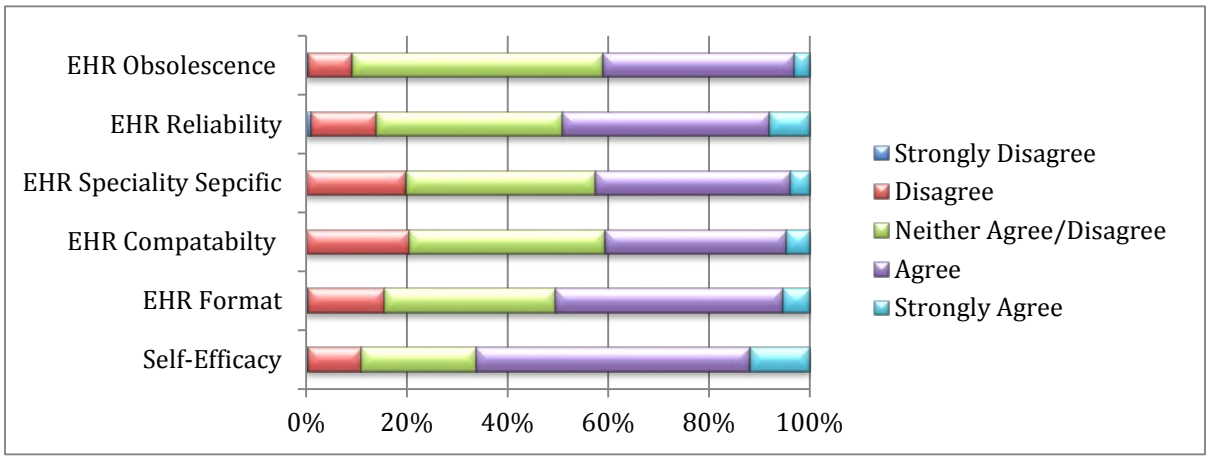


Figure 14: Technology-Related Responses

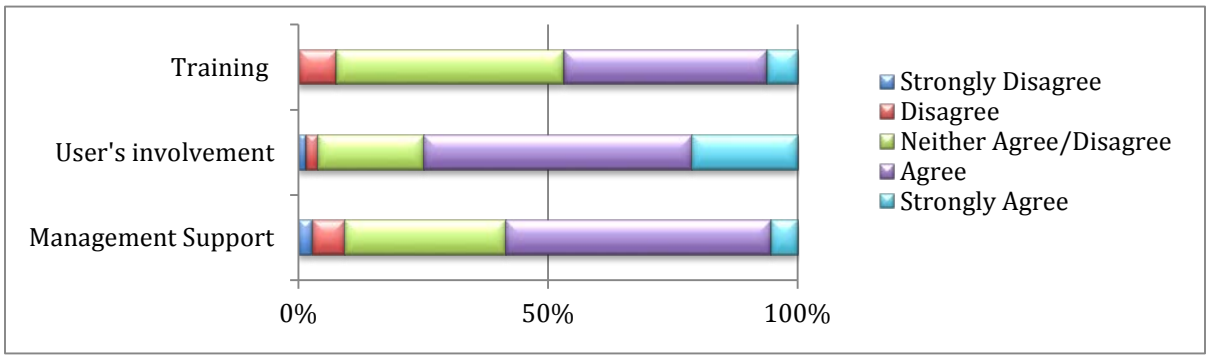


Figure 15: Organization-related Responses

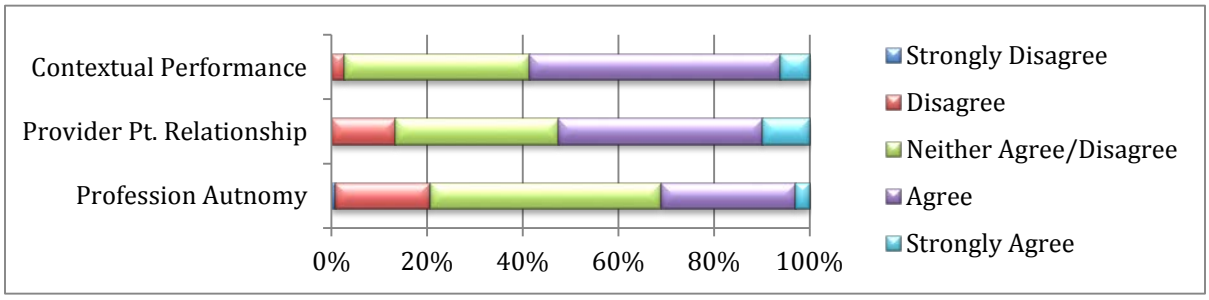


Figure 16: Profession-related Responses

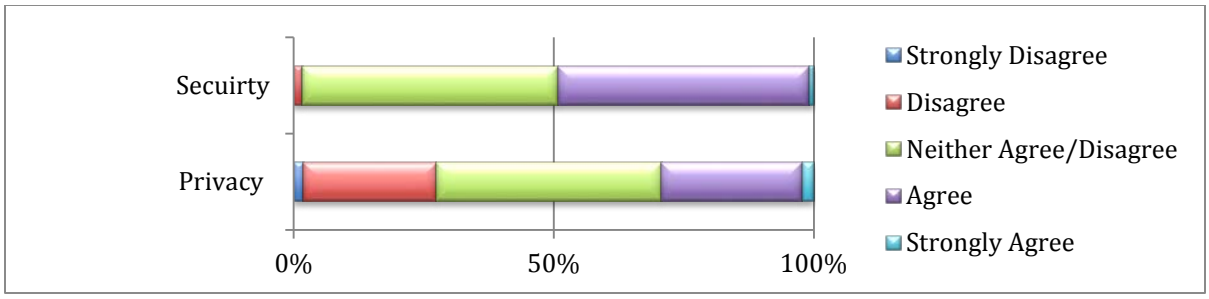


Figure 17: Legal-related Responses

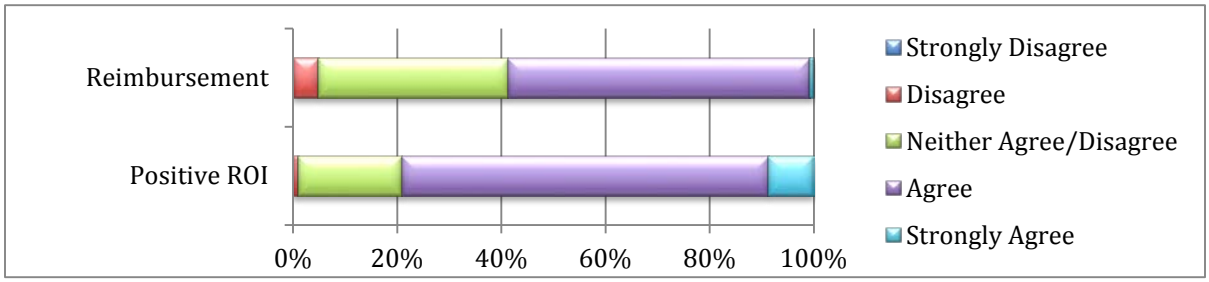


Figure 18: Finance-related Responses

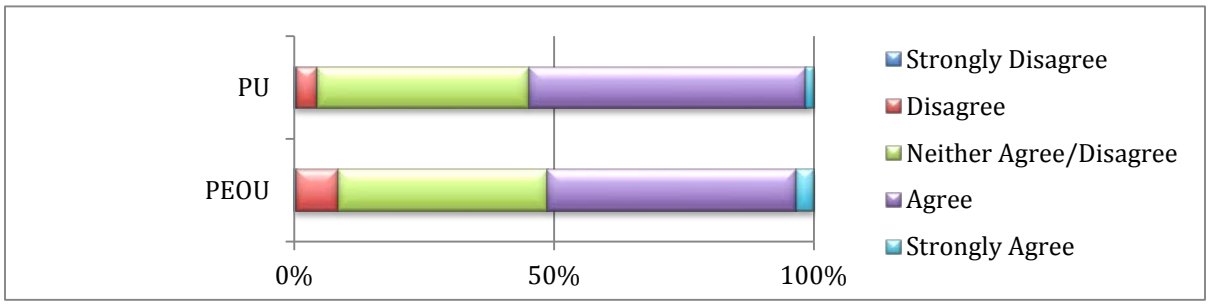


Figure 19: Human-related Responses

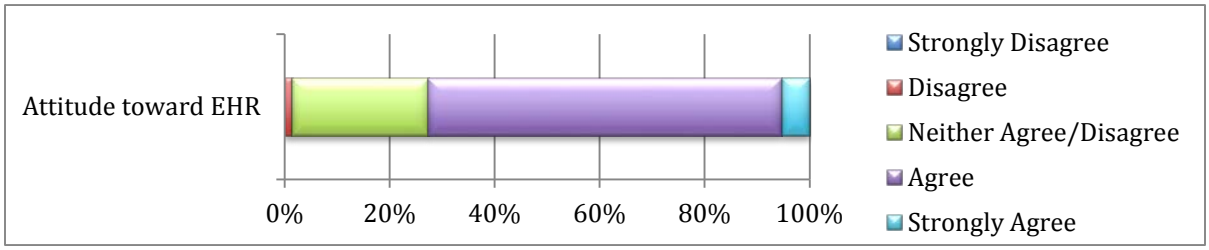


Figure 20: Attitude Toward EHR (Acceptance)

The following table provides further descriptive statistics regarding the sources of influence for EHR Acceptance and the current attitude of respondents toward EHR:

Table 10: Sources of Influence for EHR Acceptance

Measure		Mean	Standard Deviation	Median
Technology	Self-efficacy	3.57	.81	3.75
	EHR Format	3.42	.80	3.67
	EHR Compatibility	3.28	.78	3.33
	EHR Specialty-specific	3.29	.74	3.20
	EHR Reliability	3.44	.82	3.33
	EHR Obsolesce (Up to date)	3.33	.67	3.20
Organization	Management Support	3.55	.76	3.80
	Users' Involvements	3.87	.75	4.00
	Training	3.36	.69	3.00
Profession	Profession Autonomy	3.07	.72	3.00
	Provider-Patient Relationship	3.40	.81	3.50
	Contextual Performance	3.63	.59	3.85
Legal	Privacy	2.94	.82	3.00
	Security	3.29	.41	3.25
Finance	Favorable return on investment	3.66	.53	3.50
	The anticipated impact of EHR on reimbursement	3.41	.54	3.50
Human	Perceived Ease of Use	3.40	.66	3.50
	Perceived Usefulness of EHR	3.66	.64	4.00
Attitude about EHR (Acceptance)		3.72	.51	3.83

Regarding the actual use of EHR, the following functions were used by the respondents: Demographic characteristics of patients (74.5%), Problem lists (71.5%), Medication lists (77.6%), Discharge summaries (70.7%), Laboratory reports (77.2%), Radiologic report (77.2%), Diagnostic-test results (76%), and Provider order entries for medications (71.9%). Overall, 76% of the respondents acknowledged that they used EHR in their practices.

Table 11: Used Functionalities of EHR System

Measure	Frequency	Percentage %
Demographic characteristics of patients	**196**	**74.5**
Problem lists	**188**	**71.5**
Medication lists	**204**	**77.6**
Discharge summaries	**186**	**70.7**
Laboratory reports	**203**	**77.2**
Radiologic reports	**203**	**77.2**
Diagnostic-test results	**200**	**76.0**
Provider order entry for medications	**189**	**71.9**
Overall, using EHR	**200**	**76.0**

5.4 INFERENTIAL ANALYSIS

The data can be inferred to give further understanding of user's attitude by examining the differences in variables and attitudes toward EHR among groups and whether it depends on respondents' characteristics.

5.4.1 Differences according to demographics characteristics

This section investigates the relationship between the mean scores of each variable and outcome in the study according to the following demographic characteristics: Gender (Male/Female), and respondents' involvement in rehabilitation care (Involved, Not involved).

Using T-test for independent samples to examine differences in the mean scores of study's variables according to gender reveals that significant differences were shown only for the following variables: Professional Autonomy and Perceived Usefulness, and for the outcome variable Positive EHR Attitude. (See Appendix D)

Accordingly, among current and potential users of EHR (N = 263), female respondents reported greater influence of profession Autonomy as compared to males (t=2.98 (.003)). However, male respondents perceived greater role for Perceived Usefulness as compared to female. (t=2.07(*p*=.04)). Furthermore, there was a statistically significant difference in attitudes toward EHR according to gender, with male respondents showing more positive attitude toward EHR as compared to females. (t =2.34 (*p*=.020)).

Table 12: T-test for Differences in Study's Variables According to Gender

Measure	Item	Frequency	Mean	SD	*t*	*p-value*
Profession Autonomy	Male	153	2.95	.74	**2.98**	**.003**
	Female	110	3.21	.65		
Perceived Usefulness	Male	153	3.73	.58	**2.07**	**.04**
	Female	110	3.56	.70		
Positive EHR Attitude	Male	153	3.78	.47	**2.34**	**.020**
	Female	110	3.63	.54		

T-tests were used to assess the differences in mean scores according to users' involvement in rehabilitation care, revealing that significant differences achieved only for the following variables: Professional Autonomy, Provider Patient relationship, Security, and Positive EHR Attitude. (See Appendix D) Thus, among current and potential users of EHR (N = 263), there were statistically significant differences in perceiving the influence of Professional Autonomy, Provider Patient Relationship, Security, and Attitude toward EHR according to the users' involvement in rehabilitation practices. EHR users who are involved in rehabilitation care appreciate the roles of these three variables more than users who were not participating in rehabilitation care. (t=-2.6, (*p*=.010); 2.93, (*p*=.004); 2.18, (*p*=.030) respectively). Furthermore, respondents who are involved in rehabilitation care showed a less positive attitude toward EHR. (t =2.04 (*p*=.041))

Table 13: T-test for Differences in Study's Variables According to Involvement in Rehabilitation

Measure	Item	Frequency	Mean	SD	*t*	*p-value*
Profession Autonomy	Involve in Rehab	142	3.17	.72	**2.6**	**.010**
	General Practice	121	2.94	.69		
Provider-Patient Relationship	Involve in Rehab	142	3.53	.81	**2.93**	**.004**
	General Practice	121	3.24	.79		
Security	Involve in Rehab	142	3.34	.42	**2.18**	**.030**
	General Practice	121	3.23	.39		
Positive EHR Attitude	Involve in Rehab	142	3.66	.49	**2.04**	**.041**
	General Practice	121	3.79	.51		

One-way ANOVA was used to assess the differences in the mean scores of study variables based on Age of the respondents. This analysis failed to find any statistically significant differences in these variables based on age (F=. 893 (*p*=.473)).

5.4.2 Differences according to IT knowledge and previous use of HIS

Exploring the difference between groups in the mean scores according to Users' Experience, Occupation, Computer Sophistication Level, Computer Training, and Previous Usage of HIS revealed no statistically significant differences between groups (F= 1.22, (*p*=.304); .424, (*p*=.655); 1.63, (*p*=.168); .494, (*p*=.813); and 1.76, (*p*=.156) respectively).

Table 14: One-way ANOVA for Differences in Study Variables

Measure	Item	Sum of Squares	df	Mean Square	*F*	*p-value*
Experience	Between Groups	1.24	4	.311	1.22	.304
	Within Groups	65.92	58	.255		
	Total	67.16	62			
Profession	Between Groups	.218	2	.109	.424	.655
	Within Groups	66.94	60	.257		
	Total	67.16	62			
Computer Sophistication Level	Between Groups	1.65	4	.413	1.63	.168
	Within Groups	65.51	58	.254		
	Total	67.16	62			
Computer Training	Between Groups	.77	6	.128	.494	.813
	Within Groups	66.39	56	.259		
	Total	67.16	62			
Using HIS	Between Groups	1.34	3	.447	1.76	.156
	Within Groups	65.82	59	.254		
	Total	67.16	62			

5.4.3 Correlations among model dimensions

Although most of the dimensions appear to be related, only weak correlations were observed between most of the dimensions. However, the human dimension was moderately related to the technology (.535) and organization (.476) dimensions. This might be interpreted as the following: better understanding user's needs and preferences allows for more informed decision making about technology and organization implication of EHR.

Table 15: Correlation between Study's Dimensions

	Human	Technology	Organization	Profession	Legal	Finance
Human		.535*	.476*	.198	-.059	.417*
Technology			.380	.130	.044	.324
Organization				.231	.055	.370
Profession					.210	.253
Legal						-.340
Finance						

According to Dancey and Reidy's categorization, r-values between 0.7 to 0.9 are interpreted as strong correlations, 0.4 to 0.6 as moderate correlations, and r-values between ±0.1 to ±0.3 are weak correlations. (Dancey and Reidy, 2004).

5.5 QUALITATIVE RESULTS

Qualitative measures are an indispensable tool of assessing users' attitudes toward EHR. The following section covers responses for open-ended questions 21-26.

Regarding the designated roles of management (Q21) in EHR implementation, 93% of the responses emphasized the importance of the roles of management in successfully adopting EHR. The respondent expressly mentioned that it is "very vital," "important," "essential," "without it projects fail." Comments about the designated roles of management include: "choos[ing] an appropriate and high quality EHR system and applications" and "show[ing] support and responsibility," "accountability," "tackl[ing] all difficulties," "ensur[ing] performing tasks effectively." Regarding what management needs to demonstrate to perform these roles, the respondents emphasized the role of "visionary leaders," "lead[ing] by example" and the importance of " engaging intended users," "consult[ing] with the professional," "ensur[ing] having users opinions."

Question 22 evaluates the roles of politics and other environmentally related factors in EHR acceptance; 73% of the respondents emphasized that such factors "play a major part," "important, vital roles". One response underlined that "national policies should always be established to support implementation of EHR." Other stated that regulators should have a "role in mandating adoption and using of (unified) EHR systems," "role in controlling and regulating information access in EHR and prevention of unauthorized parties," and in "allocating funds."

Regarding the evaluation of a national EHR policy (Q23), 52% of the respondents revealed that the current policies are "not enough," "need more effort," "week," "old," "inefficient policies that needs to be updated and supported with technology," "still far from being adequate," and that

“more work and efforts need to be done on this matter.” Therefore, some responses stressed the “need for more work and effort” especially with having the eHealth in progress.

Evaluating the country’s willingness to finance widespread national health information infrastructure (Q24) revealed positive responses. 40% of responses reported that the government is: “very willing” and “capable to provide finances for infrastructure,” and “achievable considering the money that already allocated for the national EHR, and it is already started and hopefully it will continue to grow and develop.” Although most of the responses acknowledged the willingness of the government to support EHR, some emphasized that it still “ lagged behind”, and “lack of leadership” in sponsoring and financing projects related to health information technology was cited.

Regarding the roles that temporal trends play in EHR acceptance (Q25), e.g., recent medication error study, the annual report of the Saudi Legal Health Organization (LHO), etc., 77% of the respondents acknowledge that it “certainly play[s] a major role,” and “very vital” especially that the number of legal cases related to healthcare have been increasing lately. Furthermore, the respondents valued the role of EHR in confronting the impact of these trends as it facilitates “conducting quality improvement studies,” “minimizing medication errors and toxicity,” “improves patient safety,” and allows “using health surveillance system.” A very informative response disclosed that the most important trend is the “healthcare inconsistencies (apparent) in Saudi Arabia.”

The final question asks respondents to identify factors important in the rehabilitation setting that affect user’s attitude toward EHR. 38 % of the responses revealed the following factors:

1. EHR should be easy to use. Specifically, “ease to use,” “easiness to use,” “easy,” “easiness to access.” Furthermore, using EHR should “not require more time,” “time conserving,” and “conserve efforts.”
2. Responses revealed that EHR should “suits users’ needs,” “EHR needs to be customized,” “has special features to support rehabilitation care,” “adopt standards related to rehabilitation,” “use known medical terminologies related to profession,” “level of details,” “hav[e] enough details support rehabilitation.”
3. Need to be connected and sharing data with other healthcare settings.

In summary, the respondents’ comments reflect the crucial roles of management in tackling the difficulties in adopting EHR. Calling for national policies and mandating adoption and using of EHR systems are another streams that are seen in this qualitative analysis. Regardless of the willingness of the government to finance widespread national EHR, lack of leadership and inconsistencies in healthcare services are barrier for a widespread adoption of EHR in Saudi Arabia.

6.0 MODEL IDENTIFICATION AND ANALYSIS

6.1 INTRODUCTION AND STRUCTURAL EQUATION MODELING ASSUMPTIONS

Structural Equation Modeling (SEM) was used to identify and analyze the proposed model. SEM is a new generation of multivariate procedure that demonstrate relationships between predictors and outcome e.g., attitude, opinions, judgments etc., pictorially to allow better understanding of the proposed model (Byrne, 2013; Ullman & Bentler, 2003)

SEM is a confirmatory approach that estimates a model's parameters and then compares covariance matrices between theoretical model and data models. Model fitness is then assessed and a good fit indicates that the model provides a plausible explanation for the phenomena by the included predictors and relationships among these predictors.

Besides the three previously mentioned assumptions about normal distribution, missing values, and having adequate sample size, the following multivariate assumptions have special importance in SEM:

6.1.1 Linearity

Linearity refers to the state of having a linear relationship between independent and dependent variables. In this regard, linearity was tested by performing curve estimation for all relationships in the model and determined that all relationships are sufficiently linear to be tested by a

covariance-based SEM algorithm such as the one used in the AMOS® IBM (See appendix D for R Square, F and Sig).

6.1.2 Multicollinearity

SEM requires that independent variables (IVs) not be highly correlated as it can influence the quality of the estimate (Ruiz, 2009). Serious multicollinearity occurs when an IV can predict other IV with a high degree of accuracy. Variable Inflation Factor (VIF) is used to measure the degree of multicollinearity and the rule (value) of 5 is used to indicate serious multicollinearity (Koper, 2009, O'brien, 2007). Therefore, exogenous variables were measured simultaneously, and the resulting VIF levels were less than 5. This indicates an acceptable level, and no serious multicollinearity issue is foreseeable.

6.2 STRUCTURE EQUATION MODEL

6.2.1 Building and testing a model using AMOS® graphics

IBM® AMOS® 22 was used to draw the model that appears in Figure (21), which shows each predictor and its variables. The figure below depicts the initial model:

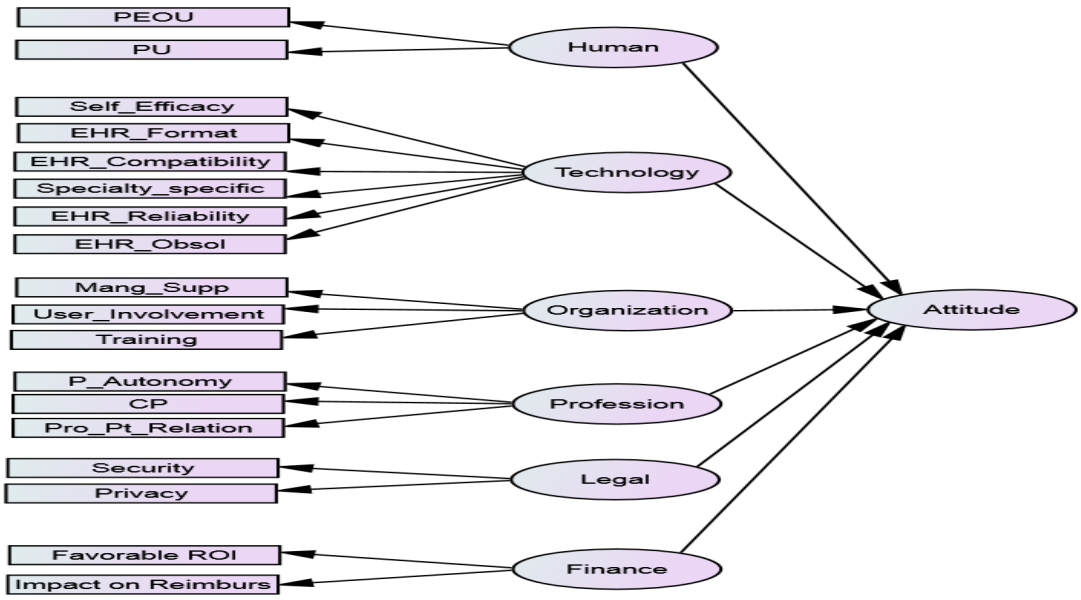


Figure 21: Building the Model By AMOS

The model has the following observed (measured) and unobserved (latent) variables:

Table 16: Variables of the Model

Observed, endogenous variables	Unobserved, exogenous variables	Unobserved, endogenous variables
Self_Efficacy, EHR_Format EHR_Reliability, EHR_Compatibility, Specialty_specific, EHR_Obsol, Mang_Supp, User_Involvement, Training P_Autonomy, CP, Pro_Pt_Relation PU, PEOU Security, Privacy Favorable ROI, Impact on Reimbursement	ORGANIZATION TECHNOLOGY PROFESSION HUMAN LEGAL FINANCE	ATTITUDE

Furthermore, the model has observed exogenous variables (Age, Gender, Occupation, Level of IT Sophistication, Experience, and Previous HIS use). The original model was run and because the Structural Equation Modeling (SEM) indices were not highly correlated and in some

instances did not reflect all information about the model, the combined reporting of Chi-square (X^2 or CMIN/DF), (CMIN/DF), (GFI or AGFI), and (RMSEA) is recommended. (Hu and Bentler (1998), (Jackson, 2003; MacCallum, Widamann, Preacher, & Hong, 2001). The following table illustrates model fit indices:

Table 17: The Original Model Fitness Indices

	Minimum Value of Discrepancy	Goodness-of-fit-index		Measures Based on the population discrepancy
	X^2/df (CMIN/DF)	GFI	Adjusted GFI	RMSEA
Original model	25.136	0.238	0.111	0.304
Recommended values	Good fit=1 Acceptable fit [1-3 or 5]	0.90 or greater represents a good fit		<0.05 Close fit >0.08 Reasonable error of approximation ”Mediocre Fit” >.10: Poor fit

Accordingly, values of test statistics X^2, Goodness-of-fit-index (GFI), Adjusted GFI (AGFI), and the Root Mean Square Error of Approximation (RMSEA) indicated poor fit. Using modification indices, the covariances among the errors associated with measuring the following variables were introduced:

Contextual Performance	<-->	Provider Patient relationship
Profession Autonomy	<-->	Provider Patient relationship
Profession Autonomy	<-->	Contextual Performance
User's Involvement	<-->	Training
User's Involvement	<-->	Management Support
Training	<-->	Management Support
Self Efficacy	<-->	EHR Obsolescence
Self Efficacy	<-->	EHR Specialty Specific
Self Efficacy	<-->	EHR Compatibility
Self Efficacy	<-->	EHR Reliability
EHR Obsolescence	<-->	EHR Specialty Specific
EHR Obsolescence	<-->	EHR Compatibility
EHR Obsolescence	<-->	EHR Reliability
EHR Specialty Specific	<-->	EHR Compatibility
EHR Specialty Specific	<-->	EHR Reliability
EHR Compatibility	<-->	EHR Reliability
Favorable ROI	<-->	Impact on Reimbursement

Figure 22: Modification Indices

Thus, a permissible fit yielded the resulting modified model based on the following model fit indices:

Table 18: The Modified Model Fitness Indices

	Minimum Value of Discrepancy	Goodness-of-fit-index		Measures Based on the population discrepancy
	X^2/df (CMIN/DF)	GFI	Adjusted GFI	RMSEA
Original model	3.58	.78	.72	0.099
Recommended values	Good fit=1 Acceptable fit (1-3 or 5)	0.90 or greater represents a good fit		<0.05 Close fit >0.08 Reasonable error of approximation "Mediocre Fit" >.10: Poor fit

6.2.2 Testing validity of the model

6.2.2.1 Invariance test Measurement invariance indicates whether the respondents perceived each latent variable (dimension) conceptually in the same manner. Consequently, structure and loading

weights of variables of each dimension should be sufficiently equivalent across different groups. This is important as it implies proper model fit across different groups. Thus, invariance tests were conducted for the following groups: Male/Female, Involved in Rehab/General care and across different professions: medical, nurse, and allied health care professional. For each group, a model was created, and critical ration of differences among groups were assessed. Overall, each group was able to produce a reasonably good fit, as no single group perceived one dimension differently. Therefore, this indicates invariance and validity of the model for all studied groups**.**

6.2.2.2 Construct validity: Convergent and discriminant validity It is important to assess the validity of the model, which should include both convergent and discriminant validity (Hair, 2010). Convergent validity indicates to what extent the latent variable is explained by its observed variables, for example, the ORGANIZATION dimension which is explained by its observed variables (Management Support, User involvement, and Training). Discriminant validity, in contrast, indicates whether the latent variable can be better explained by other observed variables from different dimension.

Therefore, the following parameters were considered to assess the validity of each variable: Average Variance Extracted (AVE), Maximum Shared Variance (MSV), and the Average Shared Variance (ASV). All variable were found to be able to provide adequate discrimination validity emphasizing that each variable PROFESSION, ORGANIZATION, HUMAN, and TECHNOLOGY was explained best by its own observed variables. For convergent validity, however, the AVE was acceptable for all latent variables except for FINANCE and LEGAL, whose AVE scores were .430 and .366, respectively. This indicates that the two latent variables (FINANCE and LEGAL) may not be very internally strong. However, the threshold for sufficient loading (AVE) decreases as sample size increases. For a sample size of 250, an AVE greater than

.350 is considered providing significant factor loading.(Hair, 2010) Therefore, these two dimensions are considered providing adequate construct validity, as the AVE in general is considered a conservative measure, and FINANCE and LEGAL are important dimensions in the model and represent distinct concepts (Malhotra & Dash, 2011).

Table 19: Convergent and Discriminant Validity

Latent Variables	Average Variance Extracted (AVE)>.5	Maximum Shared Variance (MSV)	Average Shared Variance (ASV)
PROFESSION	0.682	0.118	0.067
ORGANIZATION	0.690	0.229	0.124
HUMAN	0.765	0.286	0.147
TECHNOLOGY	0.776	0.286	0.109
FINANCE	0.430	0.174	0.113
LEGAL	0.366	0.092	0.022

6.2.2.3 Common method bias (CMB) Assessing common method bias (CMB) has special importance for the current study since one method for collecting model-related data, i.e., the survey, was used. Thus, it is important to assess response bias and whether variances explained by the model can be attributed to the measurement method rather than to the variables.

By using the Common Latent Variable (CLV) method, introduced by Podsakoff (2003), an unmeasured latent variable was introduced to the model, and regression weights for each variable were compared before and after introduction of the CLV. Accordingly, estimates were calculated for each variable and the difference between before and after CLV (delta values) were found to be less than 0.2 (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). This indicates a satisfactory fit and implies that the method of collecting data was not influencing the quality of responses in the dataset.

Table 20: Common Latent Variable Method

			Estimate (CLV)	Estimate (No CLV)	Delta
ATTITUDE	<---	ORGANIZATION	0.055	0.08	0.135
ATTITUDE	<---	PROFESSION	-0.01	0.076	0.086
ATTITUDE	<---	TECHNOLOGY	0.255	0.086	-0.169
ATTITUDE	<---	HUMAN	0.728	0.646	-0.082
ATTITUDE	<---	LEGAL	0.073	-0.077	-0.15
ATTITUDE	<---	FINANCE	-0.129	0.053	0.182
ATTITUDE	<---	Gender	-0.03	-0.044	-0.014
ATTITUDE	<---	Age	0.029	0.027	-0.002
ATTITUDE	<---	Occupation	0.099	0.086	-0.013

6.2.3 Estimation of model parameters

The Maximum Likelihood (ML) method is used to estimate model parameters by estimating regression weights, variances, and covariance among variables (Hosmer Jr & Lemeshow, 2004). ML provided both standardized and unstandardized estimates. By using covariance between predictors (unobserved, exogenous variables), ML produces unstandardized regression weight 'coefficients' (equal to b in the general equation of SEM "y = i + Xb + e" where 'i' is y-intercept and 'e' represents residue or error) to represent the amount of change in ATTITUDE per unit change in the predictors (HUMAN, TECHNOLOGY, ORGANIZATION, PROFESSION, LEGAL, and FINANCE), and provides the associate p of significance. The following table illustrates the estimated values and their significant levels:

Table 21: Dimension Relations, Unstandardized Regression Weights (Coefficients)

	Estimate	S.E.	P
ATTITUDE <--- ORGANIZATION	.046	020	**.022**
ATTITUDE <--- PROFESSION	.045	017	**.010**
ATTITUDE <--- TECHNOLOGY	.046	021	**.031**
ATTITUDE <--- LEGAL	-.179	.121	.139
ATTITUDE <--- FINANCE	.053	052	.303
ATTITUDE <--- HUMAN	.419	042	**< .001**

Accordingly, two predictors -LEGAL (P=0.139) and FINANCE (P=0.303)- failed to produce significant levels of predictions for ATTITUDE. However, unit change in HUMAN (P<0.001), TECHNOLOGY (P=0.031), ORGANIZATION (P=0.022), and PROFESSION (P=0.010) resulted in corresponding changes in ATTITUDE (0.418, 0.046, 0.46, and 0.045 units, respectively).

Moreover, estimation by ML can provide standardized regression weight 'coefficients' by replacing covariance among predictors by correlation. Thus, the calculated regression weights represent the amount of change in ATTITUDE resulting from a unit change in the Standard Deviation (SD) of the predictor.

Table 22: Dimensions Relations, Standardized Regression Weights (Coefficients)

	Standardized Regression Weight
ATTITUDE <--- HUMAN	.645*
ATTITUDE <--- TECHNOLOGY	.086*
ATTITUDE<---ORGANIZATION	.080*
ATTITUDE <--- PROFESSION	.076*
ATTITUDE <--- LEGAL	.027
ATTITUDE <--- FINANCE	.053

Thus, 0.645-unit change in ATTITUDE is explained by a single change in SD in the HUMAN predictor. Single changes in SD in TECHNOLOGY, ORGANIZATION, and PROFESSION can result in 0.086, 0.08, and 0.076, respectively unit changes in ATTITUDE.

Additionally, squared multiple correlation (R^2) is produced to represent the proportion of variance in ATTITUDE explained by the predictors together. Thus, 0.63 (63%) of variance in ATTITUDE can be attributed to the predictors in the current model.

The below figure depicts the model with regression weights, correlation, variances and residues:

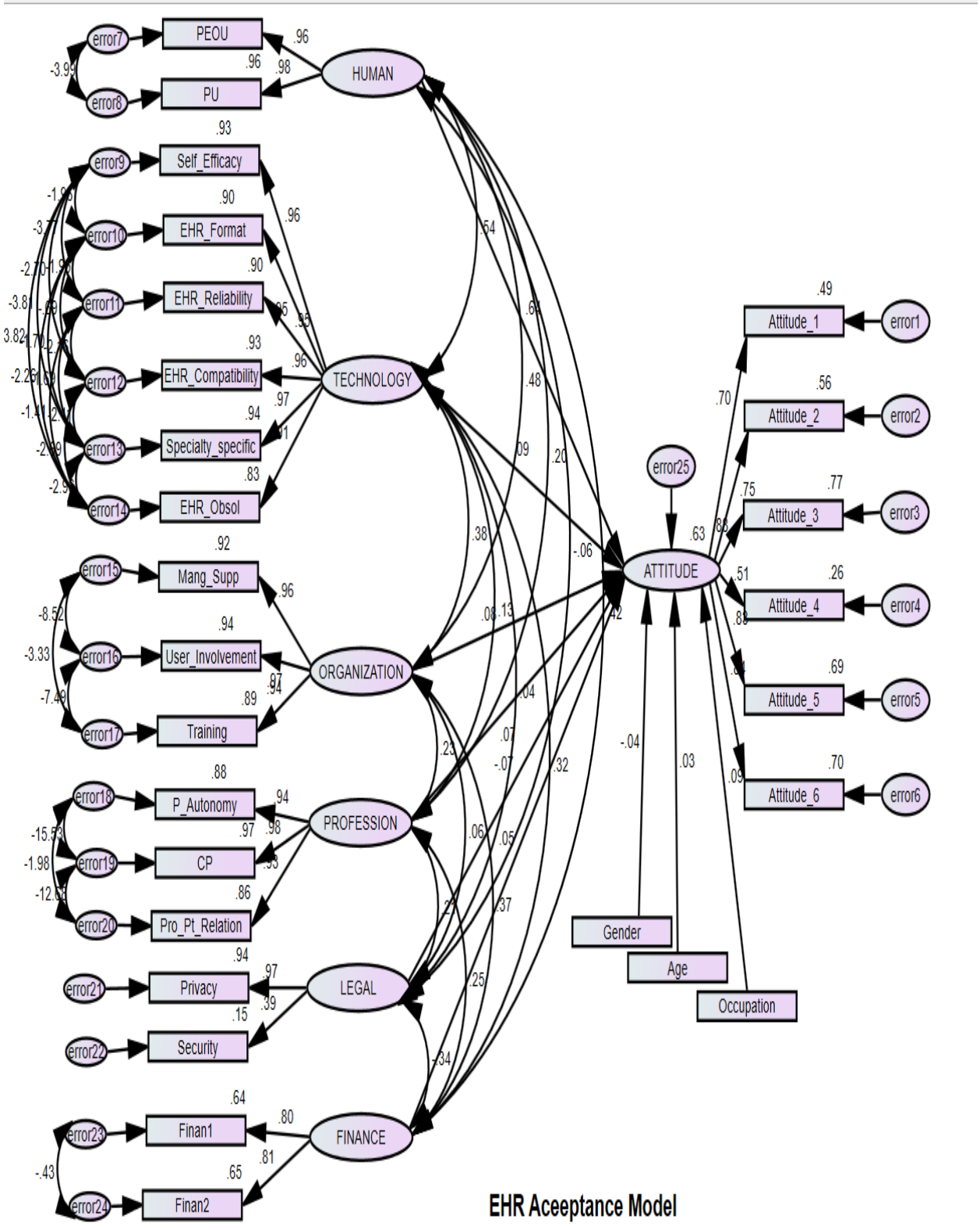


Figure 23: The Proposed Model with Regression Weights, Correlation, Variances and Residues

7.0 PROCESS ANALYSIS OF ACCEPTANCE THROUGH MEDIATION AND MODERATION AMONG PREDICTORS AND ACCEPTANCE

Regardless of the ultimate outcome of the ongoing debate about the ability of SEM to demonstrate causality, it is beneficial to understand the formation of user attitudes toward EHR by exploring chains of associations between predictors without necessarily implying causality.

As already discussed the model includes the following predictors (Human, Technology, Organization, Profession, Legal, and Financial), controlling for gender, age, and specialty, and developing a favorable user attitudes toward EHR can be explained by testing the following hypotheses:

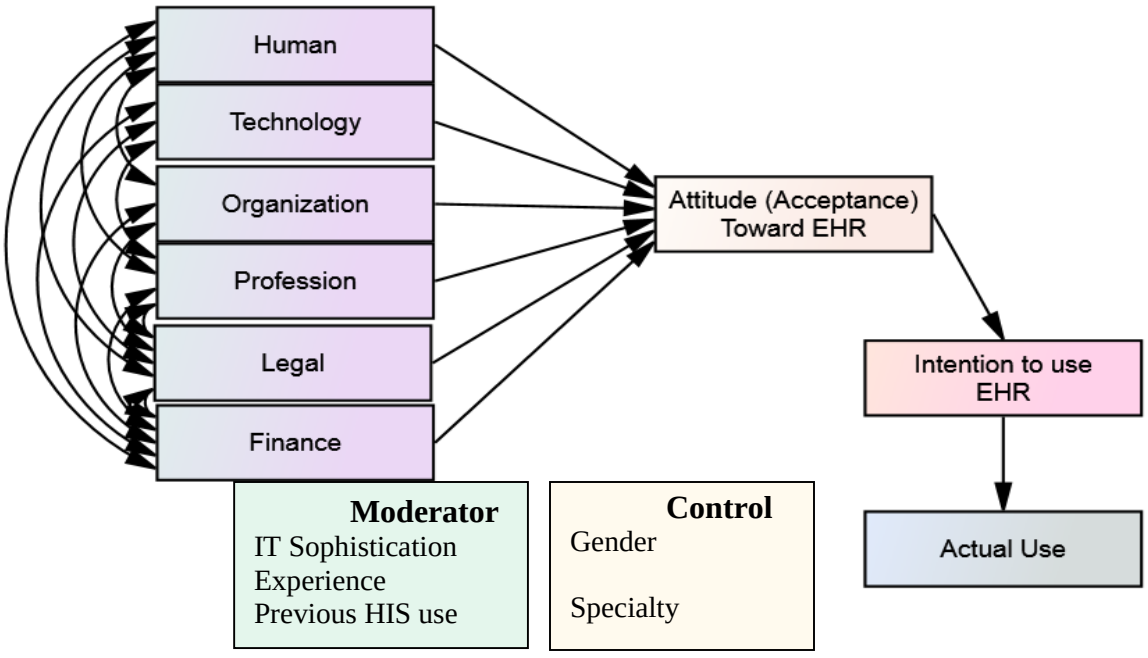


Figure 24: The Acceptance Model

It is necessary to understand the mechanism that these predictors affect acceptance. Thus, process analysis is conducted through investigating how, why, when and under what conditions acceptance is expected to occur. First, assessing if there is a mediating variable that exist between

each predictor and the acceptance and further each mediational model (Predictor→Mediator→Outcome) is hypothesized as the following:

- *H1 a-c:* **Human-related** dimension positively mediates the positive effects of Technology, Organization**,** and Profession dimensions on Attitude toward EHR (Acceptance).
- *H2 a-c:* **Technology-related** dimension positively mediates the positive effects of Human, Organization, and Profession dimensions on Attitude toward EHR (Acceptance).
- *H3 a-c:* **Organization-related** dimension positively mediates the positive effects of Human, Technology, and Profession dimensions on Attitude toward EHR (Acceptance).
- *H4 a-c:* **Profession-related** dimension positively mediates the positive effects of Human, Technology, and Organization, dimension on Attitude toward EHR (Acceptance).

Second, the strength of the relationship between each predictor and acceptance can be influenced by the users IT level of sophistication, clinic expertise, previous usage of HIS and involvement in rehabilitation. Therefore, the moderator effect is hypothesized as the following:

- *H5:* **IT Sophistication** moderates the positive effects of Human, Technology, Organization, and Profession dimensions on Attitude toward EHR (Acceptance) such as the attitude is more favorable with more IT sophistication
- *H6:* **Clinic Experience** moderates the positive effects of Human, Technology, Organization, and Profession dimensions on Attitude toward EHR (Acceptance) such

as the attitude is more favorable with more IT training.

- *H7*: **Previous Health Information System (HIS) use** moderates the positive effects of Human, Technology, Organization, and Profession dimensions on Attitude toward EHR (Acceptance) such as the attitude is more favorable with users who previously used HIS.
- *H8:* **Involvement in rehabilitation care** moderates the positive effects of Human, Technology, Organization, and Profession dimensions on Attitude toward EHR (Acceptance) such as the attitude are more favorable with user involved in rehabilitation care.

7.1 MEDIATION

Baron and Kenny (1986) introduced a four-step approach for establishing a mediation model. First, the variable has to be a statistically significant predictor for Attitude ($Y_{11} \neq 0$). Second, it has to predictor the mediator ($Y_{21} \neq 0$), and, in turn, the mediator variable must predict Attitude ($Y_{12} \neq 0$). Fourth, the prediction power of the variable is impacted (Partial Mediation mediator ($Y^*_{11} < Y_{11}$)) or eliminated in the presence of the mediator (Full Mediation).(Baron & Kenny, 1986)

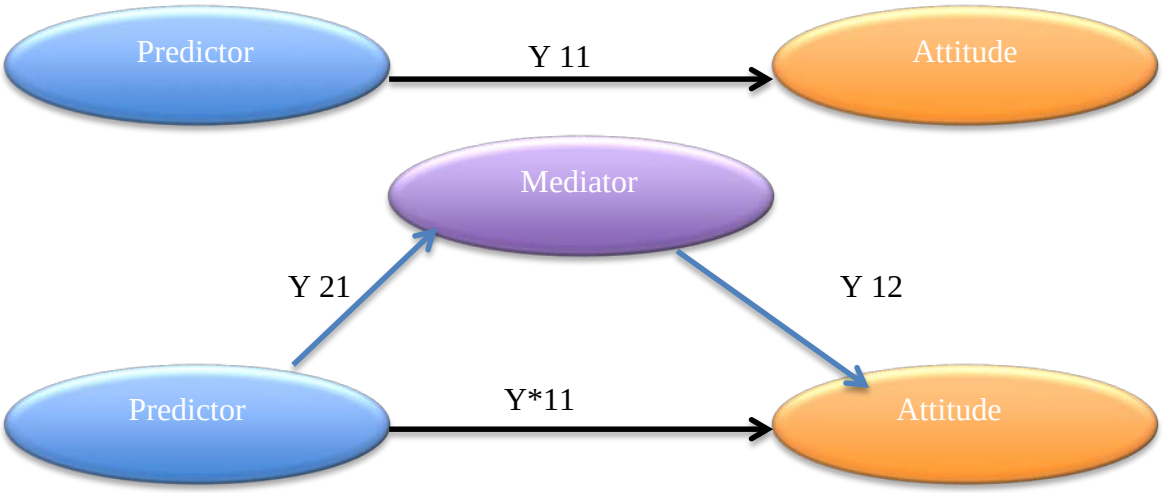


Figure 25: Mediation

Testing hypotheses (*H1 a-c*, Human dimension as a mediator) reveals the following table:

Table 23: Human Dimension as a Mediator

Relationship	Direct without Mediator (Y_{11})	Direct with Mediator (Y^*_{11})	
Technology **Human** Attitude	. 259 (<. 001)	.056 (.011)	Partial Mediation
Organization **Human** Attitude	.256 (<. 001)	.065 (.002)	Partial Mediation
Profession **Human** Attitude	.150 (<. 001)	.048 (.006)	Partial Mediation

Human-related dimension partially and positively mediates the relationship between technology, Organization, and Profession dimensions and acceptance.

Testing hypotheses (*H1 a-c*, Technology dimension as a mediator) reveals the following table:

Table 24: Technology Dimension as a Mediator

Relationship	Direct without Mediator (Y11)	Direct with Mediator (Y*11)	
Human **Technology** Attitude	.504 (<. 001)	.469 (.011)	Partial Mediation
Organization **Technology** Attitude	.256 (<. 001)	.180 (<. 001)	Partial Mediation
Profession **Technology** Attitude	.150 (<. 001)	.106 (<. 001)	Partial Mediation

Technology dimension partially and positively mediates the relationship between Organization and Profession dimensions and acceptance however; Technology has a weak mediation between Human and acceptance.

Testing hypotheses (*H3 a-c*, Organization dimension as a mediator) reveals the following table:

Table 25: Organization Dimension as a Mediator

Relationship	Direct without Mediator (Y_{11})	Direct with Mediator (Y^*_{11})	
Human **Organization** Attitude	.504 (<. 001)	.470 (<. 001)	Partial Mediation
Technology **Organization** Attitude	.259 (<. 001)	.195 (<. 001)	Partial Mediation
Profession **Organization** Attitude	.150 (<. 001)	.089 (<. 001)	Partial Mediation

Organization dimension partially and positively mediates the relationship between Human, Technology, and Profession dimensions and acceptance.

Testing hypotheses (*H4 a-c*, Profession dimension as a mediator) reveals the following table:

Table 26: Profession Dimension as a Mediator

Relationship	Direct without Mediator (Y_{11})	Direct with Mediator (Y^*_{11})	
Human **Profession** Attitude	.504 (<. 001)	.489 (<. 001)	Partial Mediation
Technology **Profession** Attitude	.259 (<. 001)	.240 (<. 001)	Partial Mediation
Organization **Profession** **Human** Attitude	.256 (<. 001)	.230 (<. 001)	Partial Mediation

Profession dimension partially and positively mediates the relationship between Organization dimension and acceptance. Furthermore, It has week mediating effect on the relationships between Human and Technology dimensions with acceptance.

In summary, Human, Organization, Technology and Profession dimensions partially mediate the effect of all other dimensions with greater mediation power for Human dimension.

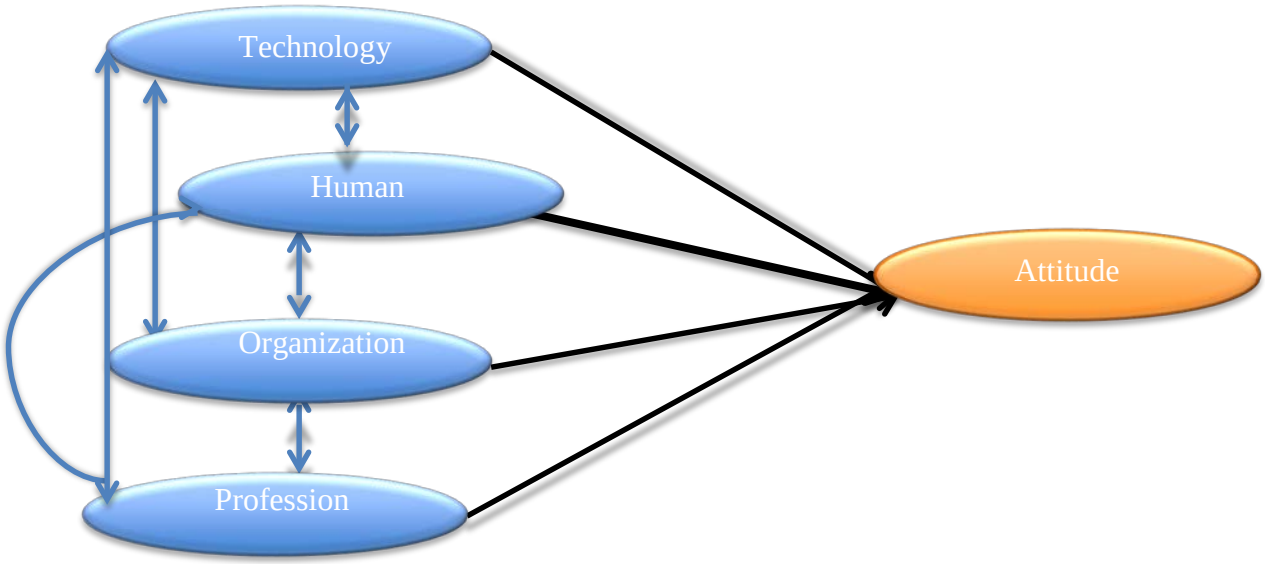


Figure 26: Process Analysis

7.2 MODERATION

Studying the moderation (buffering) aims to assess the impact of introducing variables on the strength and direction of relationships between variables and outcome. Thus, it can be used to answer questions related to when and under which conditions the outcome occurs among the groups of the dataset.

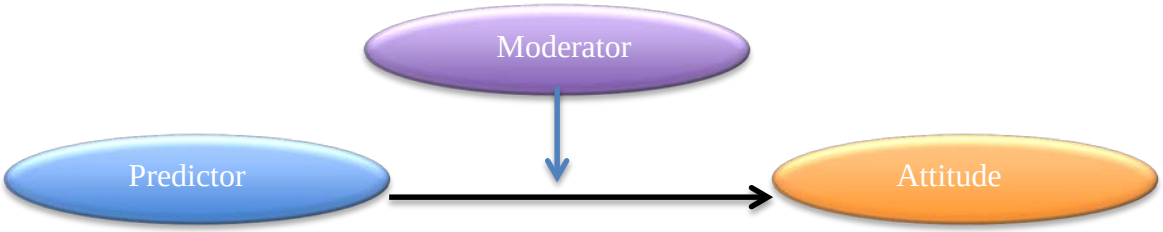


Figure 27: Moderation

The following grouping variables: IT Sophistication, Clinic experience, Having previous contact with Health Information System (HIS), and Being involved in rehabilitation care were tested by splitting the data into groups and P-values for chi-square differences between groups were calculated to determine the level of significance. The following tables show the moderation effects that exist in the model between the above-mentioned moderators and the study's variables and outcome:

7.2.1 Involvement in Rehabilitation Care

Splitting the data into two groups: respondents involved in Rehabilitation care and other involved in General care revealed interesting findings as the Legal dimension was found to be significant predictor for Attitude toward EHR in Rehabilitation group which was not in the study (original sample). Contrariwise, respondents in General care group reported influential role for Finance

dimension in predicting users' attitude toward EHR, which was not significant in the original sample and neither for the rehabilitation group. This indicates that respondents involved in rehabilitation care pay more attention to security and privacy issues around EHR in compared to those in general care, whereas, the latter reported more emphasis on return on investment and impact of EHR on reimbursement. However, the two groups evaluated other dimensions similar and no buffering effect of rehabilitation was detected. (See Appendix D)

Table 27: Moderation, Rehabilitation Care

			Rehab		General Care		
			Estimate	P	Estimate	P	z-score
ATTITUDE	**<---**	**LEGAL**	0.385	0.021	0.196	0.140	2.724***
ATTITUDE	**<---**	**FINANCE**	0.009	0.897	0.175	0.016	1.681*

7.2.2 Previous Use of Health Information System (HIS)

The respondents with lack of previous experience with HIS revealed greater influences for the roles of uses in EHR implementation (User Involvement) and for the required training as compared to the respondents with previous HIS experience. Furthermore, unwanted consequences of using EHR on the Provider-Patient Relation were perceived more by the group with no previous experience. On the contrary, the respondent with previous HIS experiences emphasized a greater role for Perceived Usefulness (PU) as a source of influence compared to the group of lack experience with HIS. Evaluating other dimensions revealed similar responses across these two

groups (See Appendix D). Thus, enhancing users attitude toward EHR should consider these differences by planning different strategies that target and satisfy different users' needs.

Table 28: Moderation, Previous Use of HIS

			Use HIS Before		Never Used HIS		
			Estimate	P	Estimate	P	z-score
User_Involvement	**<---**	**ORGANIZATION**	0.947	0.000	1.172	0.000	1.665*
Training	**<---**	**ORGANIZATION**	0.701	0.000	1.095	0.000	3.926***
Pro_Pt_Relation	**<---**	**PROFESSION**	0.874	0.000	1.197	0.000	2.778***
PU	**<---**	**HUMAN**	1.110	0.000	0.925	0.000	-1.661*

7.2.3 Clinical Experience

Assessing the impact of clinical experience on relationships exist in the model failed to detect any significant changes in strength and direction of relationships between variables and outcome. (For all comparisons, see Appendix D)

7.2.4 Level of IT Sophistication

The respondent with high level of IT skills and knowledge revealed more emphasis on the reliability of the EHR system and privacy of patient as important sources of influence as compared with the respondent with low level of IT Sophistication. However, the latter showed more

important roles of cooperation between coworkers as compared with respondents with high level of IT sophistication. All other dimensions and variables perceived with similar importance across both group. (See Appendix D)

Table 29: Moderation, Level of IT Sophistication

			Low IT Soph.		High IT Soph.		
			Estimate	P	Estimate	P	z-score
Contextual Performance	**<---**	**PROFESSION**	1.098	0.000	0.759	0.000	2.468**
EHR_Reliability	**<---**	**TECHNOLOGY**	0.871	0.000	1.058	0.000	1.811*
Privacy	**<---**	**LEGAL**	3.297	0.000	5.592	0.000	1.697*

8.0 DISCUSSION

Assessing user attitudes toward EHR is a study-worthy topic as failure to adopt EHR still occurs. Furthermore, reasons for failure appear attributable to user attitudes (Gagnon et al., 2014; Christopher A Harle & Dewar, 2012; Venkatesh, Sykes, & Zhang, 2011). Therefore, the successful adoption of EHR must include user perspectives because benefits can only be attained when intended users are empowered with the EHR to carry out particular tasks in the most beneficial and efficient way to enhance the care process (Al-Harbi, 2011a; Lau et al., 2012; Mor et al., 2010).

As the current study aimed to develop a comprehensive model to explain user attitudes toward EHR, the proposed model was thoroughly investigated to determine dimensions that influence user attitudes. The sample size was normally distributed and deemed adequate to support statistical analysis. Furthermore, subpopulations were greatly represented: male (58%)/female (42%), involved in rehabilitation care (54%)/ involved in general care (46%), and having EHR (76%)/did not have EHR (24%). Sources of influence were studied and presented in a six-dimension model covering attitude constructs in a comprehensive manner.

Many scholars emphasize the importance of studying the impact of sociodemographic criteria on respondent perceptions of variables that may shape their attitudes (Trauth, 2006; Venkatesh et al., 2003). In doing so, this has revealed that women perceived EHR to be more threats to their professional context than men. This can be inferred by the sensitivity women showed to changes to their workflow vis-à-vis men. Furthermore, this finding can be attributed to the fact that more men were in practices that did not have EHR/never used EHR compared to women in this study (33% compared to 27%). As a result, men may not be aware of all possible impacts of using EHR on their professional autonomy (Walter & Lopez, 2008). On the other hand,

men paid significantly more attention to perceived usefulness as an influential variable than women and reported having a more positive attitude toward EHR.

The respondents who provide rehabilitation care emphasized the role of professional autonomy, provider-patient relationship, and security issues more often than respondents who provide general care. However, they had less favorable attitudes toward EHR. Although some scholars urge that allied health professionals included in care team that provide rehabilitation have less autonomy than ones in general care, thus, they consider any threat to their autonomy as serious. Furthermore, some physicians in the study sample were engaged in providing rehabilitation care. On the outcome level, the rehabilitation-engaged respondents revealed less favorable attitudes toward EHR compared with other respondents. This can be partly attributed to the fact that current EHR systems are less tailored to specialized care environment; in addition, assessing EHR specialty-specific functions revealed less agreement in the rehabilitation sub-population as compared to the general study population.

Altogether, testing the proposed model revealed that 63% of variance in attitudes could be attributed to the dimensions of the current model. This is superior to the original TAM, with its limited predictive power (Chuttur, 2009). The following are the most important dimensions in shaping user attitudes towards EHR: human, technology, organization, and profession. Financial and legal dimensions, in contrast, failed to provide sufficient statistically significant roles in predicting user attitudes in the current study.

Users' Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of EHR represent the human dimension in the model. Responses in this dimension revealed high levels of agreement on the importance of these two variables (3.4 and 3.66, respectively). Moreover, the human dimension seemed to be the most important source of influence in the model as it explains the

majority of variance in the user attitudes toward EHR. Consequently, a unit change in the standard deviation of human dimension results in a 0.645 unit of change in the overall attitude. This dimension had particular importance in all previous acceptance models. Furthermore, its importance is particularly emphasized in this study due to the overall lack of awareness of the importance and benefits of EHR. Moreover, a lack of experience with EHR and lack of professional support are additional struggles facing EHR users in the Saudi healthcare system (Aldajani, 2012; Khalifa, 2014). It is worth mentioning that the human dimension positively and partially mediates the positive relationship between the predictors (technology, organization, and profession) and user attitudes toward EHR. This agrees with a substantial body of literature that states that the human dimension is key to the success of the EHR system. Consequently, the buy-in decision should be oriented around users' needs and preferences (Fenton, Giannangelo, & Stanfill, 2006; Metfessel, 2013).

In the technology dimension, the following measured variables were reported by respondents as influencing their attitudes toward EHR: Computer Self-efficacy, EHR Format, EHR Compatibility, EHR Specialty-specific, EHR Reliability, and EHR Obsolescence. Furthermore, the technology dimension is responsible for a 0.086 unit change in ATTITUDE, which is less than the Human dimension and more than other dimensions. This can be attributed to the technical difficulties that face users in the Saudi health system, including inadequate technical skills (Khalifa, 2014), lack of standards (Uhomoibhi, Alkraiji, Jackson, & Murray, 2011), and diverse and heterogeneous EHR systems (Hasanain et al., 2014). The importance of technological aspects of EHR have been documented in relevant literature, which states that the EHR system should be compatible (Haughom, 2011), reliable (Randeree, 2007), and should not pose a struggle to users (Meade et al., 2009). Furthermore, Technology positively and partially

mediates the effects of Human, Organizational, and Professional dimensions in shaping attitudes toward EHR.

The third dimension in the model is the Organization dimension. It is composed of Management Support, User Involvement, and Training. The results revealed a valid and statistically significant predictor for attitudes toward EHR. In particular, it is responsible for a 0.080 unit change in ATTITUDE; furthermore, it was found that the organization dimension positively and partially mediates the effects of Human, Technology, and Professional dimensions. The role of Organization appears in the literature as a key element in the successful adoption of EHR. Many healthcare providers view the EHR project as transformative and that organization should support and mitigate any risk associated with adopting EHR (Altuwaijri, 2011; Berg, 2001). Thus, management support, involving users in decisions related to EHR, and providing adequate training are the main roles of an organization to overcome barriers associated with user acceptance and the widespread adoption of EHR (Aldosari, 2003; Khalifa, 2014; Morton, 2008).

Equally important is the Professional dimension as it was responsible for 0.076 of variances in Attitude. Furthermore, it was found that the Professional dimension positively and partially mediates the Organizational dimension and considered as a week mediator for other dimensions. The Professional dimension includes variables related to Professional Autonomy, Contextual Performance, and Impact on Provider-patient relationship. The results of this dimension are compatible with other studies that have emphasized the role of EHR in adding more professional responsibilities and in correcting the lack of awareness of provisions and use of EHR. (Hasanain et al., 2014; Khalifa, 2014; Morton, 2008)

The Finance and Legal dimensions were found to be irrelevant to the context of using EHR in the Saudi healthcare system, especially in rehabilitation settings. In terms of the Finance

dimension, this can be attributed to many reasons, including that most of the respondents in the current sample were from the public sector, in which issues like impact on reimbursement and positive return on investment of EHR have little effect in forming their attitudes toward EHR. This is even more obvious with the rehabilitation care setting, as most of the rehabilitation services are public funded. Additionally, financial issues in the private sector related to reimbursement are largely unregulated and basically lack the following: a unified chargemaster, bundle payments, intensity-based disease coding systems, quality-based payments, and standardized electronic transfer protocols between different parties (Bah, Al Hareky, Hashishi, Alkhater, & Ali, 2015). Moreover, standardizing documentation of care is another obstacle due to the difficulty in regulating and verifying documentation supporting medical claims. Nevertheless, there has been a pronounced effort in moving more healthcare services toward the private sector as the Saudi government envisions less involvement in providing healthcare services. The private sector is expected to contribute about 50% of the gross healthcare expenditure, according to health care strategy in the kingdom (www.chs.gov.sa)). Furthermore, there is an ongoing project aimed at developing the Saudi Health Insurance Bus (SHIB), which is an online, secure portal allowing for more robust and reliable insurance-based data exchange. Therefore, the financial dimension is expected to gain attraction as the Saudi healthcare market becomes more mature and expands its business. Thus, the financial dimension should not be excluded from the acceptance model since the current status of the Saudi healthcare system is in transition and reimbursement methods are still in their infancy.

On the other hand, the Legal dimension is similar to financial dimension in that the country does not have a national regulator of healthcare, and the Medico-legal Committee (MLC), which takes care of disputes over healthcare issues, was only recently formed. Furthermore, satisfactory

procedures for reporting privacy and security breaches have yet to be established, underscoring the need for notification rules. Moreover, there is no patient-rights advocacy body that promotes patient rights, as illustrated by a study that showed that 75% of patients in a governmental hospital were not aware of the patient's bill of rights (Almoajel, 2012). Although Article 21 of the Saudi health profession practice law stresses the importance of protecting patient privacy, enforcement is questionable since it appears that no disciplinary action has been taken so far.

Furthermore, no case related to patient privacy has ever been filed with the Medical Violation Committee (MVC) or the Medical Jurisprudence Committee (MJC) (Al-Saeed, 2010; AlJarallah & AlRowaiss, 2013; Samarkandi, 2005). In spite of studies that show EHR users' concerns over security and privacy issues, the findings of this study show that users had no great concerns over security and privacy issues in the context of using EHR in Saudi healthcare organizations. This is understandable given that security of information is still a new field across Saudi organizations (Abu-Musa, 2010). Moreover, users' access to health information is not well controlled, illustrated by one study which showed that senior management had centralized control of access rather than having a role-based access control approach (Aldajani, 2012). Another study showed that physicians in one hospital considered that reporting medical errors, regardless of seriousness, as an ethical issue but not necessarily a serious reportable event (Aldaqal & Al-Amoodi, 2014). Thus, the Legal dimension in the model received less attention compared to other dimensions. Another finding is that respondents with a high level of IT knowledge and sophistication valued security and privacy issues more than low IT-sophistication respondents. Also, it was found that respondents who were involved in rehabilitation care had more concerns over security and privacy issues than respondents involved in general care. In general, and similar to Finance dimensions, the Legal dimension is expected to gain more influence as early efforts in

raising awareness about security and privacy issues are increasing, especially in Joint-Commission-International (JCI) accredited hospitals.

Studying the impact of the IT Sophistication level of the model's dimensions and variables is important because it was found that the level of sophistication increases users' tendency to accept information system because it improves user's capabilities (Dixon & Dixon, 1994; Marcolin, Huff, Compeau, & Munro, 1993). The current study revealed that respondents with high IT sophistication perceived the importance of reliability of EHR and protecting patient privacy more than respondents with low IT sophistication. On the contrary, the respondents with low IT sophistication reported more value and importance for contextual performance variables than respondents with high IT Sophistication level.

9.0 SUMMARY OF THE STUDY

9.1 FINDINGS OF THE STUDY

This section provides a summary of the findings, study implications, limitations, and conclusion of the study.

This study provided a literature-based model that was developed by using a general and cumulative approach to explain user attitudes toward EHR. The model embodies the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), and the barriers that hinder users from proper use of the EHR system. Dimensions related to Human, Technological, Organizational, Professional, Legal, and Financial sources of influence were identified and tested in a special care setting. Because rehabilitation care facilities require an interdisciplinary (interactive) and multidisciplinary (additive) care approach, they pose an extra challenge. However, their documentation requirements and the fact that they are an understudied area made rehabilitation care facilities the setting of choice for this study. The current situation of the Saudi healthcare system demands a transition to a more connected and integrated system among different facilities of a single provider and across different providers. This situation underscores the need to have EHR in place and demands that particular attention be paid to user acceptance of the system. Thus, current and potential users of EHR in Saudi Arabia were targeted for this study. The participants were asked to rate the importance of each source of influence on their attitudes toward EHR. The sample size was 319, of which 263 responses were eligible for statistical analysis. The findings of the study emphasize the importance of the human-related dimension, as that was primarily responsible for the variance in user attitudes toward EHR. The other sources of influence

on user attitudes included dimensions related to technology, organization and profession. This calls for raising awareness of EHR by providing education and ongoing training and should motivate care providers to seek training; it also reveals a need for more specialists in the field of health information management. Additionally, the successful implementation of EHR requires involving users from the early stages of the EHR journey, beginning with assessing users' requirements, aligning the acquired technology with their workflow, and conducting all necessary system redesigns. Furthermore, indispensable ingredients for the acceptance of EHR include enhancing the usability of the EHR interface by making it less complicated, providing proper documentation, and using data standards.

In contrast, financial and legal dimensions were found to contribute less to shaping user attitudes. Nevertheless, these two dimensions should not be excluded from future applications of this model in Saudi Arabia because they are not well established simply due to the transitional status of the healthcare system there.

9.2 STUDY IMPLICATIONS

Providing a model to explain user attitudes toward EHR has many benefits.

From the perspective of research, the call for contextualization of a model for user attitudes toward EHR has been gaining more attention since most of the current models are concerned with an instance of a single user using a standard application in a private network (Richard J Holden & Karsh, 2010), while current and future technologies are more oriented toward complex, interactive, user-adapted features in a more integrated network (Röcker, 2010; Tennenhouse, 2000). Thus, dimensions related to the actual use of technology in any given field should be incorporated into

any user acceptance model. The need for such efforts was stressed in many studies, including but not limited to studies by (Bagozzi, 2007; Chuttur, 2009; Röcker, 2009; Tennenhouse, 2000), in which they concluded that the social context and variables other than perceived usefulness and ease of use do have an influence that should be considered in any study of user attitudes toward information technology. Furthermore, assessing users' beliefs in each and every context in every instance is not practical, nor is using a general tool to assess perception because it cannot sufficiently capture users' perceptions toward EHR. As a result, the current literature-based model was developed by combining two approaches: standard sets of instruments to assess general perceptions (TAM and TRA) and an instrument to assess users' attitudes in a particular setting or context using a belief-elicitation approach (Barriers to adopt EHR by users). Furthermore, the current model includes the assessment of dimensions related to the context of using EHR in the healthcare arena: human, technological, organizational, professional, legal, and financial dimensions.

Practically speaking, the current study yields a better understanding of user attitudes toward EHR. This ultimately adds to the body of knowledge which both EHR developers and leaders in hospital management can take advantage of in order to facilitate the smooth adoption of the EHR system; in this way, they can accommodate the needs of different specialties and different levels of users' skills. Essentially, the milestone of acquiring EHR is to improve the quality of care by making use of high-quality data in the most effective and efficient way. This cannot be acquired without enhancing users' acceptance of EHR. Therefore, the current study provides a comprehensive model to explain user attitudes in different care environment. In particular, this model was tested in but not limited to the rehabilitation setting. Nevertheless, adopting this model in another setting and for other information systems is possible and can provide valid results

regarding user attitudes and the context of using information systems. For instance, results showed that care providers in the rehabilitation setting in Saudi Arabia paid more attention to legal aspects of EHR, while they were less concerned about financial aspects. Furthermore, highly IT-sophisticated care providers were more concerned with the reliability of the EHR systems as compared with low IT-oriented providers, who focused more on training and their involvement in the EHR project.

The findings of this study highlighted the need to develop policies and legal procedures to regulate the use of EHR in Saudi Arabia. The legal implications of using EHR are not well established there, even including what exactly constitutes a legal EHR; in addition, there is a lack of enforcement bodies overseeing issues related to system security and patient privacy. Such bodies could raise awareness of security and privacy issues revolving around the use of EHR. Furthermore, there should be surveillance and penalties for security and privacy breaches. In fact, all of these issues taken together call for a national regulator to manage the legal aspects of EHR, regardless of the provider (i.e., governmental, private, military, or small practices).

The same shortcomings can be seen with the financial aspects of using EHR. The country's current strategy is to shift more and more care services to the private sector. Expanding the current (market) share of the private sector (from 20% to 50%) cannot be attained without redesigning current reimbursement approaches. This requires more IT solutions on both ends of the care process (care providers and third-party payers). This may call for an act similar to the US Health Information Technology for Economic and Clinical Health Act (HITECH Act) to promote the adoption and meaningful use of EHR and to keep costs of EHR down, especially for the private sector.

9.3 LIMITATION AND DELIMITATION OF THE STUDY

The study is limited to rehabilitation healthcare facilities in Saudi. Consequently, the results are constrained geographically and do not necessarily indicate perceptions or behaviors of users working in the rehabilitation health system with different types of governance or rehabilitation facilities in other parts of the world.

The study aims to report only perceptions of users toward technology acceptance (the intention to use), rather than actual EHR usage. To be able to understand and predict a behavior of interest, it is important to pay attention to the exact nature of the behavioral criterion. Acceptance of EHR as a behavior of interest, revolves around its dichotomous nature (discrete), i.e., whether or not it was performed. In contrast, continuous measuring of performing behavior will provide a magnitude of frequency of that particular behavior (Fishbein & Ajzen, 2011). On the other hand, predicting technology acceptance from intention (intention-behavior relation) is intrinsic to both TRA and TAM models. A solid part of the literature supports the validity of the intention to predict a behavior (Ajzen, 1991; Fred D Davis et al., 1989; Venkatesh et al., 2003). Stability of intention and a person's volition over performing behavior are essential for considering the intention as a good predictor of behavior (Sheeran, Orbell, & Trafimow, 1999; Tao, 2009). Ajzen and Fishbein defined a set of factors that influence the predictive power of intention. First, compatibility in measuring intention with the related behaviors in terms of scale and the category of intention-behavior criterion also impacts the power of the intention-behavior relationship. Second, the stability of intention over time to the performing behavior is another important aspect that should be considered in assessing the predictive validity of the intention-behavior relationship. The temporal stability of intention attests that intention will not change between the time of assessment

of intention and that of performing the intended behavior (after assessment but prior to performing behavior). Lastly, if performing behavior is beyond a person's control, intention cannot be used to predict the occurrence of intended behavior. Unlike computability and temporal stability of intention, volition control was the only factor that implied causality in the intention-behavior correlation (Fishbein & Ajzen, 2011).

Measuring the actual usage behavior (acceptance of EHR) is beyond the temporal boundaries of this study as it requires a follow-up and several measures over a prolonged period of time. Furthermore, the objective of this study is to provide an EHR acceptance model in the context of finding the proper way to manage EHR implementation. Furthermore, measuring the extent or magnitude of EHR usage requires proposing a number of criteria to determine the extent of usage of EHR and then following up with users to see whether or not they 'obey' those criteria over a period of time. The meaningful use requirements, for example, is an initiative that was introduced by the Department of Health and Human Services (DHHS) to measure the effective use of EHR in healthcare facilities in the United States with the intention of improving health care. Accordingly, measuring EHR usage may require more engagement in EHR usage criteria, which may present problems in explaining EHR usage predictors.

EHR acceptance, as a behavior, is conceptualized as a favorable reception to EHR. This behavior requires deliberation and considers a novel and important action. Users have to form a conscious decision to perform this behavior, i.e., "an intention". After repeating this behavior, less deliberation is required, and using EHR as a behavior will be initiated in a behavior-relevant situation. Moreover, once a behavior is habituated (EHR acceptance → daily EHR use), a cognitive intervention is seldom necessary, and the behavior (routine behavior) will be activated with similar situational cues. Stimuli are only required to initiate similar behavior again, i.e., care-encounters

and a hospital environment are expected to automatically elicit EHR usage. This is not to say that intention is only needed for important (infrequent, non-routine) behavior. In two meta-analysis studies, intention was able to predict both frequent and infrequent behaviors, and intention-behavior correlation coefficients (r) were high for both types of behaviors in both studies. Further, no statistically significant differences were found between ability of intention to predict frequent and infrequent behaviors (Ouellette & Wood, 1998). The scope of this study is to provide a framework for predicting EHR behavior in a real-life setting.

The current study is also constrained by its self-reported methodology and willingness to respond. The practicality of self-report makes it the preferred method in conducting research in the social sciences. Behavioral self-reports can be a reliable and valid methodology if the researcher employs appropriate precautions to minimize bias and improve accuracy in collecting data, instead of conducting other difficult-to-perform methods like direct observation of behavior. In general, building a valid and reliable method for measuring a behavior requires a match definition and mutual understanding of the behavior of interest between investigators and study respondents. Thus, it is important to investigate the nature of EHR acceptance behavior and address any bias related to using the self-report method for measuring this behavior. Measuring acceptance and usage of EHR by self-report raises questions regarding the validity of the self-reporting method compared to direct behavioral observations. It is reasonable to expect some bias in measuring behavior in a self-report method as it encompasses the tendency for recall issues. People tend to have more difficulty in recalling behaviors that happened a long time ago compared with more recent ones. Furthermore, recall accuracy and the issue of self-presentation bias are other threats that come with self-reporting and are observed in the over-reporting of socially desirable behaviors and the underreporting of undesirable behaviors.

The possibility of recall issues for behavior like using and accepting EHR seldom exists, bearing in mind that introducing EHR is an important and novel intervention which requires more deliberation and forming a conscious decision as to whether to accept or reject such an action. For users, recalling such behavior and their daily interaction with EHR would, arguably, minimize any risk for recall bias. Further, using a validated, well-structured collecting data tool is another methodological strategy that it is believed will minimize such biases (Hassan, 2006).

Self-presentation biases can be addressed by ensuring the confidentiality of respondents and illustrating the educational and research purposes of the current study. Assuring the anonymity of respondents and including a statement about the purpose of this study and further explaining the importance of providing accurate data will be employed to minimize the risk of inaccurate reporting of users' attitudes toward EHR (Aday & Cornelius, 2011; Groves et al., 2013).

9.4 FUTURE DIRECTIONS

Testing the model in different care settings and with different users is necessary, as more applications would provide extra validation of the model's dimensions and variables; this is in line with suggestions by many studies to test EHR in different specialties and settings (Kokkonen et al., 2013; McGinn et al., 2011; Sanders et al., 2014).

Additionally, testing the model in a different geographic area may uncover different results, especially with regard to the legal and financial dimensions and their predictive power in terms of user attitudes toward EHR.

Besides replicating the study in different settings, some literature showed that attitudes of care providers toward EHR can change over time, especially during critical times like pre- and

post-implementation, six months after implementation, and two years after acquiring EHR (Gadd & Penrod, 2001). Therefore, examining the consistency of the model through a longitudinal study is recommended.

Fourth, conducting focus groups or semi-structured interviews to collect the most influential variables in each dimension can further refine the model, in particular the variables that were embodied in each dimension. This is especially important for dimensions that did not show very high reliability in Cronbach's alpha statistic, namely, legal and financial dimensions. These belief elicitation approaches would boost our understanding of user attitudes toward EHR.

The proposed model can be used to explain user attitudes toward mobile health (mHealth) applications. Several models were proposed to vet mHealth users' acceptance. Mohamed, Tawfik, Al-Jumeily, and Norton (2011) added a construct related to technology design to the original TAM constructs (Perceived Usefulness 'PU', Perceived Ease Of Use 'PEOU') and further stressed that other technical, social, and cultural constructs may be influential. El-Wajeeh, Galal-Edeen, and Mokhtar (2014) underpinned the original TAM constructs by uncovering antecedents to PU and PEOU in the mHealth context, concluding that portability, perceived value, and PEOU affect the construct of PU, while PEOU was affected by self-efficacy and technology anxiety. L. Wu, Li, and Fu (2011) presented an integrated model that incorporated findings about PU, PEOU, and compatibility, which were the most influential constructs, and training and technical support, which failed to produce significant effects in determining users' acceptance of mHealth applications. Other studies include the attempt of Maiga and Namagembe (2014) to deploy the Unified Theory of Acceptance and Use of Technology 'UTAUT' into the mHealth context, and this revealed that performance expectancy, effort expectancy, and disturbance concerns were the main constructs that impacted user acceptance, while social influence and facilitating conditions

were non-significant constructs. On the other hand, Chatterjee, Chakraborty, Sarker, Sarker, and Lau (2009) tested the DeLone and McLean model, which revealed that for mHealth application, users overlooked constructs related to system quality (extent of data process, information access, communicability, and portability) and information complexity compared with users of other information technology. However, task structure and service quality (system reliability, system support) were necessary and sufficient predictors for accepting and using mHealth applications.

The application of the present model for mHealth is supported by the challenges facing current users of mHealth applications. Malvey and Slovensky (2014) emphasized concerns over privacy and security issues, product efficacy, the lack of product regulations, the ambiguity of reimbursement for services provided through mHealth applications, and inadequate business models of mHealth applications. Therefore, the six dimensions of the proposed model can accommodate the different concerns around using mHealth; hence, testing the model is believed to produce results that are worth investigating.

In light of concerns and barriers to the expansion of cloud and telehealth technologies, cloud computing and telehealth are future applications of the proposed model. (Hsieh, 2015) found that perceived value, perceived threat, inertia, cost, and regret avoidance are the main sources of providers' resistance to cloud computing, while for telehealth, issues related to privacy and security, liability, patient acceptance, cost, management support, and reimbursement concerns are the main challenges (Brewster, Mountain, Wessels, Kelly, & Hawley, 2014; Wade, Eliott, & Hiller, 2014).

9.5 CONCLUSION

This study provided a comprehensive model to explain user attitudes toward EHR in the rehabilitation setting. The proposed model is a literature-based model developed through a general and cumulative approach by contemplating instruments to assess general perceptions toward information technology (TAM and TRA) and those related to users' attitudes toward EHR in a particular setting or context (Barriers to adopt EHR by users). Consequently, dimensions related to the context of using EHR in healthcare arena, including human, technological, organizational, professional, legal, and financial dimensions, are embodied in the model. Examining the model in the rehabilitation setting across Saudi Arabia revealed that human, technological, organizational, and professional dimensions are the necessary and sufficient predictors for users in the tested settings. The results are in line with previous research in general and call for raising awareness of EHR and its anticipated benefits and difficulties. Continuous learning and ongoing training sessions are key aspects in attaining users' acceptance of EHR. This requires motivating care providers to learn about it and get trained in its use; furthermore, it supports having more specialists in the health information management field. Additionally, implementing EHR requires involving users from the early stages of the EHR journey beginning with assessing users' requirements, aligning the acquired technology with their workflow, and conducting all necessary system redesigns. Furthermore, enhancing the usability of the EHR interface by making it less complicated, providing proper documentation, and using data standards are indispensable ingredients for its acceptance. The findings of this study also call for developing policies and legal procedures to regulate the use of EHR in Saudi Arabia by establishing a national regulator and enforcement bodies to oversee issues related to system security and patient privacy. Furthermore, it is worth proposing an act or policy (stimuli) to promote the adoption and meaningful use of EHR

and to keep costs of EHR low, especially for the private sector. Regarding future directions, the proposed model is to be taken to different levels and examined in different care settings, geographic areas, and with different technologies, including but not limited to mHealth, cloud computing, and telehealth.

APPENDIX A

[THE SURVEY QUESTIONNAIRE]

A Comprehensive Approach To Explaining Users' Acceptance and Their Intention to use Electronic Health Record (EHR) In Real-Life Setting, Focusing Specifically on Rehabilitation Facilities With Primary Emphasis on Saudi Arabia Healthcare System.

Dear Participant,

You are invited to participate in a research study titled "A Comprehensive Approach To Explain Users' Acceptance and Their Intention to Use Electronic Health Record (EHR) In Practice-Setting, Focusing Specifically on Rehabilitation Facilities With Primary Emphasis on Saudi Arabia's Healthcare System". The present research will address the factors that play influential roles in determining users 'acceptance and their intention to use EHR in rehabilitation facilities.

This study is being conducted by Abdullah Alanazi as a requirement for completion of the doctoral dissertation, school of Health and rehabilitation sciences at the **University of Pittsburgh.**

In this study, you will be asked to complete a survey. Your participation in this study is voluntary and you are can stop at any time. The survey should take 15-20 minutes to complete. There are no risks associated with participating in this study. The survey collects no identifying information of any respondent. All of the response in the survey will be recorded anonymously and only aggregated data will be presented in any reports of findings of this study.

While you will not experience any direct benefits from participation, information collected in this study may benefit clinicians and professionals working in rehabilitation care in the future by better understanding aspects related to successful adoption of health information systems in rehabilitation setting. By completing and submitting this survey, you are indicating your agreement to participate in the study.

Any and all information received will be kept strictly confidential. Data gathered through these means will be summarized in the aggregate and will exclude all references to any individual responses. Please DO NOT include your name or any identifiers in any field in the survey.

The Survey link:

https://pitt.co1.qualtrics.com/SE/?SID=SV_9M5BCGagPhJyCCF

Your participation is highly appreciated and thanks for taking time assisting me in my educational endeavors.

If you have any questions regarding the survey or this research project in general, please contact Abdullah Alanazi at ata13@pitt.edu.

Abdullah Alanazi, Doctoral Candidate, Department of Health Information Management, University of Pittsburgh

I. **Profile of Respondents**

1. Gender:

❑ Female ❑ Male

2. Age (in years).

❑ 20-29 ❑ 30-39 ❑ 40-49

❑ 50 and above

3. Nationality:

❑ Saudi

❑ Western countries (include US, Canada, and Europe)

❑ Middle East

❑ Far East

❑ Other _____

4. Experience in health care field (in years):

❑ < 5 ❑ 5-9 ❑ 10-14

❑ 15-19 ❑ 20 and above

5. In which area of medicine do you currently specialized? (Select primary specialty)

❑ Allergy & immunology	❑ Infectious disease	❑ Pediatrics
❑ Anesthesiology	❑ Medicine, general	❑ Physical med/Rehab
❑ Cardiology	❑ Nephrology	❑ Plastic Surgery
❑ Hematology	❑ Neurology	❑ Psychiatry
❑ Dermatology	❑ Neurosurgery	❑ Pulmonary medicine
❑ Diagnostic imaging	❑ OB/GYN	❑ Radiation oncology
❑ Digestive disease	❑ Oncology	❑ Radiology
❑ Emergency medicine	❑ Ophthalmology	❑ Rheumatology
❑ Endocrinology	❑ Pathology	❑ Surgery, general
❑ Family/ general practice	❑ Orthopedics	❑ Trauma surgery
❑ Geriatrics	❑ Otolaryngology	❑ Urology
❑ Other _____		

6. Please indicate your profession

❑ Physician (❑ Consultant \ Sr. Consultant ❑ Assistant Consultant ❑ Fellow ❑ Resident)

❑ Nurse ❑ Other _____

7. Please indicate your participation practice (aims at improving, maintaining or restoring physical strength, cognition and mobility with maximized results)

❑ Involve in rehabilitation care

❑ Not involve

❑ Other _____

Ii. IT Knowledge, Training, and Frequency of IT Use

1. On the whole, how sophisticated a computer user do you consider yourself?

- ❑ **Novice** has an incomplete understanding and approaching tasks and needs supervision to complete them
- ❑ **Advanced beginner,** has a working understanding, tends to see actions as a series of steps, can complete simpler tasks without supervision.
- ❑ **Competent**, has a good working and background understanding, sees actions at leastpartly in context, able to complete work independently to a standard that is acceptable though it may lack refinement.
- ❑ **Proficient** has a deep understanding, sees actions holistically, can achieve a high standard routinely.
- ❑ **Expert** has an authoritative or deep holistic understanding, deals with routine matters intuitively, able to go beyond existing interpretations, achieves excellence with ease.

2. What training or experience with computers have you had? (Select all that apply)

- ❑ Formal training in IT by any means. (Academic, profession)
- ❑ Workshops or conferences on IT.
- ❑ Self-guided learning about IT
- ❑ None

3. Which of the following best describes your use of health information system available to you?

- ❑ I always use the health information system in my work
- ❑ I use the health information system sometimes in my work.
- ❑ I rarely use the health information system in my work.
- ❑ I have never used any health information system in my work.

Iii. Users' Attitude Variables

1. Self-efficacy

The following questions ask you to rate your **expectation of** the extent to which you believe you have the capability to use the system

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. I feel comfortable using the EHR on my own.	1	2	3	4	5
2. I can easily operate the EHR on my own.	1	2	3	4	5
3. I am able to use the EHR, even if there was no one around to show me how to use it.	1	2	3	4	5
4. Overall, I am confident in my ability to use the EHR.	1	2	3	4	5

2. EHR Format

The following questions ask you to rate your **expectation of** the extent to which you believe the output of the EHR is easy to read and understand

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. The layout of the screen makes it easy for me to read the information presented.	1	2	3	4	5
2. The information is clear.	1	2	3	4	5
3. Overall, I think the output is presented in a useful format.	1	2	3	4	5

3. EHR Compatibility

The following questions ask you to rate your **expectation of** the extent to which you believes the system is consistent with their existing values, needs and past experiences.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. I think that using the EHR fits well with the way I like to work.	1	2	3	4	5
2. Using the EHR fits into my work style.	1	2	3	4	5
3. Overall, using the EHR is compatible with all aspects of my work.	1	2	3	4	5

4. EHR Specialty-specific Functions.

The following questions ask you to rate your **expectation of** the extent to which you believes the system provides all the information needed to carry out their work

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. The EHR provides the precise information I need.	1	2	3	4	5
2. The information content meets my needs.	1	2	3	4	5
3. The EHR provides reports that are just about what I need.	1	2	3	4	5
4. The EHR provides sufficient information.	1	2	3	4	5
5. Overall, the information content meets my needs.	1	2	3	4	5

5. EHR Reliability

The following questions ask you to rate your **expectation of** the extent to which you believes the system provides all the information you need when you need it.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. I get the information I need in time.	1	2	3	4	5
2. The EHR provides up-to-date information.	1	2	3	4	5
3. Overall, the information I need is always available in the EHR when I need it.	1	2	3	4	5

6. EHR Obsolescence (Up to date)

The following questions ask you to rate your **expectation of** the extent to which you think the phenomenon of obsolete (outdate or unsupported technology in five to ten years) of EHR system is serious issue.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. The obsolescence of EHR system is NOT a serious issue?	1	2	3	4	5
2. The EHR is updated frequently as needed	1	2	3	4	5
3. The obsolescence will not restrict my plan to adopt or use EHR	1	2	3	4	5
4. The EHR vendor provides the required support and maintenance	1	2	3	4	5
5. The EHR can meet my future expectations	1	2	3	4	5

7. Management Support

The following questions ask you to rate your **expectation of** management's support (including physician leadership) in EHR implementation and your organizational climate.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. The EHR project is important to top management.	1	2	3	4	5
2. The EHR project is introduced to me effectively by the management.	1	2	3	4	5
3. Management is doing an effective job during the implementation of the EHR	1	2	3	4	5
4. Management involves me in the implementation of the EHR.	1	2	3	4	5
5. Management provides me with the training that I need in order to use the EHR effectively.	1	2	3	4	5
6. I have easy access to resources to help me in understanding and using the EHR	1	2	3	4	5
7. Management expects me to use the EHR	1	2	3	4	5

8. Users' Involvements

In the following questions you are asked to rate your **expectation of** involvement during the implementation phase of the EHR project.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. My involvement during the EHR implementation phase is a must.	1	2	3	4	5
2. My involvement during the EHR implementation phase **is** effective.	1	2	3	4	5
3. My involvement during the EHR implementation phase makes the EHR more useful to me.	1	2	3	4	5
4. My involvement during the EHR implementation phase makes the EHR easier to be used.	1	2	3	4	5
5. Overall, my involvement during the EHR implementation phase positively affects my attitude about using the EHR.	1	2	3	4	5

9. Training

The following questions ask you to give your opinion **(expectation)** about the training you received on how to use the EHR.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. The training I received on the EHR was adequate.	1	2	3	4	5
2. I received the training that I need to be able to understand and use the EHR.	1	2	3	4	5
3. The EHR training made it more useful to me.	1	2	3	4	5
4. The EHR training made it easier for me to use this technology.	1	2	3	4	5

10. Profession Autonomy

The following questions ask you to give your opinion about the profession's autonomy.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. Using the EHR increases the hospital administration's ability to control and monitor the physicians' clinical practices and decision-making.	1	2	3	4	5
2. Using the EHR **may** threaten the physicians' personal and professional privacy.	1	2	3	4	5
3. Using the EHR **may** result in legal or ethical problems for the physician.	1	2	3	4	5
4. Using the EHR **may** limit the physicians' autonomy in making clinical decisions or judgments.	1	2	3	4	5
5. Overall, the physicians' attitude about using the EHR **may be** negatively affected as a result of the increased control and monitoring of his/her clinical practices and decision-making.	1	2	3	4	5
6. Overall, the physicians' attitude about using the EHR **may be** negatively affected as a result of the security, legal and/or ethical concerns associated with using the EHR.	1	2	3	4	5

11. Provider-Patient Relationship

In the following questions you are asked to give your opinion about the provider-patient relationship.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. The patient's confidence in the provider **will likely be** diminished if the patient sees the physician using computer-based technology as a diagnostic aid.	1	2	3	4	5
2. Using the EHR **will likely** threaten the provider's credibility with his/her patients.	1	2	3	4	5
3. Using the EHR **will likely** reduce the patient's satisfaction with the quality of health care he/she receives.	1	2	3	4	5
4. Overall, using the EHR **will likely** interfere with the effectiveness of the provider-patient interaction.	1	2	3	4	5

12. Contextual Performance

Based on your expectation, the following questions are asked to rate how your functions as EHR user within the boundaries of your assigned responsibilities.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. I praise co-workers when they are successful.	1	2	3	4	5
2. I support or encourage a co-worker with a personal problem.	1	2	3	4	5
3. I talk to others before taking actions that might affect them.	1	2	3	4	5
4. I say things to make people feel good about themselves.	1	2	3	4	5
5. I encourage others to overcome their differences and get along.	1	2	3	4	5
6. I treat others fairly in daily interactions	1	2	3	4	5
7. I help someone without being asked.	1	2	3	4	5
8. I put in extra hours to get work done on time.	1	2	3	4	5
9. I pay close attention to important details in their work.	1	2	3	4	5

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
10. I work harder than necessary to ensure work is completed	1	2	3	4	5
11. I ask for a challenging work assignment.	1	2	3	4	5
12. I exercise personal discipline and self-control – even in difficult situations.	1	2	3	4	5
13. I take the initiative to solve a work problem	1	2	3	4	5
14. I persist in overcoming obstacles to complete a task.	1	2	3	4	5
15. I tackle a difficult work assignment enthusiastically.	1	2	3	4	5

13. Privacy

Based on your expectation, the following questions are asked to rate how your perceptions about system's ability to protect the confidentiality and integrity of information and resources.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. The patient's privacy **will likely be** threaten as personal data can be used for purposes other than monitoring their health	1	2	3	4	5
2. I am concerned about how my patients' privacy is protected on EHR.	1	2	3	4	5
3. Using the EHR **will likely** threaten the patient's privacy as EHR might know/track my patients' personal data.	1	2	3	4	5
4. Using the EHR **will likely** threaten the patient's privacy as EHR might share my patients' personal information with other parties	1	2	3	4	5

14. Security

Based on your expectation, the following questions are asked to rate how your perception about system being free from danger or threat.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. For EHR system, there should be no security hole.	1	2	3	4	5
2. When we implement EHR system, I am concerned with unauthorized third-party access to personal information.	1	2	3	4	5
3. In using EHR system, we should make sure that no unauthorized modification could occur to our data.	1	2	3	4	5
4. In using EHR system, I worry that a malicious third party could hack the system.	1	2	3	4	5

15. Financial aspects of EHR

The following questions are asked to rate how **your** expectation about whether the associated costs with EHR system are justified and cost-recovery of the EHR investment is possible.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. Costs associated with implementation of an EHR is justified by the anticipated care benefits	1	2	3	4	5
2. EHR may improve charge capturing. Thus, it enhances billing accuracy (if applicable)	1	2	3	4	5
3. Realization of positive Return on investment (ROI), rates of return on money invested; from an EHR implementation is possible.	1	2	3	4	5
4. EHR may positively improve hospital reimbursement level	1	2	3	4	5

16. Perceived Ease of Use of EHR

Based on your expectation, the following questions are asked to rate how easy the EHR **is** to use.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. The EHR is clear and understandable "user-friendly".	1	2	3	4	5
2. Learning to use the EHR is easy for me.	1	2	3	4	5
3. I become skilled at using the EHR.	1	2	3	4	5
4. Overall, I expect the EHR is easy for physicians to use.	1	2	3	4	5

17. Perceived Usefulness of EHR

Based on your expectation, the following questions are asked to give your opinion about how useful the EHR is to you and to the health care system.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. Using the EHR improves the quality of my work in providing better patient care.	1	2	3	4	5
2. Using the EHR gives me greater control over my work schedule.	1	2	3	4	5
3. Using the EHR allows me to accomplish tasks more quickly.	1	2	3	4	5
4. Using the EHR allows me to accomplish more work than would otherwise be possible.	1	2	3	4	5
5. Using the EHR enhances my overall effectiveness in my job.	1	2	3	4	5
6. Using the EHR makes my job easier to perform.	1	2	3	4	5
7. Overall, the EHR is a useful tool for practicing my profession.	1	2	3	4	5

18. Attitude about EHR Acceptance

Based on your expectation, the following questions are asked to give your opinion about EHR usage and acceptance.

	Strongly Disagree	Disagree	Neither Agree/ Disagree	Agree	Strongly Agree
1. The development and implementation of the EHR technology support the physician in providing better patient care.	1	2	3	4	5
2. I encourage the use of the EHR among my colleagues.	1	2	3	4	5
3. I need the EHR technology to provide effective patient care.	1	2	3	4	5
4. I am **not satisfied** with using the paper-based patient record in my job.	1	2	3	4	5
5. All healthcare providers should learn to use the EHR effectively.	1	2	3	4	5
6. Overall, my attitude about EHR acceptance and usage is positive.	1	2	3	4	5

19. Actual EHR Use

Based on your experience in this hospital, check (Yes) / (No)/ (NA) in front of the following electronic EHR functionalities to give your opinion about actual EHR usage:

EHR Function	Yes	No	Not Available (NA)
1. Demographic characteristics of patients			
2. Problem lists			
3. Medication lists			
4. Discharge summaries			
5. Laboratory reports			
6. Radiologic reports			
7. Diagnostic-test results			
8. Provider order entry for medications			
9. Overall, I actually use EHR in my facility.			

Comments: ……

20. Regarding EHR training, how do you learn best? (Select only one)

- ❑ Group setting
- ❑ By myself
- ❑ Other (please specify) _____

Additional comments: _____

21. In your opinion, what role do you feel management (including physician leadership) plays in EHR system implementation?

22. In your opinion, what roles do you feel that politics and other environmental-related factor play in EHR acceptance?

23. In your opinion, how would you evaluate the national policy, and public education aimed at creating a more efficient health care system with embodying IT

24. In your opinion, how would you evaluate the country's willing to finance a wide national health information infrastructure?

25. In your opinion, what roles do you feel that temporal trends (ex. recent medication error study, annual report of the Saudi Legal Health Organization (LHO)) play in EHR acceptance?

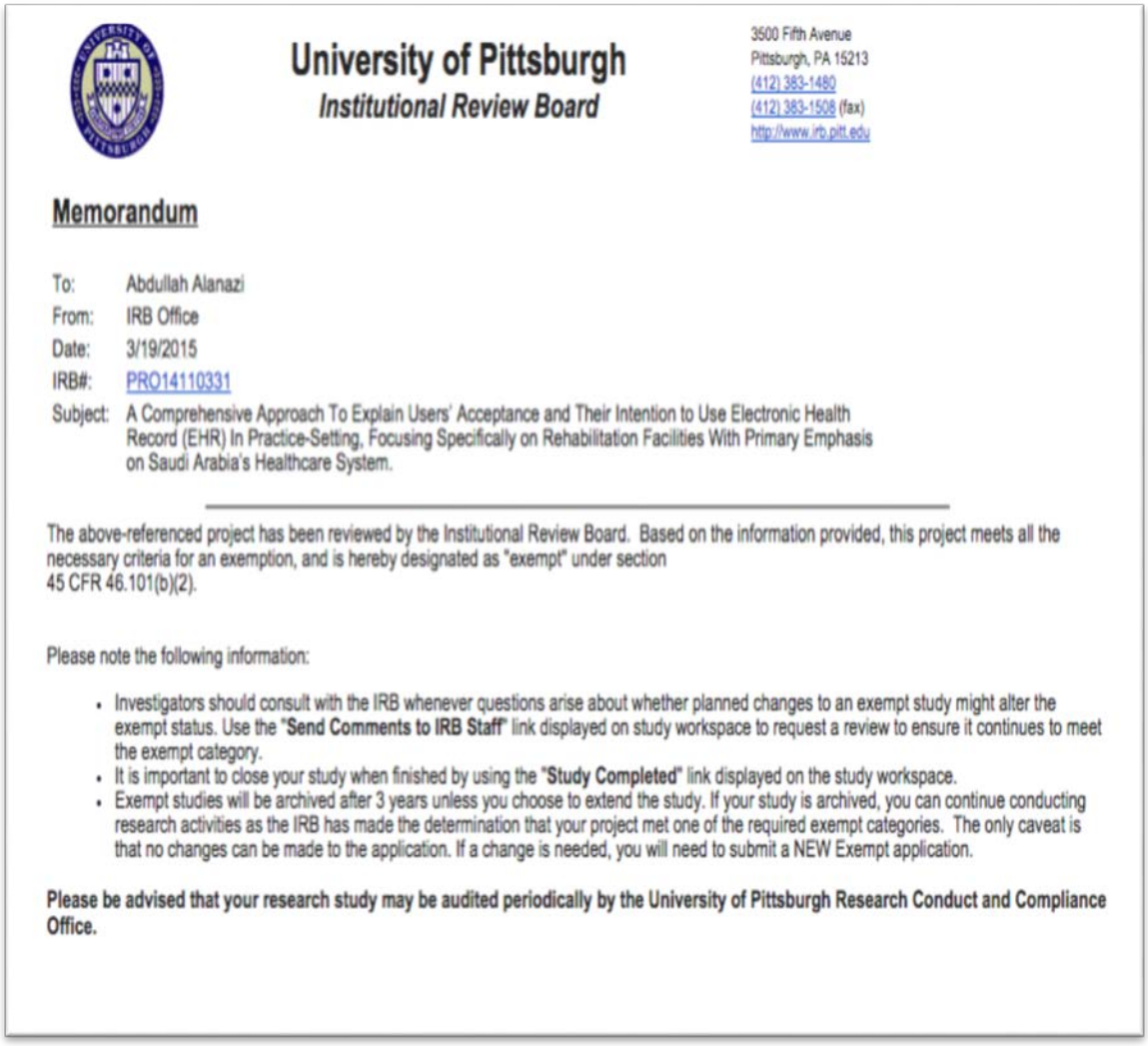
26. In your opinion, what factors unique to rehabilitation setting that affect user's intention to use EHR and their actual use?

27. Please use this section to provide the researcher with any additional comments or suggestions regarding the usage and acceptance of the EHR. These comments will help the researcher better understand your responses overall and may suggest other questions that need to be addressed in future studies. Thank you for your participation in this survey.

Thank you…
Abdullah Alanazi, PhD candidate in Health Information Management, University of Pittsburgh

APPENDIX B

[INSTITUTIONAL REVIEW BOARD]



University of Pittsburgh
Institutional Review Board

3500 Fifth Avenue
Pittsburgh, PA 15213
(412) 383-1480
(412) 383-1508 (fax)
http://www.irb.pitt.edu

Memorandum

To: Abdullah Alanazi
From: IRB Office
Date: 3/19/2015
IRB#: PRO14110331
Subject: A Comprehensive Approach To Explain Users' Acceptance and Their Intention to Use Electronic Health Record (EHR) In Practice-Setting, Focusing Specifically on Rehabilitation Facilities With Primary Emphasis on Saudi Arabia's Healthcare System.

The above-referenced project has been reviewed by the Institutional Review Board. Based on the information provided, this project meets all the necessary criteria for an exemption, and is hereby designated as "exempt" under section 45 CFR 46.101(b)(2).

Please note the following information:

- Investigators should consult with the IRB whenever questions arise about whether planned changes to an exempt study might alter the exempt status. Use the "**Send Comments to IRB Staff**" link displayed on study workspace to request a review to ensure it continues to meet the exempt category.
- It is important to close your study when finished by using the "**Study Completed**" link displayed on the study workspace.
- Exempt studies will be archived after 3 years unless you choose to extend the study. If your study is archived, you can continue conducting research activities as the IRB has made the determination that your project met one of the required exempt categories. The only caveat is that no changes can be made to the application. If a change is needed, you will need to submit a NEW Exempt application.

Please be advised that your research study may be audited periodically by the University of Pittsburgh Research Conduct and Compliance Office.

APPENDIX C

Respondents' Facilities (Optional to report)

Facility Name	Location	City
Suliman-Habib Medical Group	Central Province	Riyadh
King Abdullah bin Abdulaziz University Hospital		Riyadh
King Fahad Medical City (KFMC)		Riyadh
King Faisal Specialist Hospital, Riyadh		Riyadh
King Khalid University hospital Riyadh		Riyadh
King Saud Medical City		Riyadh
National Guard Health Affairs - KAMC		Riyadh
Security Forces Hospital (SFH)		Riyadh
Sultan Bin Abdulaziz Humanitarian City		Banban
Taif University Teaching Hospital	Western Province	Taif
Comprehensive rehabilitation of disabled persons		Taif
Alhada Rehabilitation Hospital		Taif
MakKah Medical Center		Makkah
Al-Noor Hospital		Makkah
Dammam Medical Complex	Eastern Province	Dammam
King Fahad Specialist Hospital		Dammam
Prince Saud Bin Jalawi Hospital		Al Mubarraz
Gurayyat General Hospital	Northern Province	Gurayyat
Abu Arish general Hospital	Southern Province	Jazan
Khamis Mushayt General Hospital		Khamis Mushayt

APPENDIX D

[STATISTICAL OUTPUTS]

Number of Variables Missing Per Case

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	232	72.7	72.7	72.7
	1.00	23	7.2	7.2	79.9
	2.00	3	0.9	0.9	80.9
	3.00	2	0.6	0.6	81.5
	5.00	3	0.9	0.9	82.4
	6.00	5	1.6	1.6	84.0
	7.00	4	1.3	1.3	85.3
	27.00	3	0.9	0.9	86.2
	74.00	4	1.3	1.3	87.5
	84.00	1	0.3	0.3	87.8
	86.00	3	0.9	0.9	88.7
	87.00	3	0.9	0.9	89.7
	89.00	2	0.6	0.6	90.3
	90.00	3	0.9	0.9	91.2
	91.00	2	0.6	0.6	91.8
	92.00	3	0.9	0.9	92.8
	93.00	23	7.2	7.2	100.0
	Total	319	100.0	100.0	

Sources of Influence for EHR Acceptance

Measure	Item	Frequency	Percentage %
Self-efficacy	Strongly Disagree	1	.4
	Disagree	28	10.6
	Neither Agree/Disagree	60	22.8
	Agree	143	54.4
	Strongly Agree	31	11.8
EHR Format	Strongly Disagree	1	.4
	Disagree	40	15.2
	Neither Agree/Disagree	89	33.8
	Agree	119	45.2
	Strongly Agree	14	5.3
EHR Compatibility	Strongly Disagree	0	0
	Disagree	54	20.5
	Neither Agree/Disagree	102	38.8
	Agree	95	36.1
	Strongly Agree	12	4.6
EHR Specialty-specific Functions.	Strongly Disagree	0	0
	Disagree	52	19.8
	Neither Agree/Disagree	99	37.6
	Agree	102	38.8
	Strongly Agree	10	3.8
EHR Reliability	Strongly Disagree	3	1.1
	Disagree	34	12.9
	Neither Agree/Disagree	97	36.9
	Agree	108	41.1
	Strongly Agree	21	8.0
EHR Obsolescence (Up to date)	Strongly Disagree	1	.4
	Disagree	23	8.7
	Neither Agree/Disagree	131	49.8
	Agree	100	38.0
	Strongly Agree	8	3.0
Management Support	Strongly Disagree	7	2.7
	Disagree	17	6.5
	Neither Agree/Disagree	85	32.3
	Agree	140	53.2
	Strongly Agree	14	5.3
Users' Involvements	Strongly Disagree	4	1.5
	Disagree	6	2.3
	Neither Agree/Disagree	56	21.3
	Agree	141	53.6
	Strongly Agree	56	21.3
Training	Strongly Disagree	0	0
	Disagree	20	7.6
	Neither Agree/Disagree	120	45.6
	Agree	107	40.7
	Strongly Agree	16	6.1

Profession Autonomy	Strongly Disagree	2	.8
	Disagree	52	19.8
	Neither Agree/Disagree	127	48.3
	Agree	74	28.1
	Strongly Agree	8	3
Provider-Patient Relationship	Strongly Disagree	0	0
	Disagree	35	13.3
	Neither Agree/Disagree	90	34.2
	Agree	112	42.6
	Strongly Agree	26	9.9
Contextual Performance	Strongly Disagree	0	0
	Disagree	7	2.7
	Neither Agree/Disagree	102	38.8
	Agree	138	52.5
	Strongly Agree	16	6.1
Privacy	Strongly Disagree	5	1.9
	Disagree	67	25.5
	Neither Agree/Disagree	114	43.3
	Agree	71	27.0
	Strongly Agree	6	2.3
Security	Strongly Disagree	0	0
	Disagree	4	1.5
	Neither Agree/Disagree	144	43.8
	Agree	113	43.0
	Strongly Agree	2	.8
Finance 1	Strongly Disagree	0	0
	Disagree	3	1.1
	Neither Agree/Disagree	52	19.8
	Agree	185	70.3
	Strongly Agree	23	8.7
Finance 2	Strongly Disagree	0	0
	Disagree	13	4.9
	Neither Agree/Disagree	95	36.1
	Agree	151	57.4
	Strongly Agree	4	1.5
Perceived Ease of Use of EHR	Strongly Disagree	1	.4
	Disagree	21	8.0
	Neither Agree/Disagree	106	40.3
	Agree	126	47.9
	Strongly Agree	9	3.4
Perceived Usefulness of EHR	Strongly Disagree	1	.4
	Disagree	10	3.8
	Neither Agree/Disagree	101	38.4
	Agree	132	50.2
	Strongly Agree	19	7.2

Positive Attitude toward EHR

Measure	Item	Frequency	Percentage %
Positive attitude about EHR	Strongly Disagree	0	0
	Disagree	4	1.5

(Acceptance)	Neither Agree/Disagree	68	25.9
	Agree	177	67.3
	Strongly Agree	14	5.3

T-test for independent samples results for the differences in the mean scores of the study variables according to Gender

Measure	Item	Frequency	Mean	SD	*t*	*p-value*
Self Efficacy	Male	153	3.62	0,82	1.09	0.277
	Female	110	3.50	0.80		
EHR Format	Male	153	3.45	.78	.837	.404
	Female	110	3.37	.82		
EHR Compatibility	Male	153	3.32	.81	.922	.357
	Female	110	3.23	.75		
EHR Specialty-specific	Male	153	3.32	.70	.705	.481
	Female	110	3.25	.78		
EHR Reliability	Male	153	3.49	.80	1.27	.205
	Female	110	3.36	.84		
EHR Obsolescence (Up to date)	Male	153	3.36	.67	.931	.353
	Female	110	3.29	.66		
Management Support	Male	153	3.54	.79	-.081	.936
	Female	110	3.55	.70		
Users' Involvements	Male	153	3.88	.69	.285	.776
	Female	110	3.86	.70		
Training	Male	153	3.37	.69	.449	.654
	Female	110	3.33	.69		
Profession Autonomy	Male	153	2.95	.74	**-2.98**	**.003**
	Female	110	3.21	.65		
Provider-Patient Relationship	Male	153	3.33	.87	-1.63	.103
	Female	110	3.49	.70		
Contextual Performance	Male	153	3.60	.58	-.846	.398
	Female	110	3.66	.61		
Privacy	Male	153	2.89	.83	-1.2	.230
	Female	110	3.00	.80		
Security	Male	153	3.28	.42	-.622	.535
	Female	110	3.30	.40		
Finance 1	Male	153	3.62	.52	-1.10	.271
	Female	110	3.70	.54		
Finance 2	Male	153	3.41	.55	.021	.984
	Female	110	3.41	.52		
Perceived Ease of Use of EHR	Male	153	3.45	.61	1.32	.189
	Female	110	3.34	.73		
Perceived Usefulness	Male	153	3.73	.58	2.07	**.04**
	Female	110	3.56	.70		
Positive EHR Attitude	Male	153	3.78	.47	2.34	**.020**
	Female	110	3.63	.54		

T-test for independent samples results for the differences in the mean scores of the study's variables according to user's involvement in rehabilitation care.

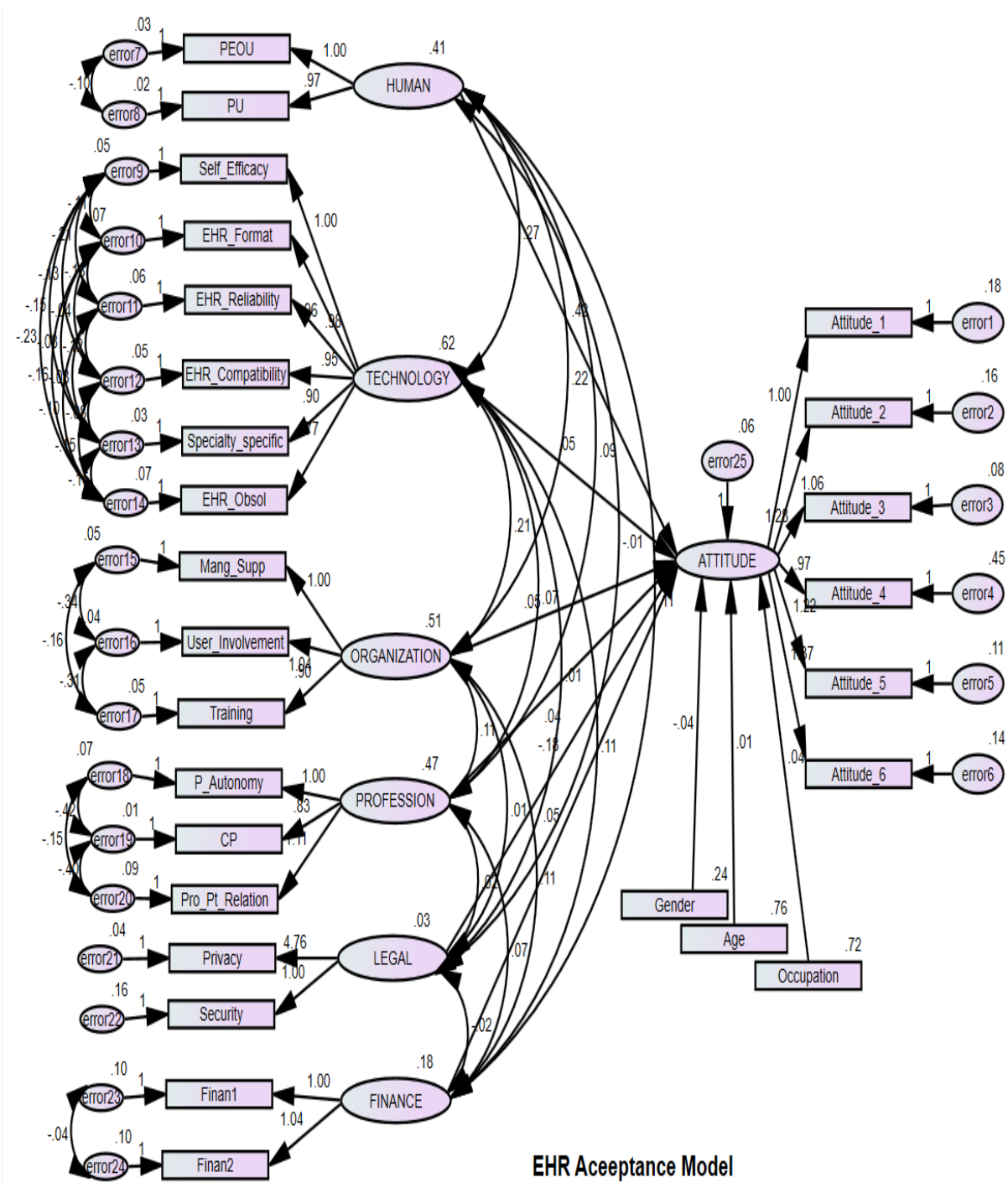
Measure	Item	Frequency	Mean	SD	*t*	*p-value*
Self Efficacy	Involve in Rehab	142	3.58	.78	.171	0.864
	General Practice	121	3.56	.86		
EHR Format	Involve in Rehab	142	3.42	.73	-.009	.993
	General Practice	121	3.42	.87		
EHR Compatibility	Involve in Rehab	142	3.28	.73	-.127	.900
	General Practice	121	3.29	.84		
EHR Specialty-specific	Involve in Rehab	142	3.26	.68	-.613	.504
	General Practice	121	3.32	.79		
EHR Reliability	Involve in Rehab	142	3.45	.81	.366	.714
	General Practice	121	3.42	.82		
EHR Obsolescence (Up to date)	Involve in Rehab	142	3.35	.60	.550	.583
	General Practice	121	3.31	.73		
Management Support	Involve in Rehab	142	3.54	.74	-.075	.941
	General Practice	121	3.55	.78		
Users' Involvements	Involve in Rehab	142	3.95	.75	1.70	.089
	General Practice	121	3.79	.74		
Training	Involve in Rehab	142	3.40	.71	.888	.375
	General Practice	121	3.32	.66		
Profession Autonomy	Involve in Rehab	142	3.17	.72	**2.6**	**.010**
	General Practice	121	2.94	.69		
Provider-Patient Relationship	Involve in Rehab	142	3.53	.81	**2.93**	**.004**
	General Practice	121	3.24	.79		
Contextual Performance	Involve in Rehab	142	3.66	.58	1.11	.268
	General Practice	121	3.59	.60		
Privacy	Involve in Rehab	142	2.93	.86	-.051	.959
	General Practice	121	2.94	.77		
Security	Involve in Rehab	142	3.34	.42	**2.18**	**.030**
	General Practice	121	3.23	.39		
Finance 1	Involve in Rehab	142	3.71	.52	1.91	.057
	General Practice	121	3.59	.52		
Finance 2	Involve in Rehab	142	3.44	.49	.711	.478
	General Practice	121	3.39	.59		
Perceived Ease of Use of EHR	Involve in Rehab	142	3.43	.69	.816	.415
	General Practice	121	3.37	.63		
Perceived Usefulness	Involve in Rehab	142	3.63	.69	-.815	.416
	General Practice	121	3.70	.57		
Positive EHR Attitude	Involve in Rehab	142	3.66	.49	**-2.06**	**.041**
	General Practice	121	3.79	.51		

One-way ANOVA results for the differences in the main scores of the study's variables according to user's criteria

Measure	Item	Sum of Squares	df	Mean Square	*F*	*p-value*
Age (yrs.)	Between Groups	-647	3	.216	.839	.473
	Within Groups	66.5	259	.257		
	Total	67.16	262			
Experience	Between Groups	1.24	4	.311	1.22	.304
	Within Groups	65.92	258	.255		
	Total	67.16	262			
Profession	Between Groups	.218	2	.109	.424	.655
	Within Groups	66.94	260	.257		
	Total	67.16	262			
Computer Sophistication Level	Between Groups	1.65	4	.413	1.63	.168
	Within Groups	65.51	258	.254		
	Total	67.16	262			
Computer Training	Between Groups	.77	6	.128	.494	.813
	Within Groups	66.39	256	.259		
	Total	67.16	262			
Using HIS	Between Groups	1.34	3	.447	1.76	.156
	Within Groups	65.82	259	.254		
	Total	67.16	262			

Linearity using Curve Estimation

Variable	R Square	F	Sig
Management Supp.	.179	57	.00
User involvement	.185	58.11	.00
Training	.152	45.7	.00
P_Autonomy	.011	2.96	.087
CP	.177	56.2	.00
Pro_Pt_relation	.019	5.08	.025
Security	.016	4.34	.045
Privacy	.017	4.46	.038
Finance1	.053	14.7	.00
Finance2	.131	39.3	.00
PEOU	.4	175	.00
PU	.6	389	.00
Self-Efficacy	.16	49.6	.00
EHR Format	.177	56.2	.00
EHR Compatibility	.194	62.7	.00
Specialty specific	.279	100.9	.00
EHR Reliability	.248	86.2	.00
EHR Obsol	.187	59.9	.00



Model with Unstandardized Regression Weights

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P
ATTITUDE	<---	ORGANIZATION	.046	.020	2.287	.022
ATTITUDE	<---	PROFESSION	.045	.017	2.575	.010
ATTITUDE	<---	TECHNOLOGY	.045	.021	2.123	.034
ATTITUDE	<---	HUMAN	.419	.042	9.893	***
ATTITUDE	<---	LEGAL	-.179	.121	-1.478	.139
ATTITUDE	<---	FINANCE	.053	.056	.948	.343
ATTITUDE	<---	Occupation	.042	.020	2.133	.033
ATTITUDE	<---	Gender	-.037	.033	-1.107	.268
ATTITUDE	<---	Age	.013	.019	.673	.501
User_Involvement	<---	ORGANIZATION	1.037	.063	16.491	***
Mang_Supp	<---	ORGANIZATION	1.000			
EHR_Format	<---	TECHNOLOGY	.962	.044	22.032	***
Attitude_3	<---	ATTITUDE	1.282	.097	13.219	***
Attitude_4	<---	ATTITUDE	.973	.123	7.934	***
CP	<---	PROFESSION	.827	.052	15.860	***
Training	<---	ORGANIZATION	.901	.049	18.272	***
Pro_Pt_Relation	<---	PROFESSION	1.112	.062	17.848	***
P_Autonomy	<---	PROFESSION	1.000			
PU	<---	HUMAN	.968	.045	21.596	***
PEOU	<---	HUMAN	1.000			
EHR_Reliability	<---	TECHNOLOGY	.981	.053	18.557	***
EHR_Compatibility	<---	TECHNOLOGY	.954	.044	21.878	***
Specialty_specific	<---	TECHNOLOGY	.902	.044	20.551	***
EHR_Obsol	<---	TECHNOLOGY	.767	.048	16.064	***
Self_Efficacy	<---	TECHNOLOGY	1.000			
Security	<---	LEGAL	1.000			
Privacy	<---	LEGAL	4.756	.725	6.560	***
Finan2	<---	FINANCE	1.039	.086	12.051	***
Finan1	<---	FINANCE	1.000			
Attitude_2	<---	ATTITUDE	1.064	.094	11.353	***
Attitude_1	<---	ATTITUDE	1.000			
Attitude_5	<---	ATTITUDE	1.216	.097	12.582	***
Attitude_6	<---	ATTITUDE	1.374	.109	12.631	***

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
ATTITUDE	<---	ORGANIZATION	.079
ATTITUDE	<---	PROFESSION	.073
ATTITUDE	<---	TECHNOLOGY	.086
ATTITUDE	<---	HUMAN	.645
ATTITUDE	<---	LEGAL	-.072
ATTITUDE	<---	FINANCE	.053
ATTITUDE	<---	Occupation	.085
ATTITUDE	<---	Gender	-.044
ATTITUDE	<---	Age	.027
User_Involvement	<---	ORGANIZATION	.969
Mang_Supp	<---	ORGANIZATION	.958
EHR_Format	<---	TECHNOLOGY	.947
Attitude_3	<---	ATTITUDE	.879
Attitude_4	<---	ATTITUDE	.515
CP	<---	PROFESSION	.983
Training	<---	ORGANIZATION	.944
Pro_Pt_Relation	<---	PROFESSION	.929
P_Autonomy	<---	PROFESSION	.936
PU	<---	HUMAN	.977
PEOU	<---	HUMAN	.961
EHR_Reliability	<---	TECHNOLOGY	.950
EHR_Compatibility	<---	TECHNOLOGY	.962
Specialty_specific	<---	TECHNOLOGY	.969
EHR_Obsol	<---	TECHNOLOGY	.912
Self_Efficacy	<---	TECHNOLOGY	.962
Security	<---	LEGAL	.387
Privacy	<---	LEGAL	.971
Finan2	<---	FINANCE	.806
Finan1	<---	FINANCE	.798
Attitude_2	<---	ATTITUDE	.746
Attitude_1	<---	ATTITUDE	.697
Attitude_5	<---	ATTITUDE	.832
Attitude_6	<---	ATTITUDE	.835

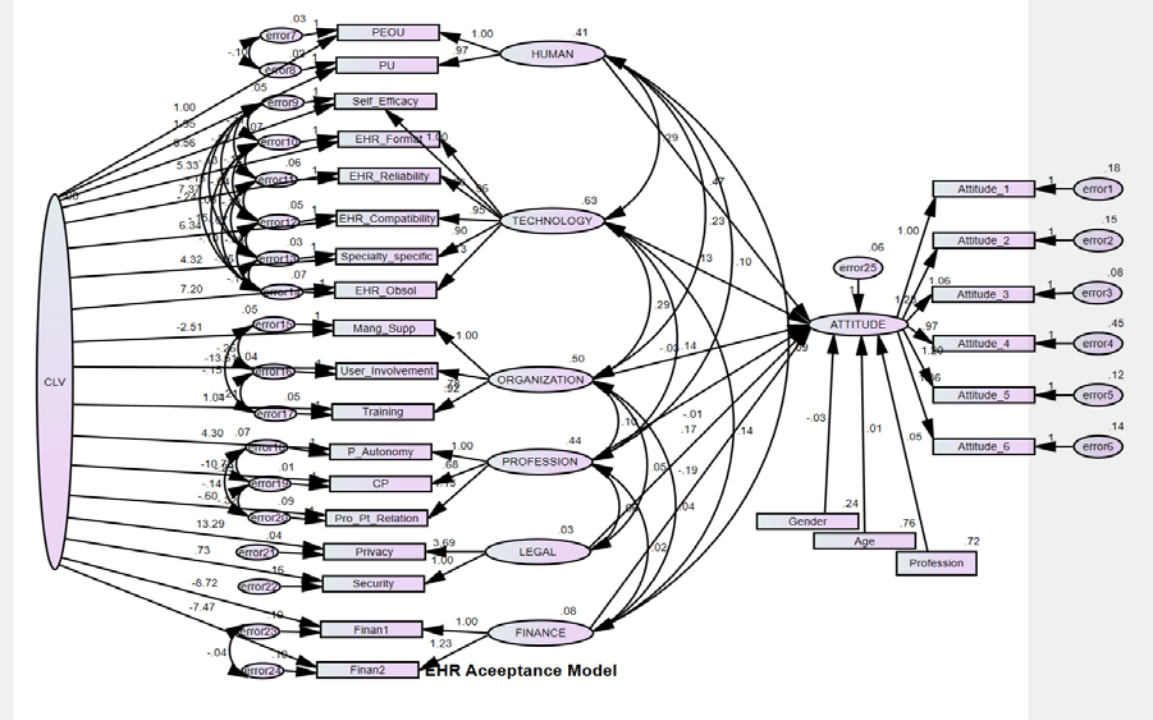
Correlations: (Group number 1 - Default model)

			Estimate
ORGANIZATION	<-->	PROFESSION	.231
PROFESSION	<-->	HUMAN	.198
TECHNOLOGY	<-->	HUMAN	.535
ORGANIZATION	<-->	HUMAN	.476
ORGANIZATION	<-->	TECHNOLOGY	.380
TECHNOLOGY	<-->	FINANCE	.324
ORGANIZATION	<-->	LEGAL	.055
ORGANIZATION	<-->	FINANCE	.371
TECHNOLOGY	<-->	PROFESSION	.130
PROFESSION	<-->	LEGAL	.210
HUMAN	<-->	FINANCE	.417
PROFESSION	<-->	FINANCE	.253
HUMAN	<-->	LEGAL	-.059
LEGAL	<-->	FINANCE	-.340
TECHNOLOGY	<-->	LEGAL	.044

Convergent and Discriminant Validity

Latent Variables	Average Variance Extracted (AVE)	Maximum Shared Variance (MSV)	Average Shared Variance (ASV)
PROFESSION	0.682	0.118	0.067
ORGANIZATION	0.690	0.229	0.124
HUMAN	0.765	0.286	0.147
TECHNOLOGY	0.776	0.286	0.109
FINANCE	0.430	0.174	0.113
LEGAL	0.366	0.092	0.022

Common Latent Variable (CLV)



			Estimate (CLV)	Estimate (No CLV)	Delta
ATTITUDE	<---	ORGANIZATION	0.055	0.08	0.135
ATTITUDE	<---	PROFESSION	-0.01	0.076	0.086
ATTITUDE	<---	TECHNOLOGY	0.255	0.086	-0.169
ATTITUDE	<---	HUMAN	0.728	0.646	-0.082
ATTITUDE	<---	LEGAL	0.073	-0.077	-0.15
ATTITUDE	<---	FINANCE	-0.129	0.053	0.182
ATTITUDE	<---	Gender	-0.03	-0.044	-0.014
ATTITUDE	<---	Age	0.029	0.027	-0.002
ATTITUDE	<---	Occupation	0.099	0.086	-0.013

Mediation

- Direct Effect

ATTITUDE	<---	HUMAN	.504	.043	11.769	***

- Mediation

TECHNOLOGY	<---	HUMAN	.652	.056	11.571	***
ATTITUDE	<---	TECHNOLOGY	.056	.022	2.552	.011
ATTITUDE	<---	HUMAN	.469	.043	10.890	***

ORGANIZATION	<---	HUMAN	.530	.048	10.958	***
ATTITUDE	<---	ORGANIZATION	.065	.021	3.142	.002
ATTITUDE	<---	HUMAN	.470	.042	11.152	***

PROFESSION	<---	HUMAN	.211	.043	4.939	***
ATTITUDE	<---	PROFESSION	.048	.017	2.766	.006
ATTITUDE	<---	HUMAN	.489	.042	11.581	***

LEGAL	<---	HUMAN	-.015	.016	-.959	.337
ATTITUDE	<---	HUMAN	.501	.043	11.738	***
ATTITUDE	<---	LEGAL	-.154	.110	-1.404	.160

FINANCE	<---	HUMAN	.271	.040	6.743	***
ATTITUDE	<---	HUMAN	.468	.043	10.872	***
ATTITUDE	<---	FINANCE	.120	.050	2.407	.016

- Direct Effect

ATTITUDE	<---	TECHNOLOGY	.259	.032	8.044	***

- Mediation

HUMAN	<---	TECHNOLOGY	.439	.039	11.219	***
ATTITUDE	<---	TECHNOLOGY	.056	.022	2.552	.011
ATTITUDE	<---	HUMAN	.469	.043	10.890	***

ORGANIZATION	<---	TECHNOLOGY	.346	.039	8.961	***
ATTITUDE	<---	ORGANIZATION	.180	.029	6.325	***
ATTITUDE	<---	TECHNOLOGY	.195	.029	6.836	***

PROFESSION	<---	TECHNOLOGY	.112	.033	3.401	***
ATTITUDE	<---	PROFESSION	.106	.024	4.384	***
ATTITUDE	<---	TECHNOLOGY	.240	.031	7.778	***

LEGAL	<---	TECHNOLOGY	.009	.012	.749	.454
ATTITUDE	<---	TECHNOLOGY	.262	.032	8.162	***
ATTITUDE	<---	LEGAL	-.336	.152	-2.206	.027

FINANCE	<---	TECHNOLOGY	.173	.031	5.541	***
ATTITUDE	<---	TECHNOLOGY	.203	.031	6.641	***
ATTITUDE	<---	FINANCE	.302	.066	4.612	***

- Direct Effect

ATTITUDE	<---	ORGANIZATION	.256	.033	7.769	***	par_2

- Mediation

HUMAN	<---	ORGANIZATION	.427	.042	10.175	***	par_18
ATTITUDE	<---	ORGANIZATION	.065	.021	3.142	.002	par_2
ATTITUDE	<---	HUMAN	.470	.042	11.152	***	par_7

TECHNOLOGY	<---	ORGANIZATION	.426	.049	8.674	***	par_36
ATTITUDE	<---	ORGANIZATION	.180	.029	6.325	***	par_3
ATTITUDE	<---	TECHNOLOGY	.195	.029	6.836	***	par_11

PROFESSION	<---	ORGANIZATION	.227	.033	6.857	***	par_21
ATTITUDE	<---	ORGANIZATION	.230	.031	7.457	***	par_2
ATTITUDE	<---	PROFESSION	.089	.023	3.845	***	par_8

LEGAL	<---	ORGANIZATION	.012	.012	1.023	.306	par_17
ATTITUDE	<---	ORGANIZATION	.259	.033	7.867	***	par_2
ATTITUDE	<---	LEGAL	-.320	.151	-2.112	.035	par_7

FINANCE	<---	ORGANIZATION	.214	.031	6.860	***	par_18
ATTITUDE	<---	ORGANIZATION	.187	.031	6.096	***	par_2
ATTITUDE	<---	FINANCE	.301	.068	4.460	***	par_6

- Direct Effect

ATTITUDE	<---	PROFESSION	.150	.029	5.197	***

- Mediation

HUMAN	<---	PROFESSION	.183	.039	4.697	***	par_18

ATTITUDE	<---	PROFESSION	.048	.017	2.766	.006	par_6
ATTITUDE	<---	HUMAN	.489	.042	11.581	***	par_7

TECHNOLOGY	<---	PROFESSION	.145	.043	3.328	***	par_36
ATTITUDE	<---	PROFESSION	.106	.024	4.384	***	par_10
ATTITUDE	<---	TECHNOLOGY	.240	.031	7.778	***	par_11

ORGANIZATION	<---	PROFESSION	.250	.039	6.448	***	par_21
ATTITUDE	<---	ORGANIZATION	.230	.031	7.457	***	par_2
ATTITUDE	<---	PROFESSION	.089	.023	3.845	***	par_8

LEGAL	<---	PROFESSION	.057	.014	3.982	***	par_17
ATTITUDE	<---	PROFESSION	.173	.031	5.581	***	par_6
ATTITUDE	<---	LEGAL	-.404	.170	-2.378	.017	par_7

FINANCE	<---	PROFESSION	.155	.028	5.476	***	par_18
ATTITUDE	<---	PROFESSION	.088	.025	3.566	***	par_5
ATTITUDE	<---	FINANCE	.386	.071	5.436	***	par_6

Moderation (Involvement in Rehabilitation Practice)

			Rehab		**Non_Rehab**		
			Estimate	P	Estimate	P	z-score
ATTITUDE	<---	ORGANIZATION	0.067	0.015	0.027	0.282	-1.088
ATTITUDE	<---	PROFESSION	0.064	0.010	0.041	0.049	-0.714
ATTITUDE	<---	TECHNOLOGY	0.067	0.023	0.007	0.778	-1.533
ATTITUDE	<---	HUMAN	0.392	0.000	0.473	0.000	0.959
ATTITUDE	**<---**	**LEGAL**	0.385	0.021	0.196	0.140	2.724***
ATTITUDE	**<---**	**FINANCE**	0.009	0.897	0.175	0.016	1.681*
ATTITUDE	**<---**	**Gender**	0.112	0.015	0.028	0.473	2.318**
ATTITUDE	<---	Age	0.004	0.871	0.025	0.234	0.598
ATTITUDE	<---	Occupation	0.089	0.000	0.048	0.099	-1.053

User_Involvement	<---	ORGANIZATION	1.096	0.000	0.981	0.000	0.925
EHR_Format	<---	TECHNOLOGY	0.914	0.000	1.007	0.000	1.059
Attitude_3	<---	ATTITUDE	1.151	0.000	1.462	0.000	1.557
Attitude_4	<---	ATTITUDE	0.963	0.000	1.014	0.000	0.207
CP	<---	PROFESSION	0.846	0.000	0.827	0.000	-0.183
Training	<---	ORGANIZATION	0.953	0.000	0.842	0.000	-1.133
Pro_Pt_Relation	<---	PROFESSION	1.109	0.000	1.114	0.000	0.041
PU	<---	HUMAN	1.016	0.000	0.880	0.000	-1.552
EHR_Reliability	<---	TECHNOLOGY	1.019	0.000	0.943	0.000	-0.726
EHR_Compatibility	<---	TECHNOLOGY	0.928	0.000	0.982	0.000	0.614
Specialty_specific	<---	TECHNOLOGY	0.870	0.000	0.931	0.000	0.697
EHR_Obsol	<---	TECHNOLOGY	0.708	0.000	0.827	0.000	1.226
Privacy	<---	LEGAL	5.040	0.000	4.385	0.000	-0.456
Finan2	<---	FINANCE	0.918	0.000	1.200	0.000	1.585

Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Moderation (Previous HIS Usage)

			Use_HIS_Before		Not_Used_HIS		
			Estimate	P	Estimate	P	z-score
ATTITUDE	<---	ORGANIZATION	0.057	0.054	0.052	0.073	-0.118
ATTITUDE	<---	PROFESSION	0.024	0.348	0.060	0.007	1.049
ATTITUDE	<---	TECHNOLOGY	0.071	0.053	0.038	0.149	-0.744

ATTITUDE	<---	HUMAN	0.442	0.000	0.453	0.000	0.124
ATTITUDE	<---	LEGAL	0.171	0.495	-0.180	0.127	-1.268
ATTITUDE	**<---**	**FINANCE**	0.166	0.080	-0.029	0.634	-1.732*
ATTITUDE	<---	Gender	-0.119	0.044	-0.006	0.878	1.586
ATTITUDE	<---	Age	0.049	0.149	0.021	0.342	-0.690
ATTITUDE	**<---**	**Occupation**	0.118	0.001	0.024	0.290	-2.173**
User_Involvement	**<---**	**ORGANIZATION**	0.947	0.000	1.172	0.000	1.665*
EHR_Format	<---	TECHNOLOGY	0.877	0.000	1.018	0.000	1.574
Attitude_3	<---	ATTITUDE	1.264	0.000	1.320	0.000	0.282
Attitude_4	<---	ATTITUDE	1.123	0.000	0.990	0.000	-0.553
CP	<---	PROFESSION	0.813	0.000	0.830	0.000	0.156
Training	**<---**	**ORGANIZATION**	0.701	0.000	1.095	0.000	3.926***
Pro_Pt_Relation	**<---**	**PROFESSION**	0.874	0.000	1.197	0.000	2.778***
PU	**<---**	**HUMAN**	1.110	0.000	0.925	0.000	-1.661*
EHR_Reliability	<---	TECHNOLOGY	0.900	0.000	1.030	0.000	1.226
EHR_Compatibility	<---	TECHNOLOGY	0.904	0.000	1.007	0.000	1.166
Specialty_specific	<---	TECHNOLOGY	0.897	0.000	0.932	0.000	0.354
EHR_Obsol	<---	TECHNOLOGY	0.782	0.000	0.803	0.000	0.199
Privacy	<---	LEGAL	6.217	0.007	4.276	0.000	-0.809
Finan2	<---	FINANCE	1.138	0.000	0.985	0.000	-0.816

Attitude_2	<---	ATTITUDE	1.134	0.000	0.978	0.000	-0.816
Attitude_5	<---	ATTITUDE	1.327	0.000	1.104	0.000	-1.163
Attitude_6	<---	ATTITUDE	1.557	0.000	1.198	0.000	-1.628

Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Moderation (Clinic Experience)

			Low_Exp		High_Experience		
			Estimate	P	Estimate	P	z-score
ATTITUDE	<---	ORGANIZATION	0.033	0.196	0.061	0.022	0.747
ATTITUDE	**<---**	**PROFESSION**	0.044	0.100	0.042	0.054	-0.048
ATTITUDE	<---	TECHNOLOGY	0.031	0.251	0.052	0.067	0.521
ATTITUDE	<---	HUMAN	0.406	0.000	0.434	0.000	0.322
ATTITUDE	<---	LEGAL	-0.077	0.647	-0.184	0.180	-0.490
ATTITUDE	<---	FINANCE	0.024	0.746	0.065	0.338	0.418
ATTITUDE	<---	Gender	-0.092	0.065	-0.025	0.549	1.020
ATTITUDE	**<---**	**Age**	-0.061	0.209	0.091	0.007	2.576**
ATTITUDE	<---	Occupation	0.061	0.038	0.040	0.109	-0.535
User_Involvement	<---	ORGANIZATION	1.012	0.000	1.067	0.000	0.416
EHR_Format	<---	TECHNOLOGY	0.935	0.000	0.976	0.000	0.462
CP	<---	PROFESSION	0.880	0.000	0.813	0.000	-0.593
Training	<---	ORGANIZATION	0.971	0.000	0.873	0.000	-0.901
Pro_Pt_Relation	<---	PROFESSION	1.261	0.000	1.078	0.000	-1.346

PU	<---	HUMAN	1.059	0.000	0.929	0.000	-1.303
EHR_Reliability	<---	TECHNOLOGY	1.012	0.000	0.954	0.000	-0.513
EHR_Compatibility	<---	TECHNOLOGY	0.974	0.000	0.931	0.000	-0.470
Specialty_specific	<---	TECHNOLOGY	0.879	0.000	0.912	0.000	0.363
EHR_Obsol	<---	TECHNOLOGY	0.758	0.000	0.777	0.000	0.189
Privacy	<---	LEGAL	5.171	0.000	4.585	0.000	-0.334
Finan2	<---	FINANCE	1.033	0.000	1.057	0.000	0.133

Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

Moderation (Level of IT Sophistication)

			Low_IT_Soph		High_IT_Soph		
			Estimate	P	Estimate	P	z-score
ATTITUDE	<---	ORGANIZATION	0.035	0.429	0.056	0.010	0.425
ATTITUDE	**<---**	**PROFESSION**	0.036	0.398	0.037	0.038	0.021
ATTITUDE	<---	TECHNOLOGY	0.023	0.582	0.037	0.135	0.278
ATTITUDE	<---	HUMAN	0.517	0.000	0.388	0.000	-1.320
ATTITUDE	<---	LEGAL	-0.082	0.612	-0.201	0.157	-0.555
ATTITUDE	<---	FINANCE	0.200	0.136	0.032	0.563	-1.161
ATTITUDE	**<---**	**Gender**	-0.172	0.007	0.033	0.397	2.727***
ATTITUDE	<---	Age	0.013	0.705	-0.006	0.788	-0.464

ATTITUDE	<---	Occupation	0.044	0.250	0.041	0.061	-0.062
User_Involvement	<---	ORGANIZATION	1.136	0.000	0.968	0.000	-1.210
EHR_Format	<---	TECHNOLOGY	0.888	0.000	1.012	0.000	1.433
Attitude_3	<---	ATTITUDE	1.275	0.000	1.255	0.000	-0.104
Attitude_4	<---	ATTITUDE	0.995	0.000	0.951	0.000	-0.190
CP	**<---**	**PROFESSION**	1.098	0.000	0.759	0.000	-2.468**
Training	<---	ORGANIZATION	0.896	0.000	0.893	0.000	-0.023
Pro_Pt_Relation	<---	PROFESSION	1.226	0.000	1.076	0.000	-0.981
PU	<---	HUMAN	0.975	0.000	0.959	0.000	-0.155
EHR_Reliability	**<---**	**TECHNOLOGY**	0.871	0.000	1.058	0.000	1.811*
EHR_Compatibility	<---	TECHNOLOGY	0.912	0.000	0.995	0.000	0.938
Specialty_specific	<---	TECHNOLOGY	0.865	0.000	0.945	0.000	0.859
EHR_Obsol	<---	TECHNOLOGY	0.700	0.000	0.823	0.000	1.269
Privacy	**<---**	**LEGAL**	3.297	0.000	5.592	0.000	1.697*
Finan2	<---	FINANCE	1.250	0.000	0.957	0.000	-1.222
Attitude_2	<---	ATTITUDE	0.986	0.000	1.071	0.000	0.456
Attitude_5	<---	ATTITUDE	1.217	0.000	1.176	0.000	-0.223
Attitude_6	<---	ATTITUDE	1.337	0.000	1.370	0.000	0.153

Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

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