

**Understanding Continuance Intentions of Physicians
with Electronic Medical Records (EMRs):
An Expectancy-Confirmation Perspective**

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Management Science (Management Science)

Submitted in partial fulfilment
of the requirements for the degree of

Master of Science in Management Science (Management Science)

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St. Catharines, Ontario
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Abstract

This thesis examines physicians' satisfaction with electronic medical records (EMRs) in the post-adoption phase. More specifically, the study examines how physicians' satisfaction with EMRs impacts on their intention to continue using as well as extend their adoption of additional functions of EMRs. Expectation-confirmation theory is used with the incorporation of perceived risk as the theoretical framework. The extended theoretical model is used to formulate *eight* hypotheses to aid in the understanding of physicians' continuance intentions. A field survey of 135 Canadian physicians that utilize EMRs was performed to test the model empirically. The study found that physicians are willing to continue using and adopting additional components of EMRs. In addition, the empirical results suggest that physicians' perceived usefulness and perceived risk impacts satisfaction, which in turn influences physicians' continuance intentions. As well, perceived risk has an influence on physicians' continuance intentions directly.

Acknowledgements

The completion of this thesis would not have been possible without the support and motivation of many people. I am grateful to all of them.

First and foremost, I would like to express my deepest gratitude to my supervisor, Dr. Anteneh Ayanso. His guidance and feedback on the content and writing style were essential to the completion of this thesis. His enthusiasm, rigor and encouragement affected the quality of this thesis appreciably.

I would also like to thank my internal committee members, Dr. Tejaswini Herath and Dr. Madelyn Law, for their feedback and comments. Their advice at the different stages of this thesis was instrumental.

Last, but not least, I would like to thank my family. Thank you to my children, Abigail and Katherine for your understanding when I was engrossed in my work. I am grateful for my Mom's help, in being able to substitute in for me when I was busy. My greatest appreciation is given to my husband for his continuous support and encouragement throughout this process. Without the support, encouragement and understanding of my family, I would not have been able to complete this thesis.

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1. Introduction

Over the last few decades, computerization of governments and businesses has become the norm. At the same time, health care systems world-wide have felt increasing pressure on both physical and financial resources due to a growth in patient needs and rising costs. This has created a need to find ways to gain efficiencies while also decreasing the costs. Computerization has been promoted in health care as a way of increasing efficiency and decreasing costs.

The computerization of health care systems is being advocated on a global basis. Since the 1990's the World Bank has been funding information technology infrastructure in health care facilities in several countries. The European Union is advocating computerization to share medical records and expertise across the political borders of Europe (Duplaga, 2007). In the U.S., the Senate has created a committee to explore an affordable health care system in which computerization is an overarching theme. In both the United Kingdom and Canada, an advisory board was created to facilitate the implementation of a nation-wide electronic medical system in each country. The rate of adoption of computerized systems in different countries can be compared using physicians' adoption rates of electronic medical records (EMRs). In a comparative study of 11 countries in 2009, it was found that 46% of physicians in the U.S. used EMRs, with the highest percentage at 99% in the Netherlands (Schoen, Osborn, Doty, Squires, & Peugh, 2009). The study also found that even with the high rate of utilization in the Netherlands, just over 50% of the physicians fully utilized the system. In Canada, The National Physician Survey (2011), completed in 2011, had the number of doctors using EMRs at 50.2%.

The computerization of health care involves the compiling of patient records from different sources. Several terms have been used interchangeably in practice as well as in the literature to describe this software system, including, electronic health records (EHR), clinical information systems (CIS), clinical information technology (clinical IT), and electronic medical records (EMRs). EHR¹ is defined as the electronic repository of a patient's records from a variety of sources that can be shared across the health care community (National Health Service (NHS), 1998). CIS is the clinical information system used within a practice that contains an electronic copy of patient record (Gallago, 2010). CIS can be limited in scope to one area or may be broad and cover all areas necessary for patient care. EMR is a digital repository of patient data that can be shared within a medical community (Angst, Agarwal, Sambamurthy & Kelley, 2010). In this thesis, the term EMRs is used and its scope is defined to represent the software system and vendor services that are used to capture the medical records of patients from sources inside and outside a physician's practice.

As a software system, EMRs contains many different functions to aid in the delivery of health care by health care providers. EMRs functions are broken down into two separate categories, practice management and clinical support (OntarioMD, 2010). Most physicians use computers for practice management, which consists of scheduling appointments for patients and billing for services. The adoption of clinical support functions is becoming common among physicians (National Physician Survey, 2011; Simon et al., 2007; Simon et al., 2009). Clinical support functions include:

¹ EHR is the term used in the U.S. for patients records used within a hospital or the records compiled and kept by the patient.

- The creation of patient notes in electronic form for all patient encounters. These notes can be shared within the practice as well as to those outside the practice for applicable patient care.
- Writing/renewal of prescriptions. The prescription is sent electronically to the pharmacy for the patient. The function for writing prescriptions alerts the physician to drug and food interactions the patient has already been prescribed. The prescription function of the software has a component that is updated regularly to incorporate current knowledge on prescription drugs, their interactions, and side effects.
- Alerts for lab results. The system can alert a physician of lab results that are available and other pertinent information received relating to patient care.
- The ability to receive and import lab results electronically. These lab reports are imported directly into the patient's electronic file.
- The ability to compile patient information and documents from other sources within the health care community.
- Best practice alerts for care and treatment of disease and illness. These alerts offer advice to physicians as to the current treatment of specific conditions. The best practice alerts are updated regularly for the most current medical knowledge.

The knowledge updates for best practice alerts, prescription drug interactions, and current medical knowledge, are handled by a third party.

EMRs provide benefits such as the improvement and support of patient care, as well as increased productivity while reducing costs (Stanberry, 2011). Further benefits of EMRs include records being more legible, accurate, and easily retrieved for use and

sharing in comparison with paper records (NHS, 1998; Stanberry, 2011). In addition, EMRs help to make sure the best medical practices are employed to provide the best patient outcome (Morris, 2004).

There are many different stakeholders within the medical community that utilize EMRs. A few of the stakeholders include physicians, nurses, laboratory technicians, physician's office staff, hospital admitting, and researchers (Payton, Paré, Le Rouge & Reddy, 2011). It was found that physicians carry the deciding vote on utilizing EMRs, due to their dominance in health care and status within the medical community (Rivard, Lapointe & Kappos, 2011). Physicians within Canada and other parts of the world such as the U.S. run their offices as independent businesses within the medical system. Most government organizations have not mandated that physicians use EMRs in their practices. For example, in both Canada and the U.S., government agencies are using incentives for physicians to adopt EMRs in their practices. Both countries have a small penalty for not adopting EMRs, namely a small claw back of fees for not using electronic billing when being paid by the government organizations for patients' medical care. Therefore, this thesis focuses on physicians as they have the power to dictate the utilization of EMRs within the health care system.

Research has shown that EMRs are slowly being incorporated into the practice function by function (HiMSS, 2009; Simon et al., 2007; Simon et al., 2009). It is expected that physicians adopt additional functions over time. It was observed in a 2007 study, those physician practices that used EMRs, only 60% utilized the function for incorporating lab results and less than 20% had implemented the alerts, warnings and reminder functions (Simon et al., 2007). The Healthcare Information and Management

Systems Society (HiMSS) (2009) has developed a six step adoption model for EMRs in physicians' practices. The logical progression of the adoption of the EMRs functions follows the steps zero through five, with each step incorporating additional functions into operation. At step zero, there are only paper records without EMRs. Then at step five, EMRs is utilized to its fullest scope with all functions employed. This suggests that the adoption process for EMRs is not an "all or nothing" approach. In addition, the adoption process of the EMRs functions can be halted at any stage in the process without affecting the processes that have already been adopted.

As EMRs are being adopted by physicians, more of the functions of EMRs are used frequently in daily practice. The rate of adoption or the lack of adoption in comparison with computerization of other application domains has been a concern for many, as the use of EMRs will create better outcomes for patients (Morris, 2004; Payne, 2010), while also decreasing costs and increasing efficiencies (Payne, 2010). The pre-adoption stage of the process has been studied in the form of resistance to new technology (Bhattacharjee & Hikmet, 2007; Paré, Sicotte, Jaana & Girouard, 2008) and physicians' expectation in their adoption of EMRs (Boonstra, Boddy & Fischbacher, 2004; Dixon & Stewart, 2000).

The rate of adoption has been analyzed through historical as well as cross-country comparisons in order to increase awareness and increase adoption (Schoen et al., 2009; Simon et al., 2009). The number of physicians that use EMRs is known from surveys done on a regular basis such as the National Physician Survey by the Canadian Medical Association (CMA). These types of surveys, however, lack a vital piece of information to accurately compare the adoption rates of physicians on a historical basis. More

specifically, the number of physicians who have discontinued use of EMRs or have stopped the adoption process at a specific stage has not been given significant attention. In one study done in 2006 roughly 50% of physicians abandon EMR after adoption (Keshavjee et al., 2006). Physicians' continuance intentions of EMRs are not very well known at this time. The pre-adoption opinions of physicians towards EMRs have been examined in the literature (e.g., Brookstone, 2010; Deutsch, Duftschmid & Dorda, 2010; Wong, Legnini, Whitmore & Taylor, 2011). However, physicians' post-adoptive behaviours regarding their satisfaction with EMRs and their intentions to continue use or adopt extended functions have received limited attention both in the information systems and health services fields.

In this thesis, physicians' post-adoption intentions towards continued use of EMRs and its extended functions during different stages of the adoption process are studied. In particular, this study investigates physicians' satisfaction with EMRs in the post-adoption phase and how their satisfaction impacts on their intention to continue use of EMRs and the systems extended functions within the practice. To achieve this end, the expectation-confirmation theory (ECT) is used as the main theoretical foundation to aid in the understanding of physicians' continuance of EMRs after adoption (Bhattacharjee, 2001a; Oliver, 1977; Oliver, 1980; Parthasarathy & Bhattacharjee, 1998). Furthermore, using ECT as the base model, perceived risk is incorporated (Cox & Rich, 1967; Featherman & Pavlou, 2002) to examine its direct, as well as indirect effects, on physicians' continuance intentions of EMRs.

This thesis is organized as follows: Section 2 presents a detailed overview of the research context, including discussion on related research on EMRs, the research gap,

and expected contributions of the proposed study. Section 3 focuses on the theoretical foundations and the research framework implemented/utilized for the study. Section 4 discusses the research methodology and data collection procedure. Section 5 summarizes the measurement of the constructs and their validity and reliability statistics. Section 6 presents the analyses and the discussion of the survey results. Section 7 outlines the theoretical and practical implications of the findings in this study. The last section provides concluding remarks and discusses the limitations of this study as well as future research directions.

2. Research Context

This section provides the research context for my thesis. First a description of EMRs is given along with a review of EMRs initiatives from a global and Canadian perspective. Next, a general review of the associated literature is provided with an emphasis on areas of previous related studies and the gap in extant research.

2.1. EMRs Overview

As the cost of health care has escalated, there has been increasing pressure to find ways to reduce the costs and increase efficiency in the health care system. Computerization has been seen by many as the cure-all for what ails different industries or organizations. For many organizations, computerization has increased efficiency and helped reduce costs. Those within health care have suggested that computerization will increase efficiency and decrease costs within health care (Stanberry, 2011).

Computerizing health care involves a software system. There are many different systems some of these are for creating patients records in many different settings for example in physicians' offices, hospitals or for use by individual patients. EMR is a type of software package offered by many different vendors to achieve this objective. Each vendor has common features for clinical support and practice management. The vendors tend to conduct business in a specific region as the requirements of different regions or governments tend to vary. These different requirements create programming issues for the different vendors such that they tend to only target one or two different areas. An example of the regional requirements is, in the province of Quebec all government documents are mandated to be in French whereas all other provinces and territories in

Canada mandate documents to be in English. Only a few of these software providers offer the software in French or a French/ English version.

The implementation of EMRs is not without its difficulties. Some of the difficulties are technological as some software is not compatible with other computerized programs creating difficulties in sharing patient information in health care networks. Other difficulties are training and the transfer of patient records from paper format to electronic format. The cost of implementing EMRs is another difficulty at the present time. The average cost of just the licence for EMRs software is approximately \$10,000, which does not include the hardware, training, set up fees or other ongoing fees associated with EMRs such as fees for updates (Prognosis, 2013). Yet, the benefits of implementing EMRs are thought to be greater than the difficulties of implementation (Bose, 2003; Institute of Medicine, 1977; NHS: Department of Health Publications, 1998).

Among the various benefits to implementing EMRs are:

- Improve and support patient care with standardized clinical practices and guidelines.
- Improve patient safety and reduce medical errors through standardization and access to up-to-date and relevant clinical knowledge, along with warnings for drug interactions and best practice for certain conditions.
- Increase productivity in health care.
- Reduce administrative costs of health care delivery.
- Support clinical and health service research.
- Adapt to future developments in technology, policy, management and finance in health care.

- Ensure the confidentiality of patient data.
- Maintain more accurate, legible and up-to-date patient data from all sources.

As the benefits outweigh the difficulties with EMRs, governments and other stakeholders are pushing the adoption of EMRs.

2.1.1. EMRs Global Perspective

Around the world, many different countries are advocating for the computerization of health care. In developed countries, EMRs are seen as a method to improve patient safety and the quality of care, which in turn will reduce costs (Stanberry, 2011). In many countries, EMRs have been in the adoption stage for many years, with more physicians adopting the technology in their practice each year. Some countries have made significant progress with most of their physicians utilizing EMRs. In many of the Scandinavian countries such as Sweden, Norway, and the Netherlands, over 90% of physicians use EMRs in their practices (Schoen et al., 2009). In comparison, the U.S. has less than 50% of physicians using EMRs in their practices (Schoen et al., 2009). Canada had a dismal 52% of physicians using EMRs in 2010 (National Physician Survey, 2011). The low adoption and usage rates of EMRs could be attributed to the difference in funding of the systems. In 2009, only 4.7% of US physicians reported receiving funding tied to information technology (IT) systems adoption (Center for Studying Health System Change, 2009). The countries that had the most significant use of EMRs had a combination of financial incentives, standards, and technical support (Schoen et al., 2009).

The adoption of EMRs seems to have slowed in some countries such as the U.S. It was hoped that U.S. health care would achieve universal EMRs adoption by the year

2014. This will not to be the case given the current adoption rate. Estimates have been made that by 2024, only 86.6% of physicians in small practices will be using EMRs (Ford, Menachemi & Phillips, 2006). The slow adoption rate is of concern to the policy makers and insurance companies in the U.S, as they have been advocating for more transparency and control over costs as well as trying to find ways to create efficiencies within the medical system.

Korea and other Pacific Rim nations are making significant headway in the usage rates of EMRs among physicians. In the 1990's, Korea started to expand its use of IT in health care and the development of EMRs within its hospitals (Kim & Lee, 2009). Both Australia and New Zealand have over 90% of their physicians using EMRs in their practices (Schoen et al., 2009).

Certain countries in Central and Eastern Europe used funding from the World Bank for the development of IT infrastructure including health care (Duplaga, 2007). Six of these countries applied a portion of these resources in the implementation of e-health. The Czech Republic made the most headway in adoption of EMRs with development of a medical database with patient information access through the Internet, with 63% of general practitioners using the Internet in 2007 (European Commission, 2007).

In developing nations, EMRs are becoming available although it has yet to be determined if the technology will aid in the improvement of patient care in the form of quality and safety (Blaya, Fraser & Holt, 2010). In some developing countries, the lack of technological infrastructure and skilled people is a hindrance to the adoption of information technology (Hersh, Margolis, Quirós & Otero, 2010). Some of these countries are using an m-health (mobile health) platform, as a step toward e-health and

overcome the lack of infrastructure. For example, a pocket digital assistant (PDA) is utilized in Ghana to store and retrieve medical records of patients and ensure continuity of care (Ofosu, 2009).

In general, different countries are at different stages in the adoption of EMRs in health care. In addition, the number of physicians that have adopted and are using EMRs varies from country to country.

2.1.2 EMRs Canadian Perspective

EMRs in Canada have been advocated by the federal government for several decades now. Starting in the mid 1990's, the federal government lobbied for an introduction of EMRs in health care. In April 1994, the federal government formed an advisory council, the Information Highway Advisory Council (IHAC). The IHAC made recommendations that an advisory council be formed to identify areas of use in the health care sector that information technology could be applied. The council identified several key areas, one of them being the utilization of the information highway, the Internet or Internet capabilities. Utilization of the new information highway in the form of EMRs was suggested. EMRs would help to alleviate the ever increasing budget for health services in Canada by helping create a more efficient system. The IHAC advised that a national health information infrastructure should be established. This infrastructure would help improve the quality of health care, increase productivity and create efficiencies, thereby decreasing administrative costs, and promote research in clinical and health services (Health Canada: Office of Health and the Information highway Health Canada, 2001). The federal government sought to integrate the health care systems across the country and viewed EMRs as a method of integration between the provinces and territories.

As part of the mandate to integrate the health care system, Canada Infoway was created in 2001. Canada Infoway was anticipated to decrease costs and improve health care. Canada Infoway was created to jointly invest in each province and territory. This joint initiative is to accelerate the development and adoption of EMRs by health care providers, hospitals, laboratories, and others within health care. Following this mandate, many EMRs vendors were approved for funding and implementation by those in health care. Each of the provinces or territories has approved different vendors and software packages for use in their jurisdiction. They each make the decision as to the EMRs needs of each province or territory. For example, in the province of Ontario, there are 12 vendors and 16 different EMRs packages approved for use and funded for implementation at this time (OntarioMD, 2011). The province of Ontario has been in the implementation stage for over ten years with a province-wide EMRs system.

As of 2010, 50.2% of physicians in Canada were using EMRs in their practice (National Physician Survey, 2011). In the same survey, it was found that in the province of Ontario, 56.7% of physicians use EMRs within their practice. Only 16.1% in Canada and 19.5 % in Ontario are using just the EMRs to keep patient records as of 2010. The rest of the physicians used either a combination of paper and electronic records or paper records only.

2.2. EMRs Adoption

With all the benefits that EMRs are expected to diffuse in health care, those that oversee and finance health care have been advocating for EMRs adoption. The adoption of EMRs has been slow in comparison with IT adoption in other fields. Consequently, the main focus of research in relevant literature has been on the reasons for the slow adoption.

A range of issues have been examined in regards to EMRs, including the reasons for physicians' resistance to adoption, and the difference in demographics between those that use EMRs and those that do not. However, the literature reviewed is in large part found to be analysing the pre-adoption behaviour of physicians and others within health care (Bhattacharjee & Hikmet, 2007; Spil, LeRouge, Trimmer & Wiggins, 2011). This focus on pre-adoption behaviour is directly related to the need to explain why physicians and health care as a community have been slow to adopt EMRs.

2.2.1. Technology Adoption Model (TAM)

The technology adoption model (TAM) developed by Davis, Bagozzi & Warshaw (1989) to aid in the understanding of adoption of IT, uses the perceived usefulness and perceived ease of use to define a person's attitude in adoption of specific IT innovations. TAM was utilized to understand physicians' adoption intentions of EMRs or a specific function (Archer & Cocosila, 2011; Bhattacharjee & Hikmet, 2007; Dixon & Dixon, 1994; Dixon & Stewart, 2000).

The role of physicians' attitudes towards adoption of IT innovations was explored by Dixon & Dixon (1994). They used TAM and end-user sophistication to understand the attitudes towards adoption for physicians. The study found that the knowledge gap in IT innovation was the major difference in physicians' unwillingness to adopt an EMRs. The lack of IT knowledge leads to a decrease in the perceived usefulness and perceived ease of use of the IT innovation.

TAM was also utilized to aid in the classification of physicians into subcategories of IT usage from high to low users in an effort to understand the differences between these two groups (Dixon & Stewart, 2000). The classification was to aid in the

development of different policies that may enable each group to increase adoption rates (Dixon & Stewart, 2000). The demographics of the groups were analyzed and compared to create subcategories for the physicians. The only significant demographic variable identified between the low and high users groups was that of the number of non-clinic hours of work. The other demographic variables were found to have no impact on the level of use of IT innovations by physicians.

Psychological ownership was utilized as an additional construct with TAM to bring a clearer understanding of why physicians are reluctant to adopt EMRs (Paré, Sicotte & Jacques, 2006). Pare, Sicotte & Jacques (2006) define psychological ownership as the state in which an individual feels as though the possession is an extension of them. When physicians have psychological ownership over EMRs, their perceptions of usefulness and ease of use are impacted positively. This positively impacts the perception of the EMR and the physician's willingness to adopt EMRs.

To understand the resistance to adoption of health information technology (HIT) of physicians, TAM was utilized along with the resistance to change construct, created and developed from previous resistance to change literature (Bhattacharjee & Hikmet, 2007). When investigating resistance to change it is important to recall that the traditional methods of change management did not increase the adoption rates of physicians in regards to EMRs. It was found that the resistance to change had a negative effect on the intention to use HIT. The resistance to change also impacted physicians' perceptions to ease of use and usefulness of HIT. The study also found that if HIT was perceived as a threat, the resistance to change would be magnified.

The attitudes of nonusers to users of EMRs in the post adoption phase were compared using TAM (Archer & Cocosila, 2011). This study looked at physicians' post adoption perceptions of EMRs. A comparison of perceptions for those that used EMRs and those who did not was the major focus. The authors found that there was little difference between the perceptions of EMRs for users and nonusers in the post-adoption phase.

TAM was utilized with the organizational support of IT, technical support and infrastructure, as construct (Bhattacharjee & Hikmet, 2008). Organizational support of IT was analyzed as to how it impacted on the perceived usefulness and perceived ease of use. As well, the overall effects organizational support had on physician's intentions to adopt EMRs were examined. It was found that the perception of technical support effected the adoption of EMRs in a positive manner. Infrastructure had a slight impact on the physicians' intention to adopt EMRs.

To understand the limited acceptance of the prescription function of EMRs, TAM was utilized to analyze other factors such as culture within the practice and social influences (Boonstra et al., 2004). For the TAM model that Boonstra et al. (2004) used for their study, they created two extra constructs to empirically evaluate the culture of the practice and the social influences. The study showed that the culture of the physicians' practice influenced their willingness to adopt the new function and utilize it fully. The study also noted that the different social groups looked at the system in different ways. Physicians within culturally different practices viewed the promotional material differently. Thus it is necessary for policy makers to address these cultural differences in the promotion of EMRs to different groups of physicians.

2.2.2. Other Models of Adoption

Furthermore, in the understanding of EMRs adoption, various other frameworks have been employed to gain an understanding of the barriers to physician adoption. For example, adoption of EMRs as a social contagion was analyzed by Angst et al. (2010). They studied the diffusion of EMRs in hospital populations at specific hospitals in comparison with the proximity and relationship to another hospital. The study looks at the contagious spread of EMRs at the firm or industry level in the health care system. The research suggests that diffusion of EMRs is accelerated if specific factors of contagion are adopted, such as industry associations and trade groups.

Other researchers (e.g., Bhattacharjee & Hikmet, 2007) also attempted to explain the resistance to adoption, as part of the reason for the slow adoption rate of EMRs in comparison with the adoption of IT in other industries. Bhattacharjee and Hikmet (2007) found that resistance to change is directly related to perceived threats. The perceived threats that the physicians foresee in adoption of EMRs are the loss of control over their work, loss of organizational status, loss of power, and loss of control over organizational resources.

Part of the reason for physician resistance to EMRs is that traditional practice routines are altered (Anderson, 1997). The EMRs imposes restrictions on how the data is recorded and the medical records are organized. The physicians lose their individualism in organizing the medical records. The imposing of restrictions through forcing functions in the system, compared to organizing medical records to suit the individual physician's requirements has been found to be a cause of resistance by physicians.

A study by Kohli & Kettinger (2004) tried to determine how to overcome physicians' resistance to adopting EMRs. They found that specific groups of physicians were less resistant to adopt EMRs if they were able to protect their economic wellbeing and their professional sphere of influence was not negatively impacted. Other physicians in the study stated that they would use EMRs if it aids in practice and patient outcomes. The study showed that physicians were more willing to use EMRs, if adoption of the system was shown to have value for them in financial, socio-economic status, altruistic, or legal aspects.

2.2.3. Adoption in Demographic Context

Individual characteristics of physicians have been analyzed in trying to identify which physicians are willing to implement EMRs. It was found that physicians willing to use EMRs tend to be younger and have fewer years practicing medicine (Meade, Buckley & Boland, 2009; Simon et al., 2007). Moreover, the practice size and the type of practice influenced the adoption rate of EMRs for physicians. It was found in both studies that the larger the practice size, the higher the adoption rate. Gender of the physician was also seen to be a factor in EMRs usage with 52% of males and 41% of females being frequent users of EMRs respectively (Meade et al., 2009).

The characteristics of physicians and their corresponding practices were analyzed to understand why some practices are able to adopt EMRs with little difficulty (Kralewski et al., 2008). Kralewski et al. (2008) analyzed the practices of several physicians and found that the culture of the practice was observed to be the best indicator for successful implementation of EMRs. For this study, culture was measured using several components, including measures for collegiality, quality, participative

management style, cohesiveness, organizational trust, adaptiveness, autonomy, and business.

Physicians' characteristics were also analyzed to understand their willingness to use electronic health records (EHRs)² to communicate with patients (Wynia, Torres, & Lemieux, 2011). The findings for the study found that 42.3% of physicians were willing to use EHRs to communicate with patients, while only 14% used EMRs on a daily basis in their practice. The study examined age, gender, practice type, physicians race, practice setting (rural, suburban, urban), and patient characteristics. Certain physicians' characteristics gave a significantly larger indication to their willingness to share medical information with a patient via the EHR. These include physicians' practice setting, gender, practice type, and patient's characteristics.

Physician self-efficacy as a characteristic was analyzed to determine if this impacted on the physicians' intentions to adopt EMRs (Ma & Liu, 2005). Ma & Liu (2005) found that the physicians' rate of adoption was influenced by their ability to utilize the Internet. This suggests that the physicians that use one form of IT are more willing to adopt another form of IT. Those physicians that utilize the Internet see the perceived usefulness of EMRs more significantly and have the intention to adopt EMRs.

2.2.4. Adoption in the Social and Cultural Context

The interaction of the different groups in health care is assessed for the level of interaction and connectivity of the group (Lurie, Thoms, Fogg & Dozier, 2009; Scott et al., 2005). These studies used the social network theory to understand the way in which different participants interact within health care systems. In one study by Scott et al.

² EHRs is the acronym used by authors to define the records kept by the patient in the study, while EMR denotes the patients records kept by the physician.

(2005), the interaction of staff of a large practice was scrutinized to give understanding of the social hierarchy within the physician's practice. In the study, physicians were the ones shown as the dominant members in the hierarchical structure. In another study by Lurie et al. (2009), the social network extended outside of the physician's practice to that of a hospital. The study was conducted from the patient's perspective with the inclusion of nurses, pharmacist, doctors, residents and family. The attending physician was again the dominant person within the social network.

Social network analysis defines the roles and social contacts within a system (Barnes, 1954). It shows that those individuals in the central position in a system are given the most power within the network. Thus, in both studies using social network analysis, it was determined that the physician had the most power. The analysis suggests that the physician is the central stakeholder within the system as most other stakeholders are centrally located to the physician in the analysis. As the physicians are in the central position within the medical system with the most power, they have the greatest ability to control the types of changes that occur.

2.2.5. Adoption in the National and Regional Context

Adoption and utilization rates of EMRs differ between countries as well as regionally within countries. This is similar to what is seen in Canada with regional differences in utilization and adoption rates (National Physician Survey, 2011). The adoption and utilization rates have been documented and comparisons have been performed in order to understand the catalyst for adoption of EMRs (Deutsch et al., 2010; Jaana, Ward, Paré & Wakefield, 2005; Protti, Edworthy & Johansen, 2007; Rozenblum, Jang, Zimlichman, Tamblyn, et al., 2011).

In comparing various countries, it was found that there are several critical areas of difficulty in the EMRs adoption process for many of the countries (Deutsch et al., 2010).

The critical areas of adoption according to Deutsch et al. (2010) are:

Acceptance and change management by those in the system. This is the most critical of the areas of adoption. The physicians and others within health care must be accepting and willing to change to EMRs. Those that are not accepting or willing to change have the ability to stall the adoption process by simply refusing to adopt EMRs into their practices.

Legal considerations and data protection. The safeguarding of data from loss or theft is an impediment. Physicians have a moral responsibility of patient confidentiality. The loss of the data can impact the quality of care and the safety of the patient. The legal implications surrounding patients' rights to confidentiality can create difficulties for the health care system. In some countries, the patient must give legal permission for their records to be shared and/or stored electronically.

Health policy-related goals and implementation strategy. In some countries, the lack of political commitment to implementation of EMRs creates difficulties in communication of goals and creation of an overarching implementation strategy. Communication of the goals surrounding the health policy leads to an understanding for those required to implement the strategy. Defined steps or procedures to implement EMRs on a country-wide basis aid in the adoption of EMRs consistently.

Project management. The need for available resources for EMRs. Skilled project managers, change management, and health care IT specialists are also needed. If any are scarce, it creates difficulties in the adoption process of EMRs.

Demonstration of benefits and funding. The benefits of the system need to be communicated and understood. Those that are expected to accept the change need to understand that the value of the change outweighs the difficulties of the change. Also the need for funding as the implementation of EMRs requires a significant financial investment.

Technical solutions and standards. Technical standards need to be established and communicated with the vendors of EMRs before implementation begins. These standards will create an environment for professionals in the system to communicate easily and efficiently regarding patient care. This includes the need to create solutions to technical difficulties that may arise in the implementation and operation of EMRs.

The technical and cultural forces of different countries were also examined to understand the differences in the EMRs adoption rates (Protti et al., 2007). For example, the difference between the adoption and utilization rates of Denmark and Alberta, Canada were compared. It was found that adoption of EMRs was impacted by the different funding processes and the health information legislation of the two countries. The more legal protection of patient information exists, the more physicians were willing to adopt EMRs. The ease and the amount of funding also impacted the adoption rate. In Denmark, the funding was easily accessible and large enough to pay a significant part of EMRs adoption as well as to sponsor training sessions for physicians on EMRs and their time. In the province of Alberta, funding was minimal with training at the expense of the physician and the physician's time was not accounted for. This difference in funding caused a significant difference in the adoption rates of the two areas. At the time of the study, almost all of the Danish physicians used computers for patient records; in contrast,

61% of the physicians in Alberta used IT in their practice (this figure does not list the percentage that use electronic means to capture patient records) .

Another study to aid in the understanding of adoption rates of hospitals was the comparison of rural versus urban and three different political regions by Jaana et al. (2005). The paper looked at functional and technical sophistication of EMRs. The systems that treated hospitals as standalone entities (instead of a portion of a larger entity), had lower levels of adoption of EMRs functions. Yet these same hospitals that were treated as standalone entities had higher levels of usage of the EMRs functions that had been adopted in comparison with the other hospitals. Thus, the way in which a medical system is regarded, in terms of a system itself or part of a larger system, determines the levels of adoption and use of EMRs and its various functions.

The provincial and federal levels of government in Canada were analyzed to give greater understanding of their initiatives towards the adoption of e-health in Canada (Rozenblum et al., 2011). In the study, the results of the initiative for the implementation of an e-health system were analyzed to identify the areas of success and the ways to improve the adoption of EMRs within Canada. The study interviewed key stakeholders. There are three main areas in need of improvement that would reduce the barriers of EMR adoption. The first area identified is the need for an e-health policy that was aligned with the major reforms in health care. The second area is a more effective way to engage physicians and others in health care. The third area identified is the need for financial incentives to be equivalent Canada-wide instead of the present system with each province providing funding in varying amounts.

2.2.6. Adoption and Stakeholders within Health Care Systems

Health care has been separated into smaller entities for various study objectives. This assists in the understanding of the way EMRs are utilized by the different stakeholders in the system. Stakeholders in the health care system are physicians, lab technicians, nurses, administrators, government agencies, insurance companies, patients and researchers (Payton, et al. 2011). Each of these stakeholders in health care have different issues with adoption and use of EMRs.

With the adoption of EMRs, job functions and patient interaction will change for nurses, physicians, and medical assistants (Strong et al., 2009). The use of social informatics was utilized to understand how the interaction with EMRs changes the roles and tasks of each of the three individual professions. Many in the system embraced the change after a short length of time and began to shape their roles within health care. Still, as tasks and roles of their job evolve with EMRs, some have a preference for the old system. This can be attributed to the change in their social identity along with their change in tasks leading to a disconnect with individuals in the medical system (i.e., patients, and colleagues).

Another study of health professionals (nurses, occupational therapists, pharmacists, physiotherapists, and psychotherapists/clinical psychologists) looking at their willingness to adopt EMRs found that perceptions of ease of use and social influence had large impacts on adoption intentions (Ifinedo, 2012). Health professional's acceptance of EMRs was found to be significantly influenced by their perception of ease of use. In this study, it was observed that health professional's positive expectations towards effort expectancy impacted positively in willingness to try the system. Effort

expectancy is created from the combination of the constructs “perceived ease of use” and “the complexity of the IS”. Social influence, the extent to which the individual’s opinion is influenced by those perceptions and opinions of individuals in their social network, was also found to impact on behavioural intentions on the adoption of EMRs. The same study established that the organizational conditions that include the necessary infrastructure and have support of management and the essential employees have positive impacts on the IS usage of health professionals. IS needs to be compatible with the health professionals’ practices and work styles in order to be utilized.

Nurses’ opinions have been analyzed to give a different perspective and understand their utilization of the new system (Hennington, Janz, Amis & Nichols, 2009; Su, Win, Fulcher & Chiu, 2009). Nurses’ utilization of EMRs in a hospital was analyzed to recognize the difficulties in adoption from a nurses’ perspective (Hennington et al., 2009). It was found that the nurses’ constraints of time and case load impacted on their ability to input data into EMRs. These constraints made updating the patient records difficult and the nurses tended to use paper notes and input these notes when they had the time. The nurses’ opinions of the EMRs in another study were measured to provide understanding from their perspective (Su et al., 2009). In that study, it was found that the more EMRs were utilized, the higher the satisfaction level was. The increase in nurses’ satisfaction with EMRs had a positive effect on the hospitals’ organizational net benefits.

Another group that EMRs research has focused on is the patient. Patients with diabetes were studied to determine the way in which EMRs could aid in their ability to oversee their care (Mantazemi, Pittaway & Kashavjee, 2009). In the study, it was found that patients required information in a form that could be understood and acted upon by

themselves. It was also observed that patients were disenfranchised by the system as they were unable to communicate with the physicians.

2.3. EMRs Use in the Post-Adoptive Context

There have been few studies that looked at EMRs in the post-adoption context. The expectation-confirmation theory (ECT) was utilized in a study of users, patients and others within health care, all using an e-health website (Koo & Wati, 2010). In this study, the users' intentions of continuing to utilize the e-health website of the National Cancer Center (NCC) in Korea were examined. It was observed that perceived usefulness positively affected the satisfaction of the user. The confirmation of knowledge has a positive effect on the patient's perceptions of the website's usefulness. The study mainly focused on the patient and if the website was meeting patients' needs for information.

In other related studies, the physicians' satisfaction rates with EMRs were examined (Simon et al., 2009; Sittig, Kuperman & Fiskio, 1999). Simon et al. (2009) compared the satisfaction rates of non-adopters to adopters of EMRs in regards to the different dimensions of health care. These dimensions include control of costs, quality of care, interaction with team and patient. The study found that there was little difference in satisfaction between the types of users. Users were sorted into 3 groups, high users, low users, and non-users of EMRs. Although high users had a much more positive attitude toward computers in the practice than non-users, it was observed that physicians in larger practices were more likely to use more of the available functions of the EMRs than those physicians in smaller practices.

Sittig et al. (1999) analyzed the physicians' satisfaction as to the user friendliness of the program and where the needs for improvements are. The study examined

physicians' satisfaction with specific programs. This helps define the needs of the user in developing improvements of specific EMRs programs.

User satisfaction with EMRs was looked at by Edsall & Adler (2008). They looked at user satisfaction with different EMRs systems and 422 family practice physicians were polled in the United States. The study compared many different systems for interoperability, overall satisfaction, ease of use, vendor support and training along with security. The study analysed the different characteristics of physicians, and the type and number of physicians in a practice. In another study, Edsall & Adler (2011) looked at the physician satisfaction with different EMRs systems. The study compared different systems with the satisfaction of physicians with the different functions of EMRs.

EMRs adaptation was also analyzed in comparison with positive and negative experiences in using EMRs (Noteboom, Bastola, & Qureshi, 2012). It was found that positive experiences such as time savings and improved access to data when using EMRs increased physician adaptation of EMRs. Negative impacts on physician adaptation of EMRs were also uncovered, including the negative effects on productivity, as well as mismatch with work practices and processes.

In related research, the post-adoption rate of satisfaction with clinical information systems (CIS) by both physicians and nurses was analyzed (Palm, Dart, Dupuis, Leneveut et al., 2010). The research utilized the adaptation of the expectation-confirmation model without looking at willingness to continue usage. Perceived ease of use and usefulness of the CIS were used to understand the satisfaction with CIS.

2.4. Research Gap

The above review shows that the vast majority of the literature pertaining to EMRs studied the reasons for slow adoption rates. In other words, the majority of the literature on EMRs studies the pre-adoption phase. The rest of the literature has compared the physicians and institutions that have adopted EMRs to those that have not. In general, there has been limited research in the post-adoption phase of EMRs for physicians.

The EMRs adoption rates have been examined with the diffusion rates of adoption, such that a prediction is made as to when all physicians will be utilizing EMRs instead of paper records. Other studies have looked at the adoption rates from a historical basis and discussed the needed measures to increase the rate of adoption (Simon et al., 2007; Simon et al.2009). The studies that are using prediction to estimate the future adoption rates have a limitation as they rely on the expectation that adoption of EMRs will continue. The numbers that have adopted EMRs are calculated in many of the studies using historical data as to how many physicians in a past year were using EMRs in comparison to how many were using EMRs in a previous year. The problem with this method of calculating for adoption rates is that it may miss a portion of physicians that have actually discontinued use of EMRs in that same period. The continuance intention of physicians is unknown in this context. Are some physicians discontinuing use of EMRs? In the review of the associated literature, few studies have been done on post-adoption usage behaviour of physicians. None of these studies have dealt with the intention of physicians to continue usage of EMRs and the process of integrating more EMRs functions in to their practices. The initial acceptance of EMRs by physicians is an important first step in the full utilization of EMRs for health care. Yet, the long term

viability of EMRs is impacted by physicians' willingness to continue using EMRs and its full functionalities in their practices.

Investigating the post-adoption usage behavior of physicians in the Canadian setting, this thesis attempts to provide both theoretical as well as practical contributions to the information systems and health care fields. In particular, the research evaluates the relevance of the expectation-confirmation model in the context of EMRs. The ECT framework has been used in many areas of IS to understand and contribute to the knowledge of users' continuance intentions. Yet, the ECT framework has not been rigorously applied to EMRs use so far. This thesis attempts to address this gap by adopting the ECT framework in the context of EMRs use by the key stakeholder of the health care system – the physician. In addition, this research incorporates the perceived risk theory into the ECT framework. This provides an integrated framework to study physicians' continuance intentions. Perceived risk is integrated into the framework of ECT as risk factor to physicians and health care is very important. Perceived risk cannot be deemed to be part of the perceived usefulness construct when analyzing EMRs. This is due to the fact that EMRs may be perceived as very useful. However, the perceived risk of using EMRs may negate or outweigh the perceived usefulness. As a result, these two constructs in the context of ECT are seen as separate and distinct in the analysis of EMRs from a user's continuance perspective.

The results of this thesis can also enlighten health care policy makers and EMRs vendors on several issues. This includes understanding physicians' reluctance or acceptance of EMRs and their willingness to continue using and adopting additional functions of EMRs. In addition, it includes the confirmation that EMRs are useful to the

physician and the extent to which perceived risks are relevant to the continuance of EMRs.

3. Theoretical Foundations

The main objective of my thesis is to examine physicians' continuance intentions of EMRs as well as their adoption of additional EMRs functions in their practice. In order to achieve this objective, the expectation-confirmation theory (ECT) and perceived risk theory (PRT) are utilized as the theoretical foundations. The ECT has its roots in consumer behaviour (Oliver, 1977; Oliver, 1980) and looks at consumer satisfaction after the adoption of a product or service and how consumers' satisfaction with the product or service impacts on their intentions for continued use. Building upon this original framework, Bhattacharjee (2001b) extended the ECT model to aid in the understanding of users' continuance intentions of IT. Using the extended expectation-confirmation framework (Bhattacharjee, 2001a; Bhattacharjee, 2001b) as the base model, in this thesis, I incorporate perceived risk as a key construct and provide an integrated model of physicians' continuance intentions of EMRs. Perceived risk is the expected negative effect of using a product or service (Featherman & Pavlou, 2002).

3.1. Expectation-Confirmation Theory (ECT)

ECT is used in the examination of consumers' satisfaction with a product or service after initial use. The theory explains consumers' intentions to repurchase or continue using a service after initial use. The ECT framework utilizes consumer satisfaction, along with the consumer's perceptions of ease of use and usefulness. ECT was initially used to evaluate consumer products, satisfaction with the product, and the intention to repurchase the product (Oliver, 1977; Oliver, 1980; Yoon & Kim, 2000). ECT has been expanded for use in the evaluation of post-adoption behaviour with information technology

(Bhattacharjee, 2001a; Parthasarathy & Bhattacharjee, 1998; Thong, Hong & Tam, 2006).

ECT originates with Oliver (1977) studying the effect of confirmation and disconfirmation of expectations on the perceived product performance and the consumers' satisfaction with the product leading to the intentions to repurchase. Disconfirmation is the act of determining that the belief or hypothesis is incorrect. The original theory looked at the consumers' satisfaction of a product after use, using the consumers' expectations of the product, perceived performance, and disconfirmation. In the original model, both pre and post use expectations were measured. Oliver (1977) found that disconfirmation had an effect on consumers' satisfaction. In addition, satisfaction has a significant impact on intention to repurchase. Also, perceived performance was found to have an influence on expectations and disconfirmation for a product. Further, it was found that disconfirmation has a lasting effect on consumers' post expectations and perceived performance (Oliver, 1980).

In subsequent studies that extended the ECT framework, the disconfirmation construct has been replaced by confirmation (Bhattacharjee, 2001a; Bhattacharjee, 2001b; Limayem & Cheung, 2008; Thong et al., 2006). Bhattacharjee (2001a) extended his ECT model to aid in the understanding of users' continuance intentions of IT. In the theoretical model, perceived usefulness, satisfaction, and confirmation were hypothesised to influence the user's intentions to continue using IT. Satisfaction is the user's evaluation of the experience using the IT and the satisfaction of use can be negative, positive or neutral (Bhattacharjee, 2001a). Perceived usefulness is the subjective analysis that the IT causes an improvement in the work performance of the individual IT user, and

it is a rational choice to continue to use the IT (Davis et al., 1989). Another term used in the literature for perceived usefulness is post-adoption expectations (Thong et al. 2006).

In the expectation-confirmation model of IS continuance (Bhattacharjee, 2001b), the users of IT continually update their expectations as they gain more experience. The IT user's initial expectations could be very different from their expectations after using the IT. Thus, the post-adoption expectations of IT are used in the model and pre-adoption expectations are deemed to be non-relevant. Confirmation of the previous expectations affects both satisfaction and perceived usefulness. The variables, satisfaction and perceived usefulness, influence the intention of the user to continue using the IT. The theoretical model shows that the construct perceived usefulness impacts the satisfaction level of the user. Satisfaction levels will change with the user's perception of usefulness. If the user finds the IT to be of little use, the satisfaction with the IT will be negatively affected.

In this thesis, the relationships between the constructs, satisfaction, confirmation and perceived usefulness are adopted in order to test physicians' continuance intentions of EMRs. Thus, satisfaction depends on physicians' confirmation of their expectations with EMRs. If the confirmation of expectations is positive, this causes physicians' level of satisfaction to stay the same or increase. If the expectations of EMRs are negatively confirmed, this will lead to a decrease in satisfaction of EMRs. Similarly, I posit that physicians' positive confirmation of expectations with the basic EMRs functions will have a positive effect on the physicians' expectations of the extended functions that are not yet utilized. Thus, following the expectation-confirmation model of IS continuance, the first hypothesis is as follows.

H1: Physicians' satisfaction with initial use of EMRs is positively related to their EMRs continuance intention.

In addition, a physician's confirmation of initial expectations of EMRs leads to satisfaction with EMRs. On the other hand, a disconfirmation of EMRs to the physician's initial expectations has a negative effect on the level of satisfaction with EMRs. Therefore, following the expectation-confirmation model of IS continuance, the following hypothesis is made.

H2: Physicians' extent of confirmation is positively related to their satisfaction with EMRs.

As EMRs are adopted and utilized, physicians can judge if their initial perceptions were correct. This adjustment in the perception of EMRs changes the level of satisfaction with EMRs. When EMRs are utilized by physicians after adoption, their perceptions of usefulness will change. Accordingly, the following hypothesis is made regarding the relationship between perceived usefulness and satisfaction with EMRs.

H3: Physicians' perceived usefulness is positively related to their satisfaction with EMRs.

In the adoption and utilization process of EMRs, physicians determine if EMRs are useful in their practice. If EMRs are determined to not have usefulness in the practice, physicians may not continue using EMRs or may stop the adoption of additional functions for full implementation of the system. Thus, following the ECT model, the hypothesis regarding the relationship between perceived usefulness and IS continuance is as follows.

H4: Physicians' perceived usefulness is positively related to their continued use of EMRs.

The expectations of the potential practicality of EMRs is equivalent to perceived usefulness. Confirmation of these expectations may change the opinions of physicians towards the usefulness of EMRs. The confirmation of expectations of EMRs by physicians will have a positive influence on their perception of usefulness. However, disconfirmation of physicians' expectations will have a negative effect on their perception of usefulness. Consequently, the following hypothesis can be formed between confirmation and perceived usefulness.

H5: Physicians' confirmation of expectations is positively related to their perceived usefulness of EMRs.

3.2. Perceived Risk Theory (PRT)

Perceived risk has been utilized as a construct of TAM to aid in the definition of the expectations of consumers in pre-adoption (Featherman & Pavlou, 2002; Lu, Hsu & Hsu,; Li & Huang, 2009). Perceived risk has been successful in aiding the explanation of the adoption of IT. Both TAM and ECT observe the expectations of consumers at different points in the adoption process. TAM is used to study pre-adoption expectation, while ECT considers the post-adoption expectations of consumers. However, perceived risks received limited attention in the IS continuance literature. Perceived risks are the expected negative effects of using a product or service (Featherman & Pavlou, 2002). Perceived risks increase when the uncertainty increases or the consequences are more significant (Lu et al. 2005). Perceived risks are influenced by two distinct factors, the

amount at stake and the level of uncertainty for the individual (Cox & Rich, 1964). From the perspective of physicians and the health care environment, several aspects of risk are involved in the continued use of EMRs as well as in extending its scope within the practice through extended functions. Thus, in this thesis, I integrate perceived risk with ECT to aid in the understanding of physicians' expectations and continuance intentions of EMRs in the post-adoption.

It was found that there are several critical areas of implementation for EMRs (Deutsch et al., 2010). These critical areas are similar to the dimensions of perceived risk, which include acceptance and change management, demonstration of benefits and funding, project management, health policy-related goals and implementation, basic legal and data protection, and technical difficulties. Bhattacharjee & Hikmet (2007) found that physician perceived threats of EMRs lead to physician resistance in adoption of EMRs. The perceived threats found are physicians' loss of control over their work, status, power, and organizational resources. Deutsch et al. (2010) found several critical areas when implementing EMRs in different countries. These critical areas of implementation are the same areas that physicians perceive as risks with EMRs.

In the pre-adoption studies on the barriers physicians perceive, it was found that there are several categories (Boonstra & Broekhuis, 2010). The categories are financial, lack of computer skills (performance of software), time, psychological, social, and privacy/security. The perception of the risk involved with these issues has been found to be the reason many physicians decided not to adopt EMRs in their practices.

In the IT adoption literature, the perceived risk construct has been defined by Cox & Rich (1964). In other studies, the perceived risk construct has been broken down into

different dimensions. Featherman & Pavlou (2002) identified these dimensions of risks as performance, financial, time, privacy, social, psychological, and overall risk. Lu et al. (2005) identified the dimensions of risk to include physical, functional, social, time-loss, financial, opportunity risk, and information.

Based on the key dimensions of risk defined in previous research, seven dimensions of risk that will best fit the types of risk physicians face regarding EMRs are identified. They include performance, financial, time-loss, social, psychological, privacy, and overall risk (see Table 1). These seven different dimensions of perceived risk will aid in the assessment of post-adoption evaluation of EMRs from the physician's perspective.

Table 1: Dimensions of Perceived Risk

Categories	Definition
Performance Risk	The risk that the EMRs does not function as intended.
Financial Risk	The risk that EMRs are not worth the ongoing financial burden placed on the physician's practice.
Time-loss Risk	The risk that EMRs take too much time in creating and accessing patient's records, therefore wasting time.
Social Risk	The risk that loss of social status within the physician community will occur for the physician.
Psychological Risk	The risk that physician will feel their self-image has been harmed with the use of EMRs.
Privacy Risk	The risk of the loss of control over the personal information of the patient and personal notes about the patient.
Overall Risk	The perceived risk of the overall evaluation of EMRs to the physician.

(Featherman & Pavlou, 2002; Lu et al. 2005)

The seven dimensions of risk are discussed in more detail below, along with the implications on physicians' continuance intentions with EMRs.

Performance Risk - Performance risk is the possibility of EMRs not performing as expected. Performance risk of EMRs is vital for physicians to access and update information in a timely and consistent manner. The performance risk also includes a risk due to technology. The hardware and software the EMRs need to run is complex (Paré et al., 2008). This complexity creates issues such as bugs in the system that the vendor has not addressed.

Physicians need to access patient records in a timely fashion to understand the patients' pre-existing medical conditions as well as prescribed drugs the patient is taking. If the records are unavailable to the physician, some important information may be missed. This missing information can have serious consequences and impacts on the patient care.

Financial Risk - The financial risk of EMRs is the maintenance cost and upgrades necessary for the system. The maintenance costs for EMRs include the yearly subscription fees to the provider, increase in the electric bill, increased cost of Internet and the cost of hiring experts to maintain the system. An additional cost for many physicians is the increase in staff to create electronic copies of information that has previously been received in a non-electronic form. Although many physicians are locked into a yearly subscription fee for the use of EMRs, these fees do not incorporate major software upgrades. The major software upgrades are paid for by the practice. The cost of upgrades to software and replacing computer equipment is part of the ongoing cost of EMRs. These extra costs over the life of the EMRs affect the physician in a negative way.

Time-loss Risk - With continuing use of EMRs, the physician will have a time-loss risk. Time-loss risk affects the physician in two ways. The first is that the other stakeholders (laboratories, hospitals, clinics, etc.) may have incompatible systems with the physician's EMRs. This may result in the physician's office spending extra time scanning and copying reports to place in the electronic file. The other time-loss risk may be an increase in time to input patient information when caring for a patient.

Social Risk - The social risk is the loss of status within one's peer group. The social risk for physicians is important as the loss of status within the physicians peer group could result in loss of power and income. If the EMRs are not compatible with others' EMRs, the physician is unable to communicate electronically with those in the system. The physician risks being out of the loop in their patients care if they continue with EMRs. Being unable to communicate efficiently with other physicians in the system, can impact on patient care and physicians' billable hours. Being unable to communicate with other physicians efficiently and effectively may reduce the quality of patient care, which may have a negative impact on the physician's reputation.

Some of the physicians and physician peer groups view EMRs as a way for administrators to gain more control over patient care, with a loss of autonomy by physicians. The adoption of EMRs by some physicians is perceived by their peer group to be a devaluation of the social position of the group by using EMRs. Therefore, the use of EMRs may have a negative impact on their social standing within the physician community.

Psychological Risk - The psychological risk refers to feelings of harm or loss of self-image (Featherman & Pavlou, 2002). The psychological risk for physicians is the loss of

how they view the image of a physician to be and how they are perceived by others. The physicians may perceive that patients view them in a less professional manner when they adopt EMRs, causing a loss in their professional self-image. A decrease in their professional image may also occur when a physician sends electronic copies of a patient's file to other physicians. The electronic records are not subject to being easily self-edited, such that other physicians may see notes or other material that maybe damaging to the physician's professional image.

Part of the physician's self-image is that of an employer. EMRs may affect a physician's image in being a competent boss and leader within their medical practice. The support staff will be using EMRs in the medical office. If the system is difficult to manipulate or files from outside sources are problematic to input in the system, these problems will cause extra aggravation. If the physician's support staff find the EMRs problematic to use, the physician might perceive his image of a capable leader diminished by the support staff.

Privacy Risk - Privacy risk is defined as the lack of control over personal information (Featherman & Pavlou, 2002). Privacy risk is a large factor for both the physician and patient. Electronic copies of patient records are easier to access than the paper copies. This creates a higher chance of patient's records being leaked or accessed by unauthorized individuals. The notes and the personal comments that physicians put in the patient records also have the chance of being leaked to unauthorized individuals. This is a privacy risk for both the patient and the physician. The physician's notes are considered to be intellectual property of the physician and are protected by copyright law in Canada.

The notes of other physicians must also be protected by the physician as notes from one physician relating to a patient are shared electronically with others.

Medical records are seen as private. The physician has a legal and moral obligation of confidentiality. The exposure to security breaches with patient information is increased with the use of EMRs. The increase in exposure comes from sharing electronic resources with other physicians. In addition, the security exposure is increased when the records have remote access, since unauthorized users may be able to gain access easily. The responsibility of privacy is placed on the physician to ensure that patient records are secure.

Overall Risk - The overall risk is the combination of the six risk factors, performance, financial, time-loss, social, psychological, and privacy. Overall risk is used to measure the total risk perceived. It is used to assess if the other six risk factors have been able to measure the perceived risk completely.

The perceived risk construct is anticipated to have a relationship with the constructs, satisfaction, confirmation, and continuance intention. Thus, physicians' satisfaction with EMRs depends on their perceptions of risk. As EMRs are utilized after adoption, the physician is able to evaluate their initial perceptions of risk for EMRs. These changes to the perception of risk cause physicians to adjust their perceptions of EMRs and their level of satisfaction with it. The physicians' perception of risk will negatively impact their satisfaction with EMRs. Accordingly, the following hypothesis is formed regarding the relationship between perceived risk and satisfaction with EMRs.

H6: Perceived risk is negatively related to physicians' satisfaction with EMRs.

The expectations of the potential threats of EMRs to the smooth and efficient running of the practice are perceived risks. Disconfirmation of these perceived threats may reduce physicians' perception of risk with EMRs. As physicians use EMRs, they will confirm if their initial perceptions of risk were accurate. Thus, the positive confirmation of expectations of EMRs by physicians will reduce their perceptions of risk. Accordingly, the following hypothesis can be formed between confirmation and perceived risk.

H7: Physicians' confirmation of expectation is negatively related to the perceived risk of EMRs.

During the adoption and utilization process of EMRs, physicians verify their perception of risks. If EMRs are perceived to have a large risk, the physician may discontinue use. The perception of risk will also affect physicians' willingness to continue the process of adopting additional functions of EMRs. The more risk perceived, the less willing physicians will be for further adoption. Therefore, following the ECT theory, the hypothesis between perceived risk and IS continuance can be made as follows.

H8: Perceived risk is negatively related to physicians' continuance intention with EMRs.

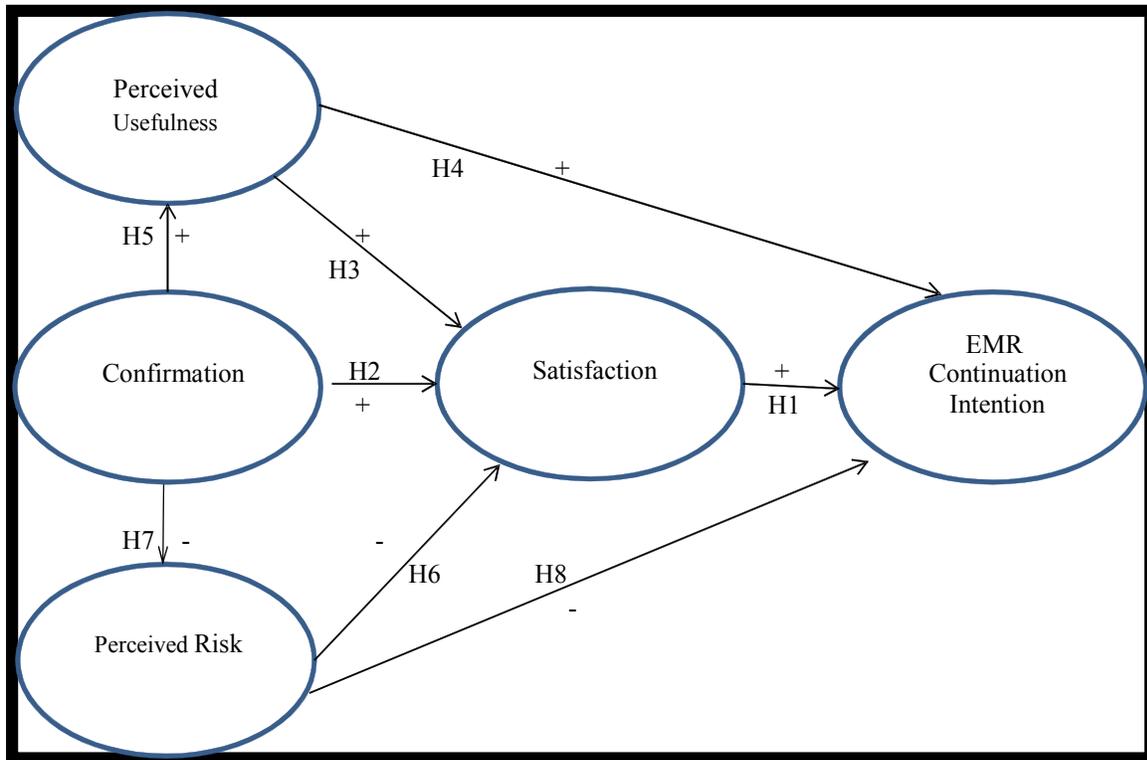


Figure 1: Theoretical Model

4. Research Methodology and Data Collection

This section provides an overview of the field survey of physicians conducted to support the empirical testing of the hypotheses. The section is organized in two parts: data collection, and description of instruments.

4.1. Participant Recruitment and Data Collection

A field survey was conducted to collect data using an electronic mechanism as well as a hard copy that was made available to those who wished to do the survey off-line. The method of an on-line survey was used successfully by Bhattacharjee (2001a) in his study of e-commerce users. There are several advantages of using an online survey over the paper-based mail in survey, including flexibility of geographical location, reduced costs, and quicker responses (Bhattacharjee, 2001a). In this study, a hard copy of the survey was also made available to those contacted in person.

The target audience for the survey was Canadian physicians using EMRs in their practice. According to the National Physicians Survey (2010), the number of physicians in Canada is approximately 66,906, with 50.2% (approximately, 33,987 physicians) using EMRs. The survey was done as a cross-sectional analysis of physicians to give an understanding of the physicians' opinions at a specific point in time. A cross-sectional analysis is the preferred way to gather data for the ECT framework. In both Oliver (1977) and Oliver (1980) studies, a longitudinal approach was used with two different cross-sectional analyses and comparisons. Bhattacharjee (2001a) demonstrated that only one cross-sectional data set for the ECT framework was necessary to gain insightful results.

Therefore, only one survey period was utilized to collect the data necessary to validate the framework and test the hypotheses.

For the pilot study of the survey, physicians were recruited by personal contact from the Niagara region. The physicians were recruited by visiting their offices and requesting their assistance in the study through their staff (receptionist or office administrator). The pilot study consisted of 6 physicians. During this pilot study, the recruitment of physicians for the survey was found to be challenging. Thus, a decision to offer an honorarium of a \$10 Tim Horton's gift card to complete the survey was introduced. The use of the enticement helped increase the response rate of physicians in the survey.

Personal contact was employed to persuade some physicians to complete the survey, as well as a list of physicians' e-mail addresses was used to request their assistance with the survey. The e-mail list was used to contact physicians inviting them to do the survey on-line. The rate of acceptance for the electronic request was low, whereas the acceptance rate to do the survey by personal request was much higher. This low response rate can be attributed to physicians' work environment as they are often busy with patients, attending seminars and workshops, and many other additional requests for their expertise.

Of the 334 physicians contacted by e-mail, 23 physicians responded and filled out the survey, with a response rate of 7 percent. In the survey request sent via e-mail, there was an option for declining the invitation to do the survey. Thus, the total number of responses, including those who declined, was actually 37 or 11% of those invited to do

the survey. The electronic mode of the survey was used to contact physicians outside the Southern Ontario region.

The hard copy survey was sent to 229 physicians and 112 responded, with a response rate of 48 percent. These physicians were recruited for the study by visiting physicians' offices and requesting that they offer their assistance in the study. A survey package was only left with those physicians that utilize EMRs and if the physicians were willing to do the survey or their staff thought they would be willing to do the survey. The survey package consisted of a cover letter, the questionnaire, a self-addressed envelope and a \$10 gift card from Tim Horton's.

The majority of physicians surveyed were from Southern Ontario. This was due in part to the proximity to persuade physicians in person to participate in the survey. The smaller part of the survey population from elsewhere in Canada was recruited through e-mail. The e-mail request had a lower response rate than those physicians contacted in person. The difference in the response rate can be partly due to only physicians that have utilized EMRs were asked to do the survey when contacted in person. Whereas, the physicians who were contacted via e-mail, it was unknown if they have utilized EMRs. Another factor that affected the difference in response rate is that only physicians that were willing or their staff thought to be willing to complete the survey were left a copy of the survey. Thus, the response rate of those physicians that were given a hard copy is higher. In addition, the difference in the response rate is characteristic of on-line surveys in comparison with paper based surveys (Millar & Dillman, 2011).

For the survey results to reasonably indicate the opinions of the physician population, a sample size of the population needs to be large enough. The sample size

was assessed using two different methods (Bartlett, Kotrlik & Higgins, 2001). The number in the sample was compared with other surveys of the same population. In addition, the sample size was verified using the sample size formula³ recommended by Bartlett et al. (2001). In the formula, a five percent risk of acceptable error was used, thus utilizing the t-statistic value in the sample size equation. As the survey gives a continuous value, the margin of error is 3% with the acceptable margin of error being ± 0.21 ($0.03 * \text{the seven points on the Likert scale}$). The standard deviation was estimated using the fourth method described in Bartlett et al. (2001). This method used the number of points on the scale divided by the number of standard deviations, which gives a value of 1.16. Thus, the recommended sample size is calculated to be 119.

In other similar studies of the same population, the sample size was roughly around the same number. For example, in the study by Archer & Cocosila (2011), a sample size of 118 was used, which was reduced to 102 when the responses were analyzed. Another study by Palm, et al. (2010) examined post adoption evaluations of clinical information systems used a sample size of 101 physicians. As such, a sample size of 130 is deemed acceptable for this population using two of the methods outlined by Bartlett et al. (2001). In this study, a total sample size of 135 was available, with 5 contributions removed due to a significant portion of the data missing. Thus, a final sample size of 130 was used for this study.

To compare the demographics of the population of physicians to those in the survey sample, the survey had a general question to define physician demographics. For

³ $n_0 = [(t^2) (s^2)] / (d^2)$

the survey, the sample categories were defined as Specialist, Solo Practitioner, Family Health Team, and Community Health Centre, as shown in Figure 2. Comparing the survey population to the population of physicians to the population there are a few differences. These differences may be due to the overlapping of some categories in the survey questions; thus the physicians surveyed may belong to more than one category.

In comparison, the survey had 39% of physicians reporting as specialists, while 66% of physicians in Canada are specialists (National Physician Survey, 2011). Those physicians that classified themselves in the survey as a solo practitioner could also be a specialist. The other comparison between the population and the survey sample that shows a large discrepancy is the percentage of physicians practicing in a community health care setting. This issue is due to the survey's focus in the Southern Ontario which does not have a large population of Community Health Care practices. Although the breakdown in the survey does not capture the demography perfectly, it has a reasonable degree of representation from the Canadian physician population.

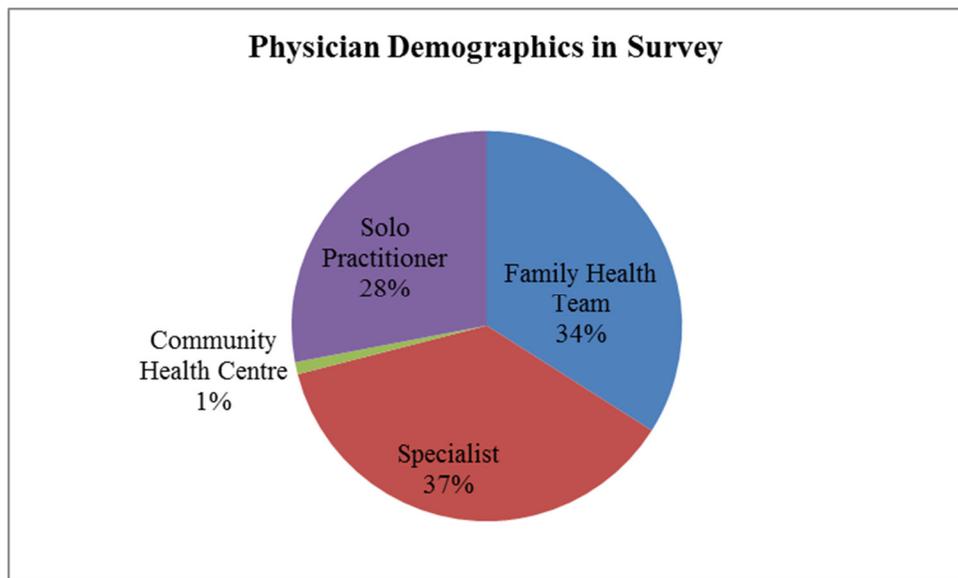


Figure 2: Physician Demographics: Survey

4.2. Instrument Construction

In this thesis, five constructs have been measured: perceived usefulness, confirmation, perceived risk, satisfaction, and continuance intention. Six sub-constructs were used for perceived risk. All the constructs are measured using multiple items and the Likert scale. A seven point Likert scale was used for the constructs, perceived usefulness, confirmation, satisfaction, and continuance intention. This is similar to the scale used by Bhattacharjee (2001b). The Likert scale used for the perceived risk construct is a seven point scale similar to the one used in Featherman & Pavlou (2002). This Likert scale will range from strongly disagree (1) to strongly agree (7). Where possible, the initial scale items have been taken from previous validated measures in the IS literature pertaining to ECT and perceived risk. In addition, these scale items have been reworded to fit the setting in this study.

A pre-test of survey questions was done to ensure that these indicators are actually assessing the constructs being studied. The pre-test of most surveys has several requirements (Bowden, Fox-Rushby, Nyandieka, & Wanjua, 2002). The first is to establish a guide that gives the intended meaning of the question, along with the criteria and the methods that it should be appraised by. With the use of this guide, the questions should be reviewed to assess their ability to generate the construct.

The constructs, perceived usefulness, confirmation, satisfaction, and continuance intention, are predetermined by the ECT framework and are illustrated in Table 2. A definition of each construct was also established to assess that the measurements gave an accurate evaluation of the construct (see Table 3). With these constructs, the

measurements are defined based on the existing literature, with some modifications to account for differences in research contexts.

Table 2: Operationalization of Constructs

Construct	Measurement of Construct
Satisfaction	The satisfaction scale consists of six questions proposed by Oliver (1980) and later adapted by Bhattacharjee (2001a).
Confirmation	The confirmation scale is adapted from Bhattacharjee (2001a) with 5 measures used for the construct.
Perceived Usefulness	The perceived usefulness construct is measured using four questions as outlined in Davis et al. (1989) and further refined by Bhattacharjee (2001a).
Perceived Risk	The perceived risk construct has two to five measures for each dimension of risk adapted from Featherman & Pavlou (2003) and Lu et al. (2005).
Continuance	The continuance construct is scaled using three measurements modified from Bhattacharjee (2001a). In addition, two extra measurements are added to measure the intention to adopt additional functions of EMRs.

Table 3: Definition of Constructs

Constructs	Definition
Confirmation	The physician's evaluation of the expectations with actual experience using EMRs.
Continuance Intention	The physician intention to continue using EMRs and adopt additional functions of EMRs.
Perceived Usefulness	The physician's assessment of usefulness of EMRs.
Satisfaction	The level of happiness that EMRs brings to physicians when utilizing it.
Perceived Risk	The assessment of peril when utilizing EMRs.

This survey also includes a few new measurements to build upon the extended constructs. The measurements were evaluated during a pre-testing phase and pilot of the survey. This evaluation was done to determine if the measurements could be easily understood, enabling the creation of these constructs. In addition, the measurements were verified to create the constructs fully.

The survey was pre-tested to confirm that the questions are easy to understand and that they give an adequate measurement of the constructs. The pre-testing of the questions (measurements) involved several stages. These stages are taken to determine that the wording of the measurements is appropriate. Stage one is the pilot test of the questions, to determine the intended interpretation and meaning of each question (Bowden et al., 2002). The pre-testing of the questions was done by two individuals not in the medical sector and then by a physician. In this stage of pre-testing, the questions were analysed to determine if they were easy to understand. In addition, at this stage, the measurements (questions) were also analyzed to determine if they were able to define the constructs when combined together. Furthermore, not only were the measurements analyzed to determine if they defined the construct, they were also analyzed to determine that all portions of the construct were addressed in the measurements. The constructs have a defined meaning (given in Table 3) and the measurements are designed to quantify the important aspects of the construct.

The next stage of the pre-testing was to review the questions and revise those that were identified as needing correction. The stages of defining the measurements for the constructs and reviewing/revising their wording were done before all documents were sent to the ethics committee. At this stage, all measurement indicators were sent to ethics

for review with all the documentation needed by the review committee. After the ethics committee gave approval for the study, the next portion of the study commenced.

The next stage for the survey document was the field test. The survey was uploaded into the electronic survey software, Select Survey. In addition, a hard copy was utilized. During this stage, validation of the measurements (questions) occurred (Fink, 1995). This validation suggests that the measurements load appropriately to create the constructs in the framework. A pilot study of the survey consisting of 6 physicians was utilized to verify that the measurements created the constructs. During this phase of the testing, the measurements were reduced to 37 from the original 52 (see Appendix A). This was a result of the finding that some of the measurements were repetitive, difficult to understand due to wording, or were too vague to be easily answered. Also, a few of the physicians in the pilot study also stated the survey was too long and cumbersome, suggesting that the survey might be better received if it were less time consuming. The issue with the length of the survey created a need to reduce the number of questions. The survey measurements were analyzed to determine which ones could be removed without affecting the overall results. All of the constructs had at least two measurements removed. Each of the constructs for the ECT portion of the model have at least three measurements remaining. The Confirmation construct has three measurements, while the perceived usefulness and continuance intention constructs have 4 measurements remaining to create the construct. The satisfaction construct has 5 measurements remaining. The perceived risk sub-constructs each had no more than two measurements removed. The measurements that were removed could be measured by the remaining measures for the constructs. All of the sub-constructs for perceived risk contain two

measurements with the exception of overall risk that uses two measurements. A summary of the measurements for the constructs is presented in Appendix-A (Measurement Constructs).

After the pre-testing of the measurements and constructs, the survey was loaded into an electronic resource for conducting surveys. The survey was communicated to the physicians through e-mail lists and personal contacts, with an on-line access as well as a hard copy.

5. Instrument Validation

This section presents the results for reliability of scale, validity, and correlation analysis of the constructs and the model. SmartPLS was used for the validation of the measurements and testing the structural model. PLS was utilized as it is better in managing smaller sample sizes with a large number of indicator variables (Tenenhuase, 2008). PLS is also able to handle multidimensional constructs in a model.

The structural model was analyzed in two steps. The first step analyzed the measurement of the model for validity and reliability of the constructs. Additionally, during the first stage of analysis, the fine-tuning of the model was performed. The second step of the analysis evaluated the structural model using a bootstrap of 500.

Based on the factor loadings of the measurements, one measurement was removed as it was below the recommended threshold (Chin, 1998). This measurement was from the satisfaction construct, ST6 (see Appendix-A). Therefore, the model is comprised of 33 measurements that create four constructs: perceived usefulness, confirmation, satisfaction and continuance intentions, and one multi-dimensional construct for perceived risk. The four constructs are reflective, as they represent certain elements of the constructs (Polites, Roberts, & Thatcher, 2012). Perceived risk is created by the sub-constructs, which are formative. They are defined as formative because they are not expected to be interchangeable. In other words, if one is omitted, the other sub-constructs are not expected to define that portion of the construct (Edwards, 2001). Thus, the perceived risk construct is defined as being multi-dimensional formative construct (Petter, Struab & Rai, 2007). Perceived risk is an aggregate multi-dimensional construct as the dimensions combine to produce the construct (Edwards, 2001). The aggregate

multi-dimensional construct is created in the model by averaging the scores of the different dimensions (sub-constructs) with equal weights.

For testing the formative constructs, an examination of the weights was done utilizing principle component analysis (PCA) rather than the factor loadings (Bollen & Lennox, 1991). The results are shown in Figure 3. The results show that five of the six sub-constructs for perceived risk are significant. The sub-construct for perceived privacy risk was found to be non-significant. However, the perceived privacy risk was retained in the model to preserve the content validity (Bollen & Lennox, 1991).

To evaluate the construct for perceived risk, multicollinearity between its sub-constructs is examined. A variance inflation factor (VIF) test was applied to assess the multicollinearity between the six sub-constructs. A tolerance of less than 10 is normally utilized, but a lower tolerance level of 3.3 is suggested for formative constructs as multicollinearity creates more difficulties in the model (Petter et al., 2007). A lower bound of tolerance at 1 is also used, as a VIF of 1 indicates that multicollinearity does not exist between variables. The results of the VIF are shown in Table 10 and Figure 3. The VIF for all the sub-constructs are above 1 and below the tolerance level of 3.3. Thus, multicollinearity is not an issue for the multi-dimensional construct.

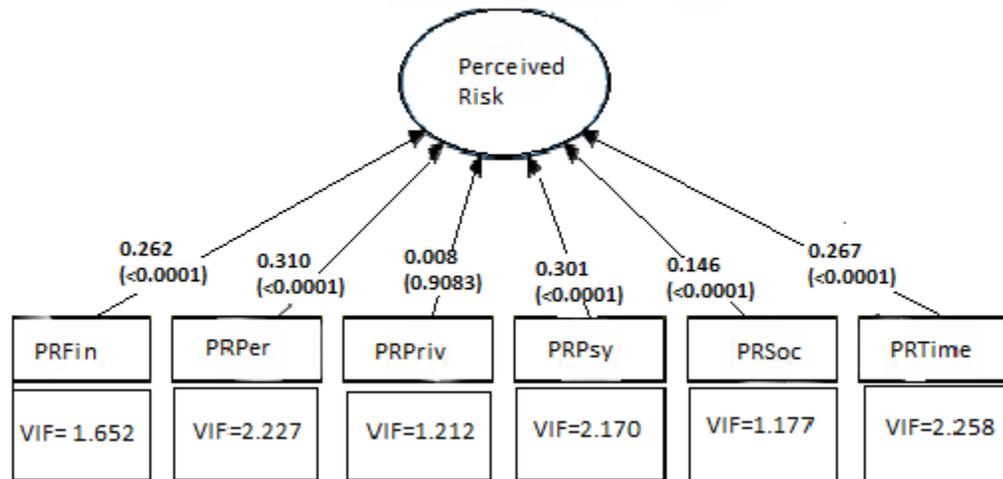


Figure 3: Multicollinearity Test of Perceived Risk

Construct validity, convergent validity and discriminant validity were used to assess the reflective constructs in the model. Construct validity is the degree to which the measured items portray the defined constructs (Gefen & Straub, 2005). Composite reliability was used to assess the construct validity of the measurements. All the reflective constructs have composite reliability values above the 0.70 threshold as seen in Table 4 (Gefen et al., 2000).

Table 4: Measures for Constructs

	AVE	Composite Reliability	R²	Cronbach's Alpha
Confirmation	0.7421	0.8954	0	0.8251
Continuance Intention	0.7473	0.9219	0.6702	0.8891
Perceived Usefulness	0.7594	0.9263	0.5776	0.893
Satisfaction	0.7353	0.9169	0.657	0.8771

The next stage of evaluation was the assessment of the convergent validity. Convergent validity is defined as the amount of variance the indicators have in common, or the amount that they converge (Hair, Black, Babin & Anderson, 2010). In this stage,

the convergent validity was evaluated using factor loadings, and average variance extracted (AVE). The factor loadings were above the threshold of 0.7 (Table 9) and were found to be significant with a t-value > 1.95 (Chin, 1998). The AVE for all of the constructs is above the 0.5 threshold (Gefen, Straub & Boudreau, 2000).

The reliability of the measurements is assessed using the Cronbach's alpha reliability coefficient (Cronbach, 1951; Brahma, 2009). The Cronbach's alpha gives a measure of mean inter-correlation for the measurements of a construct, thus the larger the alpha, the more the measurements are thought to give a reliable assessment of a construct. The Cronbach's alpha should be above 0.7 to indicate construct validity (Gefen, et al., 2000). In the model, all the reflective constructs have Cronbach's alpha values above 0.70 (see Table 4).

Discriminant validity was assessed using the measurement cross loadings (Table 7). The cross loadings for their assigned measurements were larger than their cross loadings on all other constructs (Gefen & Straub, 2005). The analysis of the cross loadings at this stage suggests that discriminant validity of the constructs cannot be rejected.

Another method to evaluate discriminant validity is to analyze the square root of the AVE. In this method, the Square root of the AVE should be larger than the correlations with the other constructs (Gefen & Straub, 2005). The square root of AVE and the latent correlation of the constructs are given in Table 6 in Appendix B. The square root of the AVE for each construct is greater than the cross correlations. Thus, discriminant validity is also shown to be evident from the constructs' cross correlations in

comparison with the square root of AVE. Using both methods to determine discriminant validity, it can be concluded that the model has discriminant validity.

To evaluate the goodness of fit of this model the R^2 of the individual constructs. The R^2 for the individual constructs range in value from 0.44 for perceived risk to 0.67 for continuance intentions. Significantly, the R^2 suggest that we can be fairly confident in that the model is a good fit for the data used.

These tests on the data suggest that the empirical model displays reliability, along with reasonable content, discriminant, and convergent validity.

6. Analysis of Hypothesis Statements

In this section, the results of the testing of the structural equation model are presented for the hypothesized relationships stated in Section 3. The t-values and p-values for the individual hypotheses are given in Table 11. The model is shown in Figure 4 with the path coefficients and the p-values.

6.1 Expectation-Confirmation Theory

The empirical testing model indicates that H1 cannot be rejected. Thus, the physicians' satisfaction is positively related to their continuance intention. The results suggest that the satisfaction physicians have with EMRs positively impacts their decision to continue using and adopting additional functions of EMRs.

The continuance intention of EMRs for physicians has two aspects. The first aspect is physicians' willingness to continue using the system, and the second aspect is physicians' willingness to continue adopting additional functions of EMRs. When looking at the individual questions for continuance intentions, it is observed that the willingness of physicians to continue using the system is larger than the intention of continuing to adopt additional functions. Approximately, 80% of physicians answered that they strongly agree that their intentions are to continue using EMRs. In comparison, the percentage of physicians who strongly agree with the statement that they are willing to continue adopting further functions of EMRs is 51%. When those that stated they agree or slightly agree with that statement are included, the percentage rises to 77%. Thus, in the analysis of the continuance construct, the measurement for intention to continue adopting new functions was removed to see if the level of satisfaction changed the impact on physicians' willingness to continue using EMRs without adopting

additional functions of EMRs. When the measurements for adoption of additional functions (IN4 & IN5) were removed from the continuance intention construct, the path model coefficient's change was minimal. The level of significance of the path was unchanged. Therefore, it can be implied that not only is satisfaction relevant and significant in physicians' intention to continue using EMRs, but also in their decision to continue adopting additional functions of EMRs.

The second hypothesis, physicians' confirmation is positively related to their satisfaction with EMRs, is not significant. Thus, H2 is rejected. The confirmation of physicians' expectations does not have a positive direct effect on physicians' satisfaction with EMRs. However, the results show that H3 (impact of confirmation on perceived usefulness) as well as H5 (impact of perceived usefulness on satisfaction) are both supported. Physicians' confirmation of expectations has a positive impact on perceived usefulness, and this in turn impacts their satisfaction positively. Thus, confirmation has a significant indirect effect on satisfaction through perceived usefulness.

The results do not show support for (H4), that physicians' perceived usefulness is positively related to their continued use of EMRs. Thus, perceived usefulness does not have a significant direct effect on continuance intention. However, it was found that perceived usefulness has an indirect effect on continuance intentions through satisfaction.

6.2 Perceived Risk

The perceived risk was analyzed as a multidimensional construct initially.

The results show that H6 is supported. Perceived Risk has a negative impact on physicians' satisfaction. The larger the perception of risk the less physicians will be satisfied with EMRs.

In addition, H7 is supported. Physicians' confirmation of expectations has a significant negative relationship with perceived risk. Thus, with the confirmation of expectations, physicians' perception of risk decreases. Furthermore, the results show support for H8, indicating that the perception of risk has a significant effect on the physicians' intentions to continue using and/ or adopting additional functions of EMRs. It is interesting to note that perceived risk has both direct and indirect (through satisfaction) impact on continuance intention.

A secondary analysis was also conducted with the perceived risk construct being analyzed as a reflective construct in the model. The results for the four constructs (confirmation, perceived usefulness, satisfaction, and continuance intention) had similar results for both models. However, the perceived risk construct appeared to have different relationships with the constructs in the models. In the alternative model, perceived risk had a significant relationship with satisfaction only. The relationship between perceived risk and the two other constructs (confirmation and continuance intention) was not significant, thus, implying that risk is an inherent factor of EMRs for physicians.

Model of constructs for the multidimensional model with path coefficients and p-values is shown below.

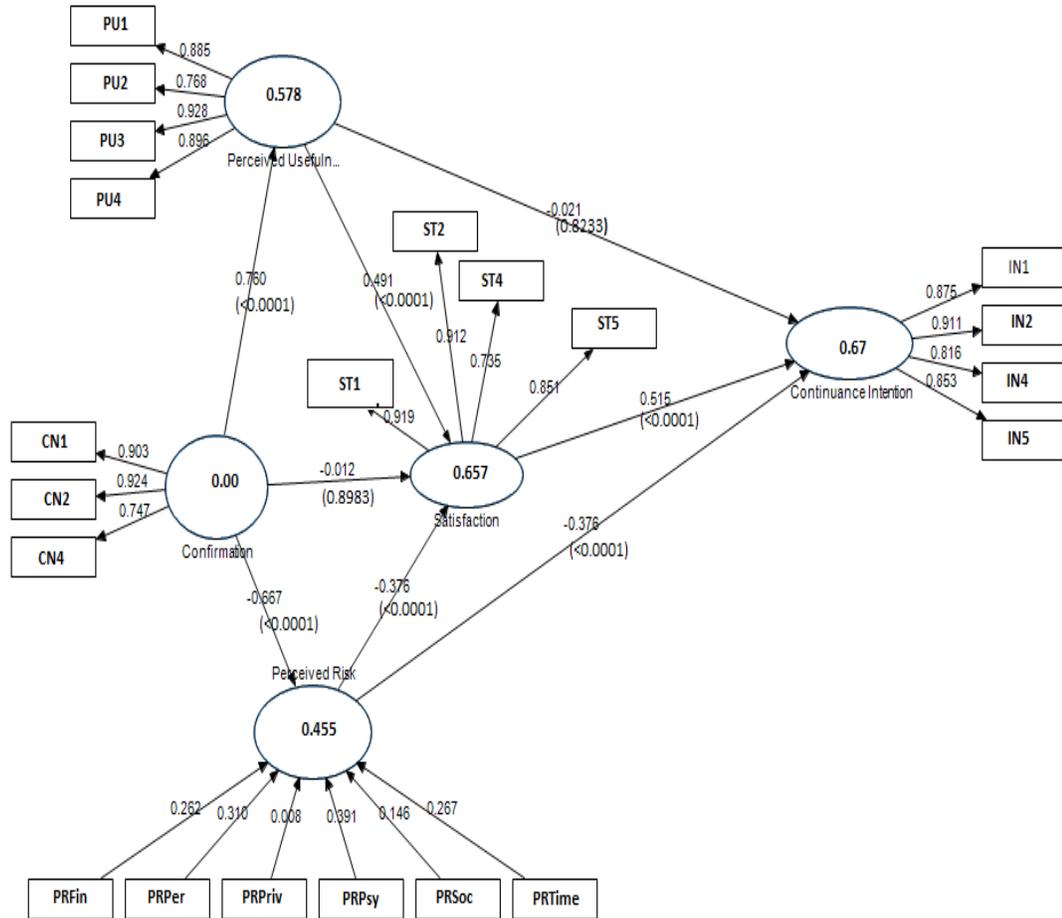


Figure 4: Model with Path Coefficients

7. Discussion and Implications

This study has found results that provide different insight and perspectives from previous studies. For example, in their study of on-line shopping, Chen, Huang, Hsu, Tseng & Lee (2010) found that a small portion of satisfaction was through the confirmation of user's beliefs, with 85% of satisfaction explained through perceived usefulness. In their study, they found that confirmation has a significant positive impact on perceived usefulness. Their findings suggest that confirmation works through perceived usefulness to effect satisfaction to a greater extent. The results in this study confirm their findings. This study finds that the impact of physicians' confirmation of initial expectations on satisfaction is through perceived usefulness as well as perceived risk.

The opposite effect was found by Bhattacharjee (2001b), where confirmation has a much larger impact on satisfaction than perceived usefulness does. In the 2001b study, users of online banking were examined to understand their continuance intentions using ECT. The difference between the two studies, Cheng et al. (2010) and Bhattacharjee (2001b), is the weight of importance that the user places on satisfaction and perceived usefulness of the IS. The difference between the two studies suggests that the user's expectations of how the IS will impact on their routines affect the way in which the IS is perceived.

Confirmations for physicians' opinions impact their view of both the usefulness and risk of EMRs. This confirmation impacts satisfaction through physicians' perceived usefulness and perceived risk associated with EMRs. In this thesis, satisfaction seems to be consequence of the physicians confirmed beliefs that EMRs are useful and the risk is manageable.

Physicians' willingness to continue using and further adopt functions of EMRs is impacted by both satisfaction and the perceived risk. Satisfaction has a large positive impact on the continuance intentions of physicians with EMRs. The perceived risk is felt both directly and indirectly through satisfaction on the continuance intention. Perceived risk impacts both satisfaction and continuance intention.

Perceived usefulness of EMRs is felt indirectly through satisfaction on the continuance intentions of physicians. This is similar to findings by Bhattacharjee (2001b), in that he found that perceived usefulness has less impact on users' continuance intentions. He found that satisfaction of the IS product had a much greater effect on the users' continuance intentions. It was observed that satisfaction explained 32% of the variation in continuance intentions for the user, while perceived usefulness only accounted for 10% of the variation in continuance intention (Bhattacharjee, 2001b). He also noted that the perception of usefulness on intentions change over the various stages of IS use. In the pre-adoption stage, perceived usefulness has a larger impact on use of IS. The pre-adoption attitude is based on perceptions alone, while the post-adoption attitude is based on actual use of the IS. Satisfaction is supported by user's experience, while the perceived usefulness is based on uncertain beliefs of the user. Thus, in the post-adoption stage of IS, satisfaction will have a much more profound effect on users perceptions of perceived usefulness (Bhattacharjee, 2001b).

7.1 Theoretical Implications

This thesis contributes to the IT adoption and use literature, particularly in the post-adoption context. The ECT framework is used to ascertain the post-adoption opinions of physicians with EMRs. The ECT framework was shown to bring understanding to

physicians' continuance intentions with EMRs. This thesis also shows a difference between the pre and the post- adoption attitude of users towards EMRs. TAM looks at pre-adoption attitudes, and ECT evaluates users' post-adoption attitudes. The pre-adoption attitude of physicians was heavily weighted on the perceived usefulness for the physician to be willing to adopt EMRs (Bhattacharjee & Hikmet, 2007). In contrast, the post-adoption attitude of physicians is heavily weighted on their satisfaction to generate their motivation to continue utilizing EMRs. The difference between the two models is that perceived usefulness is a cognitive belief, whereas satisfaction is a reflection of the user experience. Therefore, in the post-adoption context, users' opinions of satisfaction with the product should have a larger impact on continuance intentions, in comparison with perceived usefulness.

The inclusion of perceived risk to the ECT framework has been shown to bring an additional dimension to the ECT framework. The perceived risk construct is used in the pre-adoption context of understanding physicians' resistance to adopt EMRs. The inclusion of the perceived risk construct in the model has formed a broader picture of physicians' attitudes in the post-adoption phase and created a richer understanding of users' continuance intentions.

The findings further suggest that depending on the users' perspective of the IS, their confirmation may be felt more heavily on either perceived usefulness or satisfaction. The findings suggest that the users initial evaluation and confirmation are dependent on their perception of the impact the IS has to either work or lifestyle. Thus, this finding suggests that the physicians' major focus is on the usefulness and risk of use of the IS product, thus satisfaction with EMRs is a byproduct of these two perceptions

Satisfaction was found to mediate the impact of perceived usefulness on continuance intentions in this study. The perceived usefulness was found to have a small direct effect on continuance intentions by Bhattacharjee (2001b). The findings from this thesis and the study done by Bhattacharjee (2001b) imply that users' satisfaction has a large bearing on users' continuance intentions. Yet, the study by Chen et al. (2010) shows a different result, with the perceived usefulness construct having a large effect on the continuance intention of online shoppers.

7.2 Practical Implications

For physicians, perceived usefulness of EMRs is important to their satisfaction with the product impacting their continuance intentions to continue using and adopting extended functions of EMRs. Their perceived usefulness of EMRs has a much larger bearing on satisfaction with EMRs than does the perceived risk. The majority of physicians are satisfied with EMRs and are willing to continue using and adopting additional functions. In addition, the perceived risks impact negatively on their decision concerning continuance intentions with EMRs.

From the policy makers' standpoint, there are few areas that should be considered. The first is that the perceived risks cause dissatisfaction with EMRs and it also decreases the physicians' willingness to continue using and adopt further functions of EMRs. Such that the level of risk associated with EMRs should be a consideration when making policy changes. Other factors that may increase the risk associated with EMRs should be monitored to be able to mitigate the risks if changes occur within the medical system.

The second area that policy makers need to be aware of is the issue of meaningful use of EMRs for physicians. Physicians see EMRs as similar to their paper records system, although the two different mediums of recording information changes the way in which physicians interact with patients (Noteboom et al., 2012; Strong et al., 2009). This change in interaction is seen as necessary and is accepted if EMRs are seen as more useful than the previous paper system. This suggests that physicians are willing to change and adapt to new ways of caring for patients as long as they create better outcomes for the patient.

The more meaningful the use of EMRs is to the physician, the more willing they are to continue using and further adopt other features of EMRs. Changes made in the medical system that affect the meaningful use of EMRs for physicians should be addressed. To increase the meaningful use of EMRs, other stakeholders within different areas of the medical system also need to embrace EMRs.

From the vendors perspective there are areas that need to be understood regarding EMRs and physicians satisfaction with the software and vendor services. Physicians are willing to continue using EMRs. As well, many are willing to continue incorporating further functions of EMRs into their practice. This is good news for the vendors as their customers are willing to continue using their services/ products. Physicians are willing to continue using EMRs if they are satisfied. Physicians' satisfaction comes from two different perceptions, how useful EMRs is and how much risk it poses. Thus, both the issues of usability and risk need to be given attention when updating software.

EMRs needs to be relevant to patient care for physicians to deem it meaningful to use. Part of the issue with relevance is all the patient information needs to be readily

available and accessible by the physician. To make EMRs more meaningful to use, the system needs to be able to incorporate information from outside the practice easily. Many of the physicians that were contacted stated that information from outside the practice was difficult and time consuming to incorporate into the patients' records.

EMRs need to incorporate ways in which a physician can make the system more useable for themselves. The cookie cutter version of EMRs for many physicians does not create relevance. Physicians practicing in the different field of medicine have different requirements from their EMRs. Thus, the ability to tailor EMRs to the physicians' requirements would create a system that is easier and more relevant to the physician.

8. Conclusions, Limitations, and Future Research Directions

This thesis has several limitations. First, the majority of the sample is from physicians located in Southern Ontario, although the survey was deployed throughout Canada. This large portion of the sample from one area could create a sample selection bias.

A second issue is that of the users' bias in the sample survey. The survey did not ask if the respondent was currently using EMRs or had discontinued using EMRs. Therefore, it is unknown if the sample population is biased in their perceptions about EMRs causing a bias in the measurement for continuance intention. However, a few of the physicians rated their unwillingness to continue use of EMRs suggesting that user bias may not be an issue.

Thirdly, the survey may have a non-response bias. The demographics of the population were compared to the demographics of the sample. The sample has a demonstrated a reasonable degree of representation. For that reason a sample bias is unlikely.

A further issue is the smaller number of indicators used in the creation of the constructs for the ECT framework. Some of these constructs might have been better defined with the ability to measure more succinctly the behavior with extra indicators. The number of indicators needed to be limited for this thesis in order to be manageable and for physicians to actually complete the survey. The physicians that participated in the pilot study for the survey suggested that the length of the survey would be an issue.

Finally, the perception of risk in the pre-adoption phase looked at financial, performance, time, security/privacy, social and psychological. In the post-adoption phase

this study considered the same risks. The perception of risks associated with EMRs for physicians may have changed from the pre-adoption period to the post adoption period.

About half of Canadian physicians use EMRs at this point in time. Diffusion theory suggests that the early adopters are more risk tolerant, while the late adopters are more risk adverse (Rogers, 1995). According to diffusion theory, the late adopter stage is over when 50% of the population of available users have adopted the product. The physician population has reached this point. Those physicians that adopt EMRs later are considered late adopters and are more risk averse. The inclusion of the late adopters into the model may change the perception of risk and to its extent the effect on satisfaction and continuance intentions.

This thesis and other studies (Bhattacharjee, 2010b and Chen et al., 2010) found that the weight of importance of the different constructs was perceived differently when different IS products and their users were studied. The results from these different studies suggest that there is some other underlying factor, such as users' perception of the substitution value of the IS that causes these differences. The reason users substitute a routine task or function with an IS form of the process may clarify the differences in users confirmation and its impact on perceived usefulness and satisfaction.

This study combined the theories, ECT and perceived risk to bring a broader understanding to physicians' opinions of EMRs in the post-adoption stage. A survey of 130 Canadian physicians that have used EMRs was done to test the model empirically.

In summary, the results indicated that physicians' continuance intention with EMRs was dependent on their satisfaction and their perceived risk. Satisfaction mediates the effect of perceived usefulness on physicians' continuance intentions with EMRs.

Perceived risk impacts continuance intention in two different ways, directly and indirectly through satisfaction. Physicians' confirmation of expectations impacts their perceived usefulness positively, while negatively influencing perceived risks. Confirmation of expectations influences satisfaction through perceived usefulness and perceived risk.

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Terms Used:

Clinical decision support systems (CDS) – is an electronic system that is able to organize clinical data and patient information helping to improve patient care, it can also include general clinical knowledge and guidance

Computerized practitioner/ physician order entry (CPOE) - The process of entering medication orders or other instructions by the physician in an electronic format instead of a paper. They are often used with an e-prescribing component.

Expectation-confirmation Model (ECT) – the theoretical model that uses expectation and confirmed or disconfirmed perceived usefulness and satisfaction as determinants for the continued use of a product or service.

Electronic Health Records (EHR) – is an electronic record of an individual's health record this record has the ability to be shared within the medical system for medical care of the individual

-is a compilation of a patient medical record from many sources. EHR is patient centric in knowledge.

Electronic medical records (EMR) - an electronic record of patient encounters with a physician; they are part of the electronic health record on an individual. The information in the records is a user centric system with varying degrees of medical information included for each patient. -Also used interchangeably with the term electronic medical records

Health Information Exchange (HIE) – an electronic way of storing and sharing electronic health data across a specific area.

Health Information Technology (HIT) – is the computer hardware and software that is used for the storage, retrieval, sharing and use of healthcare information, data and knowledge to communicate and make decision within a healthcare system.

Information Highway Advisory Council (IHAC) - is the advisory council the federal government of Canada formed in 1994 to advise how best to utilize the new form of information flow known as the information highway. This council was to produce a report(s) as to the best use for the benefit of Canadians in utilizing the information technology available then and in the future.

Local Health Integration Networks (LHIN) - is the association that links the health care network locally together. It is responsible for funding the majority health service providers and managing the service agreements with these providers within the community. LHINs are used in the province of Ontario to aid in the management of funds on a more regional basis

Patient Health Records (PHR) - is the tool used to collect, track and share all medical information about the health of an individual. The information can use multiple sources with the capability of managing and sharing the information of a specific individual. This record is normally controlled by the patient or someone else on their behalf. The information is shared at the discretion of the patient themselves.
-also referred to as personal health record medical records

Personal Health Record (PHR) – also referred to as patient health records

Appendix A

A.1. Measurements for constructs

TP1. Which category best describes the type of practice that you see the majority of your patients?

- Family Practitioner
- Community Health Centre
- Solo Practitioner
- Specialist Practice (i.e., Pediatric, OB, Orthopedic, etc.)

IN1. I want to continue using my electronic medical records (EMRs) rather than discontinuing it.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

IN2. My intentions are to continue using EMRs rather than paper records.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

•IN3. If I could, I would like to discontinue use of EMRs.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

*Reverse coded measurement

•Measurement removed during pilot study

IN4. My intentions are to implement other functions of EMRs (i.e. prescriptions, alerts for drug interactions, etc.) that I presently do not use.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

IN5. If I could, I would like to implement other functions of EMRs.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

ST1. I am satisfied with my decision to use EMRs.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

ST2. My choice to use EMRs was a wise one.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

•*ST3 I am not happy with my earlier decision to use EMRs.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

*Reverse coded measurement

•Measurement removed during pilot study

*ST4. My experience with using EMRs was very unsatisfactory.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

ST5. I think I did the right thing by deciding to use my EMRs.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

ST6. If I use another EMR vendor's software, I would feel differently about using EMRs.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

PU1. Using EMRs helps me improve my performance in managing my patients care and my practice.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

*PU2. Using EMRs is less efficient than my paper records.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

*Reverse coded measurement

●Measurement removed during pilot study

PU3. I think that my EMRs improves my productivity in managing patients care and my practice.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

PU4. In my opinion, using my EMRs increases my effectiveness in managing patients care and my practice.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

●*PU5. I find EMRs useful in managing patient care and my practice.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

CN1. My EMR's performance of electronically capturing patient records meets my expectations.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

*Reverse coded measurement

●Measurement removed during pilot study

CN2. My EMRs gives me all the information and tools needed to manage my practice.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

•*CN3. My electronic capture of patient records falls short of my expectations.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

CN4. After sales service provided by my EMRs vendor meets my expectations.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

•*CN5. I generally get the level of service I expect my from my EMRs vendor.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

Perform1. The performance of EMRs creates problems managing my patients and their files.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

*Reverse coded measurement

•Measurement removed during pilot study

Perform2. EMR does not perform in the manner I expected.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

•Perform3. The security system built into EMRs is not strong enough to protect my patient's data.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

Perform4. There is likelihood that there will be something wrong with EMRs and it will not work properly.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

•Perform5. The expected level of service performance of EMRs, for you to continue using would be.

- Much More (points 7)
- More (points 6)
- Slightly More (points 5)
- Same (points 4)
- Slightly Less (points 3)
- Less (points 2)
- Much Less (points 1)

*Reverse coded measurement

•Measurement removed during pilot study

•Finance6. Continued use of EMRs is a waste of money, as it is not worth the continued cost of operating EMRs.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

Finance7. Continued use of EMRs is a financial risk for my practice.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

*Finance8. The amount spent on EMRs is worth it.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

*Finance9. The amount received by the government is sufficient to justify using EMRs.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

•*Finance10. The amount received in incentives for using EMRs justifies the financial cost.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

*Reverse coded measurement

•Measurement removed during pilot study

•Time11. If you decide to change EMRs vendors what is the chance that you will need to invest more time, due to switching vendors.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

Time12. Continued use of EMRs would create more time lost due to fixing errors or the need to input documents manually.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

Time13. The EMRs takes too much time in comparison with paper records.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

Time14. The time invested in EMRs is. (Scale is 7 point too little ...just right... too much)

- Too Much (points 7)
- Slightly Too Much (points 5)
- Just Right (points 4)
- Slightly too little (points 3)
- Too little (points 1)

*Soc15. Others in the medical community view me as more professional with my use of EMRs.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

*Reverse coded measurement

•Measurement removed during pilot study

*Soc16. My patients view me in a more professional manner with my use of EMRs.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

•Soc17. My continued use of EMRs will lead to loss of social position within the medical community.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

*Soc18. My continued use of EMRs will lead to an increase in power in the medical community.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

Psych19. The continued use of EMRs does not fit my self-image of a physician.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

*Reverse coded measurement

•Measurement removed during pilot study

•Psych20. The continued use of EMRs would lead to my feeling that my self-image is harmed.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

Psych21. The continued use of EMRs will cause more tension in my office between my support staff and me.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

Psych22. The use of EMRs has caused difficulties in managing patient records and harmed the professional image of myself and my staff.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

*Privacy23. The security system built into the EMRs strong enough to protect the data.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

*Reverse coded measurement

•Measurement removed during pilot study

•Privacy24. What are the chances that continuing to use EMRs will cause you to lose control over the security of medical records?

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

•Privacy25. What is the level of risk that internet hackers might gain access to your medical records?

- Very Little Risk (points 1)
- (points 2)
- (points 3)
- Risky (points 4)
- (points 5)
- (points 6)
- Very risky (points 7)

*Privacy26. EMR is a private and secure a method of storing patient records.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

*Privacy27. Using EMR to share patient records with other physicians is a secure method.

- Strongly Agree (points 1)
- Agree (points 2)
- Slightly Agree (points 3)
- Neutral (points 4)
- Slightly Disagree (points 5)
- Disagree (points 6)
- Strongly Disagree (points 7)

*Reverse coded measurement

•Measurement removed during pilot study

●*Total28. On a whole, considering all sorts of factors combined, about how risky is using EMRs in your practice.

- Very Little Risk (points 1)
- (points 2)
- (points 3)
- Risky (points 4)
- (points 5)
- (points 6)
- Very risky (points 7)

Total29. Using EMRs adds a great deal of uncertainty to my practice.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

Total30. Using EMRs exposes me to more risk than does a paper system.

- Strongly Agree (points 7)
- Agree (points 6)
- Slightly Agree (points 5)
- Neutral (points 4)
- Slightly Disagree (points 3)
- Disagree (points 2)
- Strongly Disagree (points 1)

*Reverse coded measurement

●Measurement removed during pilot study

Appendix B

B.1 Tables for model A– Perceived Risk a multidimensional construct

Table 5: Descriptive Statistics for Constructs- Model A

Descriptive Statistics					
	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Std. Error	Statistic
Confirmation	1.0000	7.0000	5.0356	.1250	1.4150
Continuance Intention	1.0000	7.0000	6.4400	.0890	1.0090
Perceived Risk	1.0000	6.26	3.7295	.0666	0.7534
Perceived Usefulness	1.0000	7.0000	5.8186	.1171	1.3253
Satisfaction	1.7110	7.0000	6.2010	.1059	1.1990

Table 6: Latent Correlations for Constructs with AVE

	AVE	Confirmation	Continuance Intention	Perceived Risk	Perceived Usefulness	Satisfaction
Confirmation	0.7421	0.8615	0	0	0	0
Continuance Intention	0.7473	0.5205	0.8645	0	0	0
Perceived Risk	0	-0.6669	-0.7479	0	0	0
Perceived Usefulness	0.7594	0.76	0.6754	-0.7872	0.8714	0
Satisfaction	0.7353	0.6112	0.7824	-0.7538	0.7771	0.8575

The square root of AVE is on the diagonal in bold.

Table 7: Cross Loadings for Constructs

	Confirmation	Continuance Intention	Perceived Risk	Perceived Usefulness	Satisfaction
CN1	0.9031	0.4884	-0.6267	0.724	0.5506
CN2	0.9238	0.4793	-0.6309	0.7258	0.6027
CN4	0.7465	0.3647	-0.4408	0.4777	0.4017
IN1	0.5317	0.8746	-0.7613	0.65	0.7512
IN2	0.5012	0.9112	-0.709	0.6631	0.7886
IN4	0.3609	0.8164	-0.51	0.4728	0.5227
IN5	0.3669	0.853	-0.5528	0.5073	0.586
PRFin	-0.4927	-0.5421	0.75	-0.5813	-0.5907
PRPer	-0.6812	-0.5156	0.8353	-0.647	-0.6282
PRPriv	-0.382	-0.1457	0.3235	-0.2945	-0.1921
PRPsy	-0.5224	-0.6602	0.8686	-0.684	-0.6946
PRSoc	-0.3494	-0.3582	0.4664	-0.44	-0.3083
PRTIME	-0.2556	-0.5035	0.5024	-0.3754	-0.3223
PU1	0.6535	0.6784	-0.6931	0.8854	0.763
PU2	0.5891	0.4328	-0.6271	0.7676	0.5546
PU3	0.6737	0.5985	-0.7199	0.928	0.7079
PU4	0.7279	0.6169	-0.7021	0.8962	0.6644
ST1	0.5475	0.7958	-0.7082	0.7358	0.9194
ST2	0.5689	0.663	-0.6422	0.7139	0.9119
ST4	0.5419	0.5081	-0.599	0.6008	0.7354
ST5	0.4375	0.6936	-0.6305	0.6026	0.8506

Cross Loadings for constructs are highlighted in bold.

Table 8: Cross Loadings for Sub-constructs –using the secondary model

	Confirmation	Continuance Intention	Finance	Perceived Risk	Perceived Usefulness	Performance	Psychology	Satisfaction	Social	Time	privacy
CN1	0.8937	0.4167	-0.4079	-0.6238	0.6919	-0.6336	-0.456	0.5186	0.2684	0.5158	-0.3414
CN2	0.9199	0.4744	-0.4566	-0.6538	0.7164	-0.6275	0.5156	0.6144	0.3391	0.4717	-0.3695
CN4	0.7652	0.4118	-0.4478	-0.5088	0.498	-0.4565	0.3579	0.4378	0.2793	0.3365	-0.3267
IN1	0.5066	0.8376	-0.5862	-0.665	0.5782	-0.535	0.6189	0.7283	0.2974	0.5106	-0.2485
IN2	0.4682	0.8857	-0.471	-0.5913	0.6176	-0.4479	0.5735	0.788	0.2836	0.4443	-0.2857
IN4	0.3125	0.7561	-0.3298	-0.3689	0.4077	-0.2424	-0.379	0.4561	0.3178	0.2124	-0.1294
IN5	0.3051	0.7917	-0.4056	-0.3926	0.4481	-0.2785	0.3638	0.5314	0.3347	0.2398	-0.0875
PU1	0.6263	0.6438	-0.5374	-0.656	0.8856	-0.5039	0.5785	0.7567	0.3573	0.5838	-0.2141
PU2	0.5725	0.456	-0.4589	-0.677	0.8033	-0.6674	0.5145	0.5771	0.3189	0.6561	-0.1941
PU4	0.7154	0.5333	-0.4899	-0.6713	0.8777	-0.504	0.5823	0.6218	0.4186	-0.521	-0.389
ST1	0.568	0.7949	-0.5391	-0.6372	0.7284	-0.5406	0.5952	0.9201	0.2837	0.5225	-0.1663
ST2	0.5825	0.6874	-0.5476	-0.6251	0.7158	-0.5412	0.5461	0.9117	0.2924	0.4639	-0.2436
ST4	0.5095	0.4793	-0.4107	-0.5542	0.5796	-0.5355	0.5393	0.7279	0.1764	0.4372	-0.1586
ST5	0.4272	0.7087	-0.5268	-0.6198	0.5775	-0.4764	0.5555	0.8386	0.2288	0.5353	-0.286
Finance7	-0.2976	-0.4118	0.7422	0.5832	-0.3666	0.4358	0.4381	-0.4441	0.1615	0.4048	0.328
Finance7	-0.2976	-0.4118	0.7422	0.5832	-0.3666	0.4358	0.4381	-0.4441	0.1615	0.4048	0.328
Finance8	-0.5599	-0.5555	0.8579	0.6906	-0.6172	0.4959	0.4949	-0.5825	0.3609	0.5291	0.2459
Finance8	-0.5599	-0.5555	0.8579	0.6906	-0.6172	0.4959	0.4949	-0.5825	0.3609	0.5291	0.2459
Finance9	-0.2088	-0.2385	0.6342	0.3981	-0.2546	0.3474	0.2018	-0.2522	0.1129	0.254	0.1786
Finance9	-0.2088	-0.2385	0.6342	0.3981	-0.2546	0.3474	0.2018	-0.2522	0.1129	0.254	0.1786
Perform1	-0.5794	-0.4017	0.4305	0.6965	-0.5492	0.8515	0.5564	-0.4979	0.3118	0.5157	0.1744
Perform1	-0.5794	-0.4017	0.4305	0.6965	-0.5492	0.8515	0.5564	-0.4979	0.3118	0.5157	0.1744
Perform2	-0.6861	-0.4592	0.5342	0.7866	-0.6367	0.8833	0.6102	-0.5913	0.2369	0.5882	0.3907
Perform2	-0.6861	-0.4592	0.5342	0.7866	-0.6367	0.8833	0.6102	-0.5913	0.2369	0.5882	0.3907
Perform4	-0.4283	-0.3665	0.4996	0.6661	-0.4393	0.8147	0.5359	-0.4623	0.1611	0.5524	0.0986
Perform4	-0.4283	-0.3665	0.4996	0.6661	-0.4393	0.8147	0.5359	-0.4623	0.1611	0.5524	0.0986
Privacy26	-0.3744	-0.2626	0.3156	0.518	-0.3079	0.2861	0.3992	-0.2559	0.2513	0.2424	0.9234
Privacy 26	-0.3744	-0.2626	0.3156	0.518	-0.3079	0.2861	0.3992	-0.2559	0.2513	0.2424	0.9234
Privacy23	-0.3566	-0.1349	0.2039	0.4116	-0.2533	0.2237	0.2788	-0.1662	0.2118	0.1916	0.852

	Confirmation	Continuance Intention	Finance	Perceived Risk	Perceived Usefulness	Performance	Psychology	Satisfaction	Social	Time	privacy
Privacy23	-0.3566	-0.1349	0.2039	0.4116	-0.2533	0.2237	0.2788	-0.1662	0.2118	0.1916	0.852
Privacy27	-0.298	-0.2266	0.3487	0.4138	-0.2352	0.1752	0.2883	-0.2129	0.1435	0.2021	0.7951
Privacy27	-0.298	-0.2266	0.3487	0.4138	-0.2352	0.1752	0.2883	-0.2129	0.1435	0.2021	0.7951
Psych19	-0.2678	-0.5549	0.3683	0.5823	-0.4342	0.3612	0.7391	-0.4744	0.2427	0.3695	0.3758
Psych19	-0.2678	-0.5549	0.3683	0.5823	-0.4342	0.3612	0.7391	-0.4744	0.2427	0.3695	0.3758
Psych21	-0.5085	-0.4852	0.4563	0.7642	-0.6044	0.6081	0.87	-0.5388	0.3134	0.5983	0.3172
Psych21	-0.5085	-0.4852	0.4563	0.7642	-0.6044	0.6081	0.87	-0.5388	0.3134	0.5983	0.3172
Psych22	-0.486	-0.5044	0.4852	0.7702	-0.5706	0.6581	0.8719	-0.6073	0.2434	0.6094	0.2744
Psych22	-0.486	-0.5044	0.4852	0.7702	-0.5706	0.6581	0.8719	-0.6073	0.2434	0.6094	0.2744
Soc15	-0.2683	-0.3381	0.2984	0.3599	-0.3349	0.2045	0.2163	-0.2588	0.867	0.0358	0.2132
Soc15	-0.2683	-0.3381	0.2984	0.3599	-0.3349	0.2045	0.2163	-0.2588	0.867	0.0358	0.2132
Soc16	-0.3045	-0.3509	0.2444	0.4398	-0.4278	0.2754	0.404	-0.3007	0.8862	0.117	0.1878
Soc16	-0.3045	-0.3509	0.2444	0.4398	-0.4278	0.2754	0.404	-0.3007	0.8862	0.117	0.1878
Soc18a	-0.2817	-0.2158	0.2169	0.3309	-0.2848	0.2068	0.1445	-0.1496	0.7293	0.1664	0.1996
Soc18a	-0.2817	-0.2158	0.2169	0.3309	-0.2848	0.2068	0.1445	-0.1496	0.7293	0.1664	0.1996
Time12	-0.4003	-0.3855	0.4589	0.653	-0.5251	0.5363	0.5271	-0.4878	0.0393	0.8368	0.2469
Time12	-0.4003	-0.3855	0.4589	0.653	-0.5251	0.5363	0.5271	-0.4878	0.0393	0.8368	0.2469
Time13	-0.4339	-0.4207	0.4972	0.7344	-0.644	0.6141	0.6277	-0.5452	0.161	0.8779	0.2118
Time13	-0.4339	-0.4207	0.4972	0.7344	-0.644	0.6141	0.6277	-0.5452	0.161	0.8779	0.2118
Time14	-0.4459	-0.3004	0.3802	0.5342	-0.4807	0.421	0.4023	-0.3494	0.1047	0.7254	0.1422
Time14	-0.4459	-0.3004	0.3802	0.5342	-0.4807	0.421	0.4023	-0.3494	0.1047	0.7254	0.1422

Table 9: Measurement Loadings and Weights

	Mean	St.Dev.	Item Loadings (t-value)	Item Weight (t-value)
Continuance Intention ($\alpha=0.8824$; $CR=0.9177$; $AVE=0.7363$)				
IN1. I want to continue using my electronic medical records (EMR) rather than discontinuing it.	6.52	1.1570	0.8816 (16.4223)	0.3369 (12.9373)
IN2. My intentions are to continue using EMR rather than paper records.	6.62	1.0030	0.9135 (47.5736)	0.3361 (10.2828)
IN4. My Intentions are to implement other functions of EMR (i.e. prescriptions, alerts for drug interactions, etc.) that I presently do not use.	5.87	1.453	0.8072 (14.5013)	0.2282 (10.8338)
IN5. If I could I would implement other functions of EMR.	6.02	1.3560	0.8437 (16.3046)	0.25 (15.9753)
Satisfaction ($\alpha=0.8785$; $CR=0.9177$; $AVE=0.7372$)				
ST1. I am satisfied with my decision to use EMR.	6.33	1.3020	0.9205 (54.2323)	0.3241 (15.3101)
ST2. My choice to use EMR was a wise one.	6.19	1.3610	0.913 (40.0877)	0.3012 (16.7982)
ST4. *My experience with using EMR was very unsatisfactory.	5.67	1.8190	0.7335 (11.4727)	0.2571 (9.8362)
ST5. I think I did the right thing by deciding to use my EMR.	6.37	1.2940	0.8518 (12.8148)	0.2772 (14.35)
Perceived Usefulness($\alpha=0.8933$; $CR=0.9264$; $AVE=0.7598$)				
PU1. Using EMR helps me improve my performance in managing my patients care and my practice.	5.98	1.4370	0.887 (32.7654)	0.3124 (18.9642)
PU2.* Using EMR is less efficient than my paper records.	5.51	1.7790	0.7735 (13.6975)	0.2376 (11.6197)
PU3. I think that my EMR improves my productivity in managing patients care and my practice.	5.61	1.614	0.9264 (42.7089)	0.2942 (18.0406)
PU4. In my opinion, using my EMR increases my effectiveness in managing patients care and my practice.	5.83	1.4740	0.8922 (23.8082)	0.2979 (19.2484)
Confirmation($\alpha=8111$; $CR=.8882$; $AVE=0.7283$)				
CN1. My EMR's performance of electronically capturing patient records meets my expectations.	5.52	1.6040	0.9033 (44.2347)	0.4209 (15.4442)
CN2. My EMR gives me all the information and tools needed to manage my practice.	5.1	1.6580	0.9243 (63.9823)	0.4306 (21.9645)

	Mean	St.Dev.	Item Loadings (t-value)	Item Weight (t-value)
CN4. After sales service provided by my EMR vendor meets my expectations.	4.26	1.7070	0.7487 (15.2735)	0.2943 (8.645)

Table 10: VIF Statistics Perceived Risk

Model	Collinearity Statistics	
	Tolerance	VIF
(Constant)		
PRTime	.443	2.258
PR Soc	.850	1.177
1 PRPriv	.825	1.212
PRPsy	.461	2.170
PRPer	.449	2.227
PRFin	.605	1.652

a. Dependent Variable: Total30

Table 11: Hypothesis Results- Model A

Hypothesis	Path	Coefficient	t-value	P-Value	Outcome
H1	Satisfaction→ Continuance Intention	0.5153	4.1509	<0.0001	Accepted
H2	Confirmation →Satisfaction	-0.0124	0.1349	0.8929	Reject
H3	Perceived Usefulness → Satisfaction	0.4908	4.6321	<0.0001	Accepted
H4	Perceived Usefulness → Continuance Intention	-0.0211	0.2212	0.8252	Reject
H5	Confirmation→ Perceived Usefulness	0.76	21.1566	<0.0001	Accepted
H6	Perceived Risk→ Satisfaction	-0.3757	3.6928	<0.0001	Accepted
H7	Confirmation→ Perceived Risk	-0.6669	12.9315	<0.0001	Accepted
H8	Perceived Risk→ Continuance Intention	-0.3761	2.6478	<0.0001	Accepted