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How nurses perceive the impact of health IT applications on their performance and satisfaction: Examining the organizational, social, and personal factors

Sadaf Ashtari

How Nurses Perceive the Impact of Health IT Applications on Their Performance and Satisfaction: Examining the Organizational, Social, and Personal Factors

by

Sadaf Ashtari

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Dissertation Committee:

Alphonso Bellamy, Ph.D., Chair

David Leapard, Ph.D.

Dorothy McAllen, Ph.D.

Huei Lee, Ph.D.

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Dedication

To my beloved parents and brother for their unconditional love, support, and constant encouragement throughout my life.

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Abstract

Applying information technology tools in the healthcare industry is an appropriate solution to integrate and record medical data and provide complete access of patients' information. However, the effectiveness of these technologies depends on their successful implementation and adaptation. This study addresses the impact of result observability, autonomy, perceived barriers, task structure, privacy and security anxiety, and communication (social) patterns on the perception of the performance and satisfaction of nurses using IT applications in healthcare. Furthermore, the effects of nurses' years of experience, age, different hospitals, different electronic medical records (EMR) applications, and personality factors are examined as a moderator factors on the relationships between the organizational and social factors, and nurses' performance and satisfaction. This study proposes a model of the relationship of organizational and social variables as predictor factors on the perception of performance and satisfaction with EMR among nurses.

Multivariate linear regression was used to build models for the perception of performance and the perception of EMR satisfaction. Professional autonomy, communication patterns, privacy and security anxiety, and result observability are the most important predictors for the nurses' perception of performance relationship. Personality factors do not have a direct relationship with the perception of performance and satisfaction; however, they have moderator effects on the relationship of the independent and dependent variables. Based on the result, financial incentives and sufficient training could influence the nurses' perception of EMR effectiveness. Based on the findings of this study, the healthcare administrators could focus on increasing employee awareness about the results and tangible

benefits of EMR applications and their effects on their performance and satisfaction. EMR development companies in collaboration with healthcare administrators could design the EMR applications more flexible in terms of professional autonomy and give the healthcare staff more freedom to make decisions and deliver care to patients. Moreover, EMR companies may need to reconsider the communication patterns among healthcare staff and patients.

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Chapter 1. Introduction

In November 1999, the Institute of Medicine (IOM) announced that healthcare in the United States is not safe and approximately 98,000 people die in hospitals each year because of medical errors (Kohn, Corrigan, & Donaldson, 2000). Different factors are attributed to the nation's medical errors. The Institute of Medicine pointed out that one of the problems comes from the decentralized and fragmented nature of the healthcare delivery system. The authors mentioned that there is not any system for health providers to access complete information of their patients when the patients see multiple providers in different settings (Kohn, Corrigan, & Donaldson, 2000).

According to the IOM report, one of the action plans that could lead to improving the healthcare system is applying information technology tools to integrate and record medical data. The goal of nationwide, interoperable health information technologies is to support healthcare safety, enhance quality of care, and provide cost-effective health services for patients.

Although healthcare information technologies, such as electronic medical records (EMR), decision support systems (DSS), and computerized physician order entry (CPOE), promise to enhance the efficiency and quality of care (Harrison, Koppel, & Bar-Lev, 2007), the effectiveness of these technologies depends on their successful implementation and adaptation. Due to the different professional training that healthcare staff receive, healthcare providers have fundamental differences from ordinary business user groups for adapting and accepting IT applications as a complementary tool in their work (Chau & Hu, 2002), and as a result, healthcare in comparison with other industries has a slower rate of adoption

(Cresswell & Sheikh, 2013). To ensure that the technological changes are useful for both individual and organizational processes (Cresswell & Sheikh, 2013) and can improve the perception of healthcare performance, different kinds of interrelated technical, social, and organizational factors need to be reviewed. The implementation of health information technologies in organizations has different aspects and different pre-requisites that should be addressed before or at the same time of the implementation. For example, work processes should be changed, job descriptions need to be revised, and social interactions have to be redefined.

This study examines the socio-technical aspects of health information technology implementation and investigates the impact of organizational, social, and personal factors on nurses' perception of their performance working with IT applications. Also, this study discusses the effects of organizational, social, and personality factors on nurses' satisfaction with EMR.

Statement of the Problem

This study addresses the impact of result observability, autonomy, perceived barriers, task structure, privacy and security anxiety, and communication (social) patterns on the perception of the performance and satisfaction of nurses using IT applications in healthcare. Furthermore, this study proposes a model of the relationship of organizational and social variables as predictor factors on the perception of performance and satisfaction with EMR among nurses. This study also examines the extent to which employees' years of experience, age, different hospitals, different EMR applications, and personality factors affect the relationships between the organizational and social factors and nurses' performance and satisfaction.

Nature and Significance of the Problem

The vision of Federal Health Information Technology Strategic Plan 2011–2015 was "A health system that uses information to empower individuals and to improve the health of the population." and the mission was "To improve health and healthcare for all Americans through the use of information and technology" (US Department of Health and Human Services, 2011).

The Office of the National Coordinator for Health Information Technology (ONC) (US Department of Health and Human Services, 2009) defined health information technology as technologies that "enable the secure collection and exchange of vast amounts of health data about individuals," and collecting health data that improve the healthcare of the future. Health information technologies can improve the healthcare delivery, transparency, payment systems, efficiency, and population health (US Department of Health and Human Services, 2011). These technologies, such as electronic health records (EHRs), personal health records (PHRs), telehealth devices, remote monitoring technologies, and mobile health applications, are not being used to their full potential. In fact, healthcare is not only a slow industry in comparison with other high-risk industries in its attention to ensuring basic safety, but also, it is slow in implementing and adapting new information technology tools and applications. In 2010, basic EHRs were used in 15% of acute care hospitals and 25% of physician offices. After five years, in 2014, their usage increased and reached to 75% of acute care hospitals and almost 60% of physician offices. ONC conducted a survey among 128 hospitals in Michigan and received answers from 83 of them; the percent of non-federal acute care hospitals with adoption of the basic EHR was 71.7%. In 2015, the average adoption rate of EHR in physician offices based on different geographic region (North,

South, East, and West) in the United States was almost 60%. Still most of the hospitals and physician offices use the basic form of health IT applications, not the advanced one and they do not use the full functionality of applications. However, there are not any statistics about the performance of working with the EHR applications in different hospitals and healthcare providers (Charles, King, Patel, & Furukawa, 2013; Hsiao & Hing, 2012).

Figure 1 presents the adoption rate of basic and certified EHR at non-federal acute care hospitals and Figure 2 describes the adoption rate of EHR in physicians' offices.

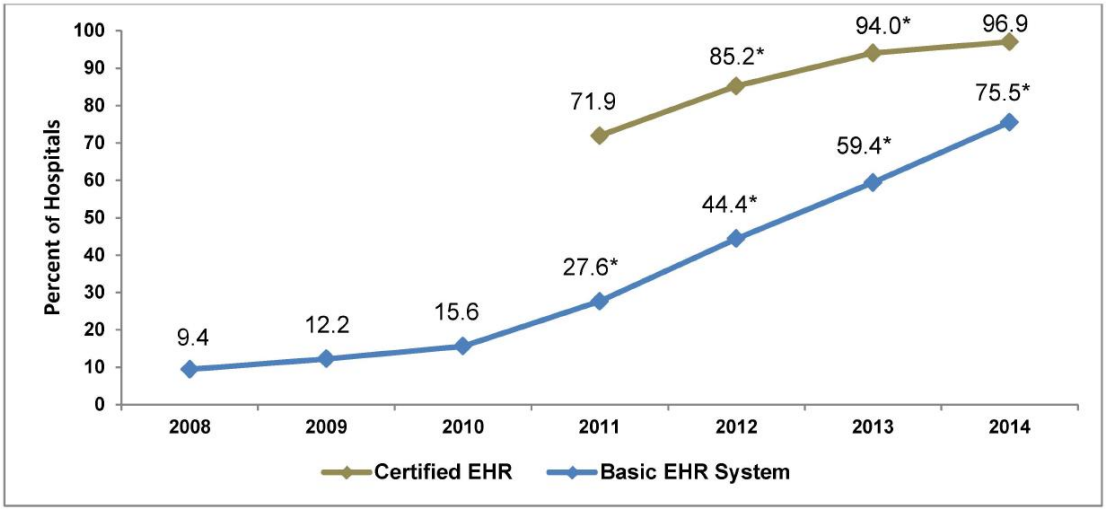


Figure 1. Percent of non-Federal acute care hospitals with adoption of at least a basic EHR with notes system and possession of a certified EHR: 2008-2014. Source: ONC/American Hospital Association (AHA), AHA Annual Survey Information Technology Supplement

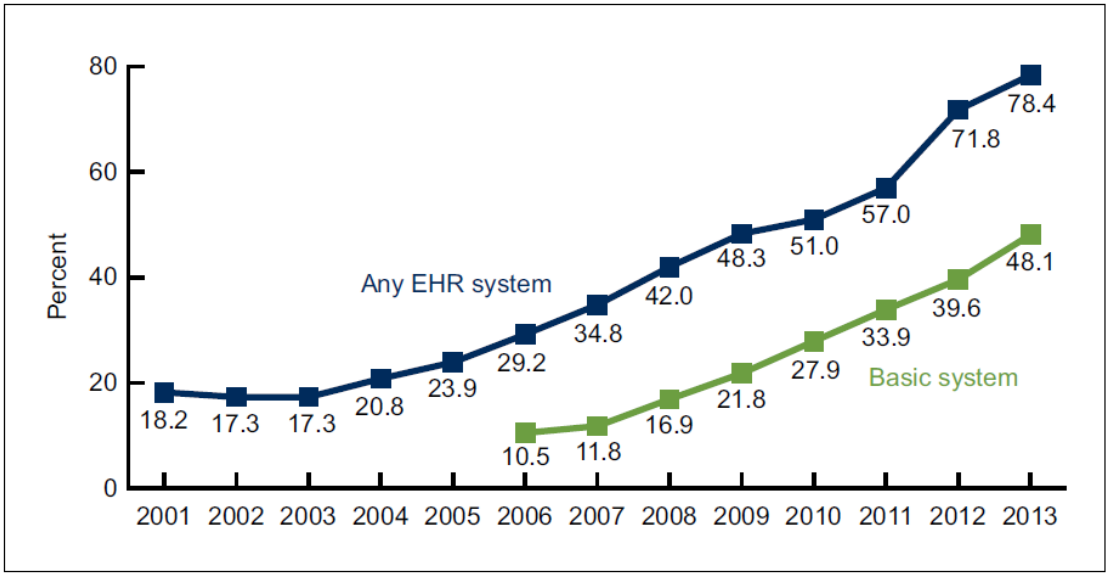


Figure 2. Percentage of office-based physicians with EHR systems: United States, 2001–2013. Source: CDC/NCHS, National Ambulatory Medical Care Survey and National Ambulatory Medical Care Survey, Electronic Health Records Survey.

In 2009, the Health Information Technology for Economic and Clinical Health (HITECH) Act was approved as a part of the American Recovery and Reinvestment Act. Its purpose was to increase healthcare system adoption and meaningful use of health IT in order to improve health. The Patient Protection and Affordable Care Act of 2010 was approved to ensure that all Americans have access to quality and affordable healthcare. It also pointed out health IT as a critical enabler to broad transformations in healthcare. Based on the Federal Health Information Technology Strategic Plan 2011–2015, five goals were determined: (1) achieve adoption and information exchange through meaningful use of health IT; (2) improve care, improve population health, and reduce healthcare costs through the use of health IT; (3) inspire confidence and trust in health IT; (4) empower individuals with health IT to improve their health and the healthcare system; and (5) achieve rapid learning and technological advancement (US Department of Health and Human Services, 2011).

Based on the five goals of the Health IT Strategic Plan, this study investigates the impact of IT applications on nurses' perception of their performance and their satisfaction with the health IT applications. In three different ways, this study is significant from the other studies in the field of healthcare information technology:

1. As far as I have searched and studied, there is a gap in the literature about the performance of healthcare providers (staff) after using the new health IT application /device (s). Implementing the new IT application/device(s), such as electronic health record, was started in 2010, and it was supposed to be implemented in every hospital across the nation by 2016. However, the implementation was slower than planned and still there are some hospitals that are in the process of implementing these new IT applications. Hence, the impact of these applications on healthcare staff and their results on the quality of patient care has not yet been determined. Furthermore, there are few specific studies in this area.
2. There are many studies about the effect of organizational, environmental, technological, and social factors on the acceptance and adoption of information technology in healthcare, but none of them focus on peoples' personality type and how different personality types can affect the adaptation and performance of healthcare staff.
3. After implementing the new health IT application/device(s), the patterns of communication of staff with each other and staff with patients are changed. As far as I know, there are few studies in this field that mention the change of communication patterns between nurses and patients, and none of them

measures the effect of this new way of communication on the nurses' performance and the quality of care. In the new way of communication, nurses have to look at a monitor instead of looking at patients, and this may affect the quality of care.

Research Objectives and Framework

This study has six independent variables: result observability, autonomy, perceived barriers, task structure, privacy and security anxiety, and communication (social) patterns. Five moderator variables in this study are personality type, years of experience, age, hospitals, and EMR applications. There are two dependent variables: nurses' perception of their performance in working with the EMR and nurses' satisfaction with EMR. This study reviews the effects of result observability, autonomy, perceived barriers, task structure, privacy and security anxiety, and communication (social) patterns on the nurses' perception of their performance in working with EMR and nurses' satisfaction with EMR. Also, this study measures the extents to which nurses' years of experience, age, hospitals, EMR applications, and personality types affect the relationships between the independent and dependent variables (see figure 3).

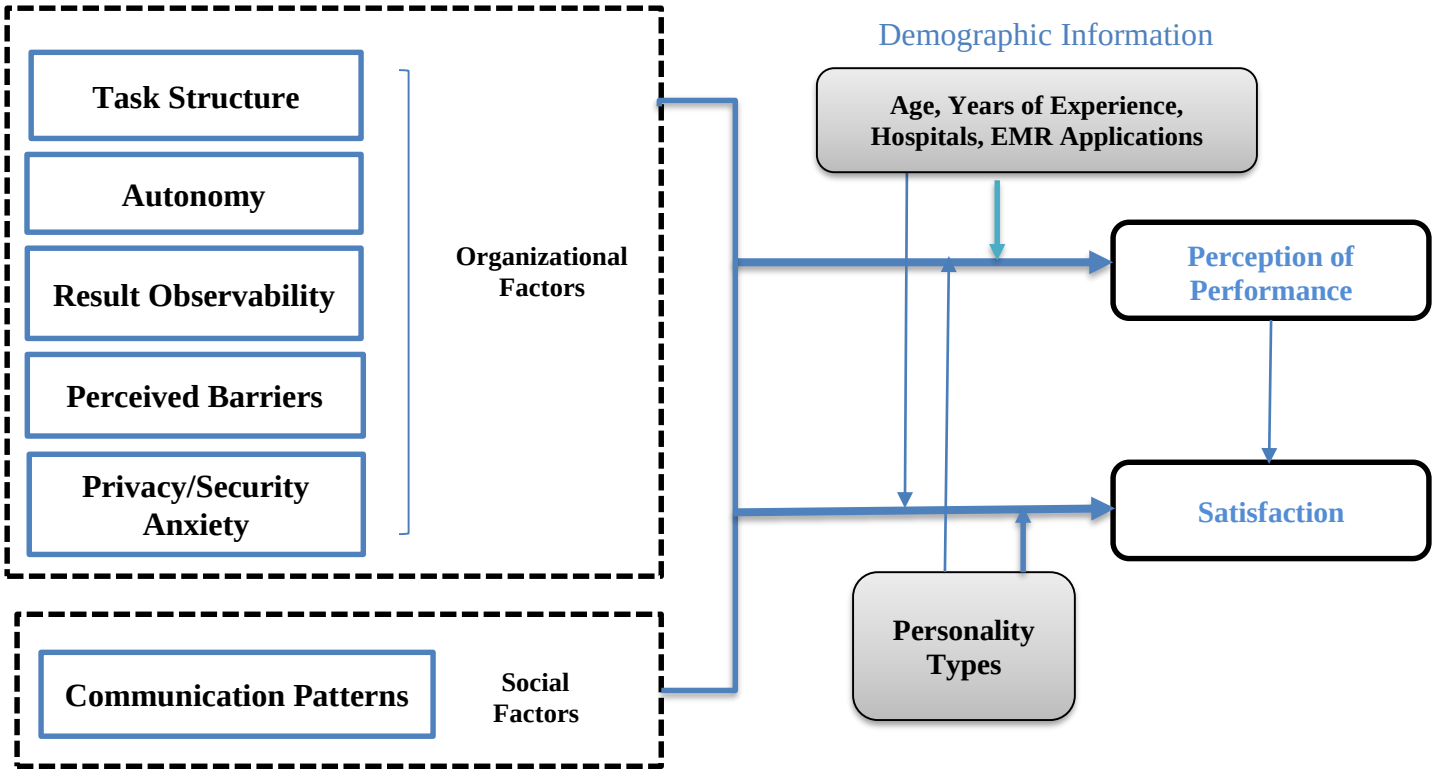


Figure 3. Theoretical Model

Research Hypotheses/Questions

The following hypotheses are tested in this study:

Hypothesis 1: There is a positive relationship between result observability and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 1a: The four personality factors moderate the strength of relationship between result observability and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 1b: Age, years of experience, different hospitals, and different EMR applications moderate the strength of relationship between result observability and the

nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 2: There is a positive relationship between professional autonomy and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 2a: The four personality factors moderate the strength of relationship between professional autonomy and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 2b: Age, years of experience, different hospitals, and different EMR applications moderate the strength of relationship between professional autonomy and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 3: There is a negative relationship between perceived barriers and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 3a: The four personality factors moderate the strength of relationship between perceived barriers and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 3b: Age, years of experience, different hospitals, and different EMR applications moderate the strength of relationship between perceived barriers and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 4: There is a positive relationship between task structure and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 4a: The four personality factors moderate the strength of relationship between task structure and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 4b: Age, years of experience, different hospitals, and different EMR applications moderate the strength of relationship between task structure and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 5: There is a negative relationship between privacy and security anxiety and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 5a: The four personality factors moderate the strength of relationship between privacy and security anxiety and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 5b: Age, years of experience, different hospitals, and different EMR applications moderate the strength of relationship between privacy and security anxiety and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 6: There is a positive relationship between communication patterns and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 6a: The four personality factors moderate the strength of relationship between communication patterns and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 6b: Age, years of experience, different hospitals, and different EMR applications moderate the strength of relationship between communication patterns and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Hypothesis 7: There is a positive relationship between nurses' perception of performance and satisfaction with EMR

Hypothesis 8: There is a positive relationship between openness and self-confidence, and the nurses' perception of performance and satisfaction with EMR.

Hypothesis 9: There is a negative relationship between apprehension and perfectionism, and the nurses' perception of performance and satisfaction with EMR.

This study investigates the following questions:

1. What are the most important predictors in the relationship between the independent variables and nurses' perception of performance?
2. What are the most important predictors in the relationship between the independent variables and nurses' satisfaction with EMR?
3. How do nurses rate their overall performance and satisfaction in working with EMR?
4. Do financial incentives impact nurses' perception of EMR effectiveness?
5. Do nurses have sufficient training to learn how to use EMR?

Definition of Terms

Electronic Heath Record (EHR): Electronic health record or electronic medical record (EMR) refers to the longitudinal collection of individual patients' and populations'

health information in digital format for the purpose of improving the quality of care (Gunter & Terry, 2005).

Nurses' perception of performance in working with EMR: Using EMR in different ways can improve or hinder the ability of nurses to work. Based on Kossman's (2006) study, EMR applications can either slow-down or speed-up nurses' ability to do charting or investigate patients' records. Overall, nurses felt the benefit of EMR use compensated for its detractions (Kossman, 2006). Nurses determined that using EMR applications can increase their access to patient care information, improve efficiency and organization, and generally enhance their work performance. On the other hand, nurses mentioned several ways that EMR use hindered their job performance, such as spending more time to retrieve or document information, decreasing the time they spent with patients, suppressing their critical thinking power, and interfering with written interdisciplinary communication (Kossman, 2006).

Nurses' satisfaction with EMR: Moreland et al. (2012) developed an instrument for assessing nursing satisfaction with electronic medication administration record (eMAR). The instrument was based on the evaluation of clinical information systems structure, process quality, and user satisfaction. The relation of satisfaction with nurse's workload, patient safety, drug information accuracy, and ease of documentation was mentioned in this study as important predictor factors. There are few reports on nurses' satisfaction with EMR and eMAR. In the early stage of EMR implementation, nurses felt positive about using EMR, but afterwards, they didn't accept it well. Based on Burkle et al. (2001), nurses and physicians initially thought the EMR system could simplify their work, but later they felt less satisfied with it. Apkon and Singhaviranon (2001) declared that in comparison between EMR and a

paper-based system, nurses' documentation task had improved and there were fewer mistakes with the EMR system documentation. Furthermore, they noticed that compliance with charting expectation improved over an 18-month period.

Professional Autonomy: Skar (2010) described professional autonomy as the "authority to make decisions and the freedom to act in accordance with one's professional knowledge base" (p. 2226). He mentioned that autonomy is a necessity in the nursing profession, especially in rapidly changing healthcare environments. Based on the findings of this study, the nursing perception of autonomy included four themes, such as "to have a holistic view", "to know the patient", "to know that you know", and "to dare". Also, the meaning of autonomy in their practice was interpreted as to be knowledgeable and confident. Genny (2009) noticed that if nurses have more autonomy, patient care and patient satisfaction could improve and it might help elevate the status of their profession. There is a relationship between nursing autonomy and respectful work environment. Nurses' autonomy is also related to socioeconomic, legal, and political factors. Force (2005) explained that different organizational structures have different effects and can increase autonomy, which leads to higher job satisfaction and retention for nurses.

Task Structure: House and Mitchell (1975) explained the task structure concept as an important component of Path-Goal Leadership Theory. Based on this theory, the leader's responsibility is to increase the employees' motivation by ensuring a high degree of task structure. According to this theory, the leadership style depends on the nature of the subordinates and the degree of task structure. Task structure is about task clarification and task specification to the employee who has to perform it. Based on House's (1996) study,

task structure includes the extent to which tasks are both defined and have detailed job descriptions and procedures.

Privacy and Security Anxiety: Confidentiality, privacy, and security of personal health information is the main issue in health information management. The security issue only protects health information in electronic form. There are different definitions of privacy, however the privacy rights defined by Shinde (2015) are the "collection, use, disclosure, storage, and destruction of personal data or personally identifiable information" (p. 3).

Based on the Office of the National Coordinator for Health Information Technology, privacy rules protect the privacy of individually identifiable health information, and security rules are related to the national standards for the security of electronic protected health information. According to Agaku, Adisa, Ayo-Yusuf, and Connolly's (2014) study, most patients had concerns about data breach when their protected health information is transferred between healthcare professionals by fax or electronically. There were even some cases in which patients did not give the information to the healthcare provider because they had security concerns.

Communication Patterns: Communication refers to a basic process of organization whose main function is to inform, persuade, and promote goodwill. Oral communications more than technical reports, publications, or other formal media can transmit new ideas within and between organizations (Katz & Tushman, 1979). Studying communication patterns could help to determine the areas within and outside of an organization. Communication related to generating and sharing new ideas or solutions may be positively associated with the performance. Katz and Tushman (1979) described that the "optimal degree of communication is contingent upon the nature of the subunit's task: the more

complex the task, the greater the unit's work-related uncertainty, and the greater its communication requirements" (p. 141).

Assumptions

There are several assumptions in this study:

- The registered nurses who were studied at a mid-size public school in southeast Michigan are a good representation of the nurses' population
- All of the participants answered accurately to the survey questions and their responses are valid enough to be analyzed.
- The items in the different scales contain the appropriate factors and can measure responses in regard to scales.

Delimitation and Limitation

This study did not use probability-based random sampling. The sample was restricted to the registered nurses who were registered in Winter 2016 at a mid-size public school in southeast Michigan. The registered nurses who are currently working at hospitals or healthcare facilities are the target of this study. For collecting more accurate data, the paper-based survey is the principal tool in this study. Also as an incentive, participants were offered a gift card to provide authentic responses.

Chapter 2. Literature Review

This study investigates the relationship of organizational and social factors on the perception of performance and satisfaction with EMR. The literature review, which is related to the organizational factors, such as result observability, professional autonomy, perceived barriers, task structure, and privacy and security anxiety, will be presented in this chapter. The communication patterns' literature review will be discussed as a subset of social factors. The health information technology challenges, health information technology history, nurses' challenges, and information technology applications for nurses will be reviewed in this chapter. Lewin's change theory, diffusion of innovation, and the Satir change model are mentioned in this chapter as a base for the theoretical framework of this study. Personality factors' literature will be reviewed as a moderator variable. Furthermore, the literature of performance and satisfaction will be investigated in this chapter.

Health Information Technology Challenges

Health Information Technology is considered to be a major innovation at technological, social, and cultural levels (Gagnon et al., 2003). Based on different studies, the implementation and adaptation of health information technologies is not an easy job because of the interrelated organizational, social, technological, personal, and environmental factors (Cresswell & Sheikh, 2013; Vest, 2010; Rippen, Pan, Russell, Byrne, & Swift, 2013; Anderson, 2007). Although health IT applications are being used in hospitals and physician offices at different levels, administrators and employees know little about the organizational changes, costs, work processes, communication patterns, and time required for successfully implementing systems (Lluch, 2011). Some scholars discussed that 5% of health IT failures are related to technical factors (Middleton, 2005), while others estimated that number to be as

high as 20% (Westbrook, Braithwaite, Iedema, & Coiera, 2004). According to Yee, Miils, and Airey (2008), the problems that are reported are not related to the technology itself but to the lack of socio-technical considerations. Of course technical problems such as lack of support, not having a user friendly interface, and not having customized applications may cause failure in health information technology implementation; however, the main problem is not technical, but rather an organizational one. In the implementation and adaptation of health information technologies, there has been insufficient attention to socio-technical factors and healthcare providers were not addressing these factors properly to make improvement in the hospitals (Wears & Berg, 2005; Coiera, 2004). Instead of implementing technology and expecting people to adopt it, the other option would be modeling the system based on the capacity via a socio-technical approach and then predicting the impact of new technologies within the existing social systems (Coiera, 2004). This study will focus on the different ranges of organizational, social and personal considerations that need to be considered to better understand the impact of health information technology applications on nurses' performance and satisfaction.

O'Brien, Weaver, Hook, and Ivory (2015) explained that the United States is in the early stages of comprehending the advantages of digitizing healthcare. The health IT applications such as EHR were implemented with the purpose of ubiquitous access to patient records and an increase in the quality of care by integrating the patient data. However, the design of these systems has increased the documentation burden and decreased the ability to manage the new work process. Based on this study, "The phenomenon of 'data rich, information poor' in today's EHRs is all too often the reality for nursing" (Charles, King, Patel, & Furukawa, 2013, p. 333). The ability of nurses to use an electronic health record

(EHR) effectively is critical to patient safety, decreased facility expenditures for training, and reduced healthcare costs.

Health Information Technology History

The trends in health information systems have changed decade by decade. Information technology has progressed very fast in recent decades, and subsequently, its effect on different industries has been huge. Healthcare is one of the industries that was influenced by information technologies. The following are health information technology trends since 1960:

1960s: The IT drivers were storage devices and large mainframes that were very expensive. Typically, hospitals shared a mainframe; the main applications at that time were hospital accounting systems.

1970s: One of the main needs of hospitals at that time was communicating with different departments such as admission, discharge, order communications, and result review. They also needed specialized departmental systems such as for the pharmacy, clinical lab, etc. Computers got smaller during this period and each department could have a computer system for itself. The only issue was that these departmental systems were separated from each other and not integrated.

1980s: Hospitals really needed a Diagnosis-Related Group (DRG) and a reimbursement system. The DRG was a statistically-based system to categorize patients in different payment groups. At the same time, personal computers with different applications, such as Widespread, came to the market and had networking capabilities. Therefore, hospitals wanted to connect the financial and clinical systems to each other in a very basic way.

1990s: The need to integrate hospitals, providers, and managed care increased and the competition between different healthcare organizations became more intense. Therefore, the clinical departmental solutions were expanded, the integration link between different departments increased and the idea for the electronic medical records (EMR) emerged.

2000s: Healthcare needs more integrated and customized applications. Very basic types of clinical decision support have been developed, and the integration between departmental systems with EMR tools have been increased. Also, the data warehousing and analytics solution received very special attention at this time (Grandia, 2014). Different government agencies supported the development of health information systems to improve the quality of care (Shortliffe, 2005).

The Health Information Technology for Economic and Clinical Health Act (HITECH Act) legislation was created in 2009 to restructure healthcare delivery and to improve healthcare quality, reducing cost and increasing information access through the integration of data within different departments. President Obama signed HITECH into law on Feb. 17, 2009, as a part of the American Recovery and Reinvestment Act of 2009 (ARRA) economic stimulus bill.

The Office of the National Coordinator (ONC) for Health Information Technology was established in 2004 within the Department of Health and Human Services. At the beginning, the dedicated budget to ONC for the Health Information Technology through HITECH program was $2 billion, with an estimated $30 billion in Medicare and Medicaid as an incentive for physicians and hospitals to become health information technology users. The HITECH Act gave the ONC the authority to manage and set standards for the stimulus program (Buntin, Jain, & Blumenthal, 2010).

HITECH was enacted in 2009, but to motivate use of this program, the healthcare providers would be offered financial incentives from the beginning of 2011 for demonstrating "meaningful use" of EHRs until 2015. The rollout of meaningful use happens in three stages, and providers must demonstrate two years in a stage before moving on to the next one. Since adoption for the second stage has been slow, the Centers for Medicare and Medicaid Services (CMS) announced in mid-2014 that it will put the third stage off until 2017.

Nurses Challenges

Strudwick and Hall (2015) addressed that nurses are working in every clinical environment and are the largest group of healthcare professionals internationally and are likely to be the largest user group of health information technologies. Strudwick and Hall (2015) stated that for operating daily tasks, nurses have to document different aspects of care, use data to make a clinical judgment, access patient health records, and plan/assess care. As a result, it is necessary to investigate factors that affect nurses' performance while they are working with health information technologies. Based on their study, nurses are working in a busy environment, and the technology that they are going to use should be powerful and beneficial enough to provide the intended value for the pre-defined purpose (Strudwick & Hall, 2015). Nurses could be satisfied with the new technologies in the organization if they found that there is support to use that system (Aggelidis & Chatzoglou, 2009).

A study by Popovici et al. (2015) focused on hospitals' communication challenges after the implementation of health information technologies. Since these applications are new in the hospitals and the transition phase from paper-based to electronic-based records takes time, there is a period of mixed use of new (electronic) and old (paper) communications

systems, which can cause errors in patient care, redundancy, and confusion. Based on this study, there is not a clear guideline for methods of communications. Some nurses want the orders on paper, some want them electronically and some others want face-to-face talk. This may cause duplicated or incomplete orders and delay in patient care.

Based on studies by Yee et al. (2012) and Hendrich, Chow, Skierczynski, and Lu (2008) surgical nurses spent 19% to 36.3% of their time on documentation. The researchers declared that nurses were concerned about the redundancy of documentation even after the transition to the electronic system, as well as the excessive time away from direct patient care and the use of overtime to complete the documentation. However, the design of new systems is the combination of the current states of organization and the template forms of vendors, so the final product is not based on the workflow and could not improve the problematic areas such as documentation for nurses. O'Brien, Weaver, Hook, and Ivory (2015), stated that even in the process of entering patient data, nurses do not see the patient's story or potential problems, so they feel like "data entry clerks."

Information Technology Applications/Devices for Nurses

There are four main nursing IT applications in healthcare that include nursing documentation, electronic medication administration record (eMAR), nurse staffing/scheduling, and patient acuity (see figure 4). According to HIMSS Analytics 2011, at least 70 percent of hospitals wanted to buy the nursing applications for the first time in 2010 and at least 10 percent of hospitals had already installed the nursing applications.

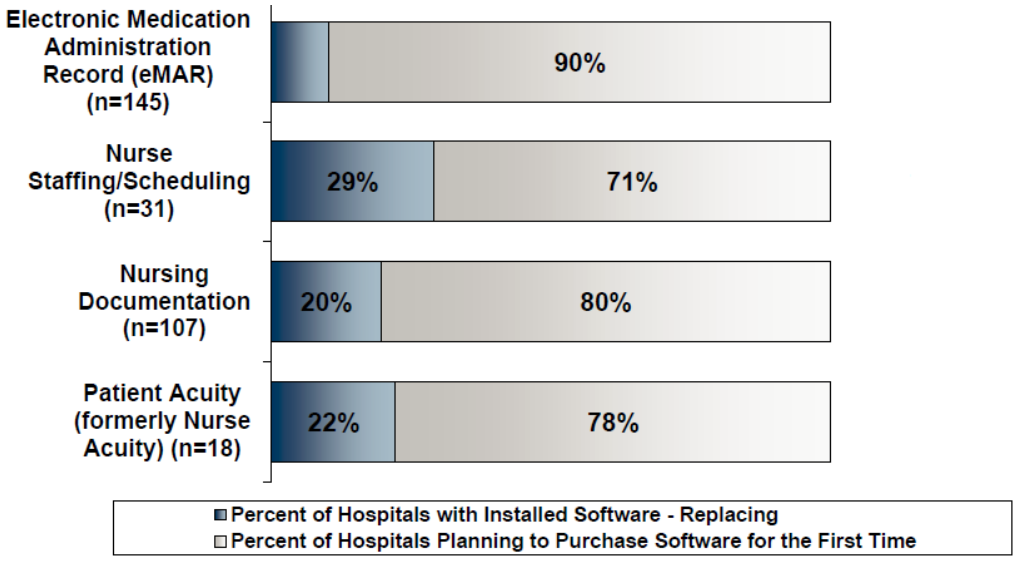


Figure 4. Percentage of hospitals with installed software or planning to purchase. Source: HIMSS Analytics Database, 2011

Other healthcare IT applications that nurses work with include electronic medical record (EMR), computerized physician order entry (CPOE), barcoding at medication dispensing (Bard), and robot for medication dispensing (RoBoT, Pyxis).

Theoretical Framework

Lewin's Change Theory

Lewin introduced the three-step change model in 1951. The model's three steps are unfreezing, changing, and refreezing. First of all, it is required to unfreeze the existing situation or status quo. In every change process, there is individual and group resistance. However, by increasing incentives and decreasing barriers, the change process can be less challenging. In the unfreeze stage employees learn that something will change and may experience some emotions, such as denial, impatience, or uncertainty. In return, administrators can assist their employees by preparing them for change, building their trust and recognition for the need to change, and brainstorming solutions within a group

(Kritsonis, 2005). In the second stage, change has to be implemented within a short time. A long change process makes employees reluctant about the new process and pushes them more into old habits and rituals. This stage has a ripple effect within an organization. One action that could assist in the change step includes encouraging the employees to see the advantages of the new situation, providing them with a relevant information about the new process and demonstrating powerful leadership. In the refreezing stage, the change should be solidified. Refreezing is the actual integration of the new values into the community values and traditions (Kritsonis, 2005). To establish the stabilized change process, it is necessary to reinforce new patterns and institutionalize them through formal and informal mechanisms.

Kwon and Zmud (1987) proposed the IT implementation process model based on Lewin's change model. Kwon and Zmud (1987) extended the previous model with the contribution of post-adoption behaviors (see figure 5). In their model, the initiation process is equal to the unfreeze stage, which investigated the organizational problems and IT solutions for these problems. The adoption and adaptation process is equal to the change stage and the IT application is developed, installed, and maintained, and employees are trained both in the procedures and in the IT application. The acceptance, routinization and infusion processes are equal to the refreezing stage. In this stage, the IT application is employed in organizational work and the employees are encouraged to use it in their normal activities. IT application finally is used to its fullest potential within the organization (Sullivan, C. H. 1985).

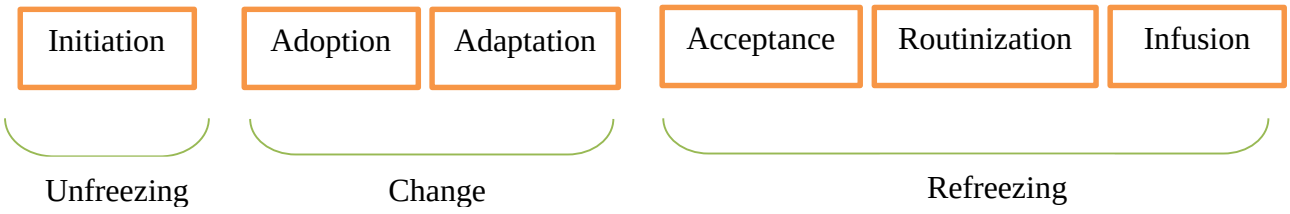


Figure 5. Stage of Change based on Cooper and Zmud (1990) Model

This study is focused on the implementation of new IT application/device(s) in healthcare. The change process in healthcare is the implementation of the new IT applications/device(s). The second stage has already been achieved in many hospitals while other hospitals are still in the first stage. However, the third stage of change has not yet been stabilized, so the results and the impact of this change on the performance and satisfaction of healthcare providers is presently unknown.

Diffusion of Innovation

In 1962, Rogers developed a diffusion of innovation (DOI) theory to explain how, over time, an idea or product was accepted and diffused through a social system. The result of this diffusion should be adopting a new idea, behavior, or product by the people as a part of that social system. Adoption in this theory means that the person performs a new behavior or uses a new product. The diffusion in DOI theory has four main elements: innovation, communication channels, time, and social system (context). Diffusion is achieved when these conditions are met: awareness of the need for an innovation, decision to adopt the innovation, initial use of the innovation to test it, and continued use of the innovation. Five main factors that have an impact on the adoption of innovation are as follows:

1. Relative Advantage—The degree to which an innovation is seen as better than the idea, program, or product it replaces. The potential adopter needs to see the benefits of innovation and how this innovation improves upon the existing technology. If people realize

benefits of adopting the innovation in regard to their current task, the speed of diffusion will increase. For example, the x-ray device for medical radiography was discovered in 1895 by Roentgen and gave physicians the ability to look inside the body without cutting it open. Although many negative effects of exposure to radiation were documented by the end of 1896, the benefits of x-ray technology outweighed the disadvantages of radiation, and this technology diffused rapidly (Cain & Mittman, 2002).

2. Compatibility—How consistent the innovation is with the values, experiences, and needs of the potential adopters and how much the new innovation can integrate with the current technologies and social patterns in the healthcare system, the greater its opportunity for adoption and diffusion.

3. Complexity— How difficult the innovation is to understand and/or use. If the key players of the innovation perceived it simple to use, then innovations would easily be adopted.

4. Triability—The extent to which the innovation can be tested or experimented with before a commitment to adopt is made. In classic diffusion research, the easier it is to test the innovation without any risk, the better the prospects for adoption and diffusion. For example, pharmaceutical companies send sample to physician offices to promote their adoption.

5. Observability—The extent to which the innovation provides tangible results (Mustonen-Ollila & Lyytinen, 2003). Observability means to watch someone who is working with new technology and be assured that the technology is safe and beneficial. For example, a physician can learn the new technology by watching a more experienced person using that device.

Damanpour (1991) discussed that in the diffusion of innovation literature much more attention should be paid to the underlying capacity of organizations to absorb new knowledge. The focus needs to shift from the analysis of the innovation to the "receiving organization" and the organization's capacity to absorb new knowledge and practices. Fitzgerald, Ferlie, Wood, and Hawkins (2002) explained that to understand the processes of diffusion, studying the additional levels of the organizational context in both sectoral and organizational levels is a necessity.

Rogers (1995) introduced a five-stage model of the innovation decision process that included knowledge, persuasion, decision, implementation, and confirmation. Fitzgerald et al. (2002) argued that the successful diffusion of new knowledge could be a prerequisite to changes in concrete practices. This is an important element in professional or knowledge-based organizations, such as healthcare. Different studies concerning the DOI concept argued that the complex diffusion process will be influenced by the characteristics of the context (Fitzgerald et al., 2002). James, Menzel, and Elihu (1966) applied Rogers' model to American healthcare. According to James et al.'s (1966) study, the linear model of Rogers is appropriate within an uniprofessional network, where clinicians have the freedom to prescribe and are not limited within a wider organizational framework. However, these approaches are not applicable for those healthcare groups that are based on multi professional groups with large and complex organizations. Implementing EMR applications in healthcare was one of the innovations that diffused in this industry. Also, reviewing the diffusion of innovation theory helped to determine important factors that contributed to adopting EMR technology in healthcare. This theory influenced the current study's result observability, task structure, and communication patterns variables.

The Satir Change Model

Satir was an American author and social worker in the field of family therapy, but she also created the Virginia Satir change process model in 1991 to explain how change impacts organizations and affects employee performance (see figure 6). Satir wanted to show how individuals experience change. Based on the Satir change model, after significant change, individuals move through five stages: late status quo, resistance, chaos, practice and integration, and new status quo (Satir & Banmen, 1991). In each of these steps, people experience different behaviors and performance. By knowing the change process, the expectations and reactions could be predictable and a solution can be suggested to prevent a big loss. Late status quo is the legacy system in the organization, and employees know "what to do" and "how to do it." They may or may not be content with their tasks and activities, but they are comfortable. Their performance pattern is consistent and a stable relationship gives employees a sense of belonging and identity. However, in a dynamic environment, which is constantly changing, staying in a static situation is not possible. New information and concepts from outside the group make the employer aware of improvement possibilities. The *foreign element* can be assumed to be a change element either from outside or inside the group of employees. Resistance is the first response to the change; the employees need awareness and openness to adapt to change (Smith, 2015). The next stage of the Satir model is chaos, when the change has occurred and the organization faces unstable situations and things seem to be out of control. If chaos is perceived as a "death" of the old status quo, the four preliminary stages of death that someone must deal with are denial, bargaining, anger, or depression. Every organization, including hospitals, will face chaos when implementing new technologies or applications, and the reaction of healthcare providers could be resistance,

anger, or denial. However, a transforming idea could be helpful to increase the awareness of new possibilities for employees. If, for example, nurses were aware of the possibilities of a new technology, they would have a better perception of working with it. In the practice and integration phase, employees will get some training on how to use a new application according to a new process or tasks within a new structure. In this period of change, performance will be even less than it was prior to the change. The focus of this study will be in this part of the Satir change process. The significant factors affecting the performance of nurses after the implementation of new IT applications will be investigated. The last phase is the new status quo phase, in which the benefits of changes will be recognized and a new status quo is formed

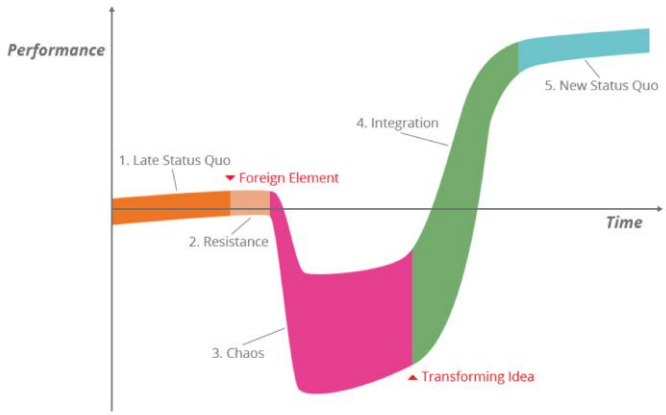


Figure 6. The Satir Change Process Model

Organizational Factors

Lluch (2011) explained that the structure of a healthcare organization shows how different team members or different levels of care are organized, collaborate, and work together. After implementation of the health IT applications, the structure of an organization and the group tasks will change. Yee, Miils, and Airey (2008) mentioned that the successful implementation of IT applications is not only related to the technology itself, but is also more

dependent on socio-technical considerations. They mentioned that the organizational structure in healthcare has utilized a hierarchical structure for years and that there is a strong need to reengineer this system to include the potential of the young generation of workers and new technologies. The current structure of healthcare organizational systems is not horizontally integrated, and it is difficult to encourage teamwork in this system (Ludwick & Doucette, 2009; Mostashari, Tripathi, & Kendall, 2009; Aas, 2007). Team-based care strategies are needed for the successful implementation of IT applications (Mostashari et al., 2009). Al-Qirim (2007) emphasized the integration of different tiers of care such as primary, secondary, tertiary, and community care. The integration is a necessity and the structure should be redesigned for implementing and using the potentials of new technology [if there is a separation between different tiers] (Fonkych & Taylor, 2005). This study measures the "task structure" of nurses' work environment as a measurement of organizational structure.

Task Structure

Lluch (2011) noted that before the implementation of health information technologies, the healthcare organizational systems had been task-focused and centered on the provider or facility rather than on patients. Nowadays, healthcare administrators are trying to change from task-focused to process-focused care with the patients as the center, which means healthcare staff should look at the bigger picture when caring for patients. Also, health information technologies support value-added, patient-centered care tasks that have profound implications on workflow, work processes, and workload. Three studies mentioned that the technologies should be designed in a way that could adapt the roles, tasks, and the workflow of the organization (Westbrook, Braithwaite, Iedema, & Coiera, 2004; Westbrook

et al., 2007; Coiera, 2009). However, the organizational structure, tasks, and workflow should be changed before the implementation of health information technology.

Role theory emphasizes the direct relationship between task description and task performance. To perform the role in an acceptable way, the person needs to gain enough information about that role (Lyons, 1971). Based on role theory, ambiguity could increase the probability of employee dissatisfaction about his/her job. On the other hand, job dissatisfaction will result in a lack of job interest and the employee will be less innovative in his/her job. In reality, some amount of ambiguity always exists. However, most employees are capable of performing their various roles despite any lack of clarity. Although in different organizations, different occupational groups may respond differently to the lack of role clarity, there is a possibility of greater anxiety and tension of members resulting from ambiguous roles (Burns & Stalker, 1961). Role ambiguity will increase with technological changes in the organization, which could change the social structures or change the way work is performed (Lyons, 1971). Another contributor to role ambiguity is the restriction of communication flow. This condition is very common in hospitals. Several researchers described the nursing profession as having a "blurred image" (Bennis, 1961; Haas, 1964). New technological, medical, and social changes will also result in new and unclear demands or definitions for the individual hospital nurse (Bennis, 1961).

Role clarity could be operationalized in two ways: objective and subjective. Objective role clarity refers to the restriction of the relevant information or the variation of the quality of the information. Subjective role clarity is more related to the feeling of having as much of the role-relevant information that a person would like to have. Raven and Rietsema (1957) found that the clarity of goals and paths is associated with greater satisfaction with the tasks.

Halamka (2016), in the report *2016 Predictions for Health IT*, mentioned that the workflow of health information technology applications will be redefined. He made an example of the current clinician duties while working with the electronic health records (EHR), dealing with how the clinician can enter 200 structured data elements, manage 140 quality measures, maintain eye contact with patients, and be empathic in only 12 minutes. He said that the workflow of EHRs need to be revised in 2016.

This study developed a task structure with a 5-item scale that measures what is expected from nurses, workflow change, work process change within the work unit, overlapping of the duties between different medical staff, and not fitting the EMR with the existing work process within nurses' work units.

Professional Autonomy

Wade (1999) defined professional nurse autonomy "as belief in the centrality of the client when making responsible discretionary decisions, both independently and interdependently that reflect advocacy for the client" (p. 310). Hall (1968) described work autonomy as a worker's freedom to make decisions based on job requirements. Kipfer (1993) declared that autonomy is equal to independence, freedom, self-determination, and self-government at work. Professional autonomy is an integrated part of healthcare providers and is essential for the quality of their job. Skar (2010) defined autonomy as the "nurses should have sufficient knowledge, power and authority to make a difference in what may happen to the patient" (p. 2227).

Losing professional autonomy is one of the most important cultural barriers of implementing health information technology. Levenson, Dewar, and Shepherd (2008) identified threats to autonomy as an unintended consequence of new information

technologies in healthcare. The healthcare professionals' autonomy should not interfere with others' autonomy, so cooperation with other healthcare professionals needs to be organized adequately. It is important to understand autonomy to clarify and develop the nursing profession in rapidly changing healthcare environments (Skar, 2010). The author described that autonomy depends on certain conditions, "such as the ability to make independent choices, freedom from coercion, rational and reflective thought and adequate information and knowledge" (Skar, 2010, p. 2226). Rapid changes of healthcare environments make nursing practice more diverse; therefore, development of nurse autonomy will depend more on specialized workplace settings than on generic professional capabilities (Skar, 2010). Mantzoukas and Watkinson (2007) explained that the diversity in nursing roles has an impact on professional autonomy. To offer high quality nursing to patients, nurses need to have professional autonomy based on their ability to criticize or analyze their experiences. Although some parts of nursing practices are interdependent with other healthcare staff, hierarchical structures and specific role responsibilities can affect nurses' freedom to make decisions about patient care (Willard, 1996).

Nurses need to make decisions and use the clinical judgments in patient care based on their own knowledge base (Freidson, 2001); however, implementing the new EMR systems at their work may limit this ability and reduce their professional autonomy. Therefore, nursing professional autonomy is one of the main factors that could contribute to the nurses' perception of performance and satisfaction with EMR that are measured in this study. Performance can be limited in a new setting while nurses' therapeutic acts are personal and portable features of their' self-understanding as nurses (Arbon, 2004).

Result Observability

Rogers (1995) defined result observability in the diffusion of innovation theory as the degree to which the results of an innovation (new idea, product, etc.) are visible to others. The results of some products, applications, etc, are easily observed and communicated to some people, whereas some innovations and ideas are either difficult to observe or to describe to others. Based on Rogers (1995) theory, a goal of this study is to determine the relationship between the result observability of the new IT application/device (s) among nurses and the perception of their performance. Rogers (1995) explained that results and advantages of some products or innovation are tangible, and individuals can easily find them. He used an example of computer hardware in which the physical product is more tangible and its benefits are easy to see. However, it is often more difficult to see the tangible results of computer software, and as a result, the adoption and adaptation of software is less than that of hardware.

For adapting the new IT applications in the healthcare, it is important for adopters to see the result of these applications. Therefore, this study focuses on result observability and its impact on the nurses' perception of performance and satisfaction. Moreover, this study measures result observability with four items, including the tangible benefits of EMR, awareness of EMR objectives at work, recognition of the positive impact of EMR on the quality of patient care, and improvement of the chances of being promoted by using EMR.

Perceived Barriers

There are barriers and difficulties in adapting and working with the new IT application/device(s) such as technical support, workload, time consumption, and training. These impact the performance of nurses while they are working with them. Training is one of

the main factors in adapting HIT applications (Tan & Lewis, 2010; Meade, Buckley, & Boland, 2009; Granlien, Hertzum, & Gudmundsen, 2008). Flynn, Gregory, Makki, and Gabbay (2009) described that training has a positive effect on staff's HIT applications adaptation and that adding financial incentives could increase the quality of training and encourage staff to learn the proper skills faster and operate the HIT applications. Hayward-Rowse and Whittle (2006) showed that poor training is a barrier that affects the nursing community when they want to operate the HIT applications. Based on the research by MacFarlane, Murphy and Clerkin (2006), good training and skill development, an appropriate implementation change in workflow, and good technical support could lead to the successful implementation of HIT applications. According to Lluch (2011), technical "support has been identified as a catalyzer for the HIT uptake and the lack of it as a barrier" (p. 855). MacFarlane et al. (2006) mentioned that when technical support fails, frustration, and low use of technologies may happen. Support is not only technical, it also involves management and colleagues' support. Based on the research by MacFarlane et al. (2006), support by management and colleagues can help to integrate HIT in healthcare professionals' daily practice, their professional role, and service delivery.

There are studies that focused on the time-consuming process of learning a new technology (Bossen, 2007). Based on clinicians' perceptions, clinical activities take more time to complete after implementing the new IT applications. However, the time and motion analysis by Korst, Eusebio-Angeja, Chamorro, Aydin, and Gregory (2005) and Wong et al. (2003) showed that if the staff were proficient with the system, the time taken for documentation would decrease slightly.

When a new application is implemented, organizational members need to learn something new and possibly complex and meanwhile displace what they already knew. Staff have to deal with the knowledge barrier related to the new application and the organizational changes after the application implementation (Robey, Ross, & Boudreau, 2002). However, it is not easy to overcome these barriers, even with formal training, because different users may not acquire the essential knowledge to work effectively or their learning pace may be very slow (Robey, Ross, & Boudreau, 2002). On the other hand, there may be a conflict between the old system and new knowledge; therefore, the ways that nurses deal with the requirements of new systems may not be completely correct and effective. Robey, Ross, and Boudreau (2002) described the misalignments in new software implementation due to the conflict between structures embedded in the software and structures embedded in the organization. Also, there may be conflicts between the characteristics of the new software and the work of software users. In Robey, Ross, and Boudreau's (2002) case study concerning enterprise resource planning (ERP), they found that the primary obstacle of ERP implementation was the firm's knowledge of existing systems and business processes. In fact, "organizational memory" was the main obstacle to acquiring new knowledge.

This study measures the perceived barriers with six items: the complexity of EMR, difficulty in learning how to work with EMR, availability of technical support, sufficient training, sufficient time to learn, and capacity of workload.

Privacy and Security Anxiety

Lost or stolen protected health information (PHI) may cost the U.S. healthcare industry up to $7 billion USD annually (Agaku, 2014), and also data breaches can impact patients and healthcare organizations dramatically. Additionally, it may be difficult to protect

and provide security for new technologies, such as mobile devices and file sharing applications, and by growing the reliance on these technologies, the vulnerability of patients' PHI to malicious intrusions may increase (Agaku, 2014). To decrease the risk of unauthorized health data disclosure, the Health Insurance Portability and Accountability Act (HIPAA) sets some rules to prohibit the access of unauthorized users to disclose the PHI.

Accessing high-quality information in a complex healthcare information infrastructure is needed for informed decision-making. Also, all participants in a new system, such as patients, health alliances, and a national health board, must have confidence about the protection of private information (Gostin et al., 1993). Although American society values individual rights and the protection of private information, concerns about privacy go beyond healthcare settings (Harris, & Westin, 1990). Since the collection, storage, and dissemination of information have become more automated, the public's fear and distrust of technology and bureaucracy have increased (Goldberg, 1992). Furthermore, as the U.S. healthcare systems' size, scope, and integration have increased, the vulnerability of the healthcare information also increased (Gostin et al., 1993). The privacy and security goals of the new automated healthcare system were investigated in the Gostin et al. (1993) study. According to their study, the goals are integrity, availability, and privacy of healthcare data so that information is accurate, complete, and trustworthy. Gostin et al. (1993) defined privacy, confidentiality, and security in their study as "privacy is the right of an individual to limit access by others to some aspect of the person," confidentiality "is a form of informational privacy characterized by a special relationship, such as the physician-patient relationship," and security is "a set of technical and administrative procedures designed to protect data systems against unwarranted disclosure, modification, or destruction and to safeguard the systems itself" (p. 2487).

Ludwick and Doucette (2009) explained that a new implementation could be a source of anxiety and aggravation for the staff. There are different causes of anxiety for healthcare providers, especially when they have to work with new IT application/devices. Since they are not usually highly skilled with computer systems, they may feel anxious about violating HIPAA privacy rules or losing patient data. Healthcare providers are afraid to depend on computer systems or are anxious that the new IT applications diminish their control for decision making (Garg et al., 2005). On the other hand, their level of accountability in doing order entry is increased, and this can cause anxiety (Gryfe, 2006). They are also worried about the effect of health information technology on their relationship with their patients.

The freedom of nurses while using EMR applications and their ability to find their own solution using these applications will be measured in this study.

Communication (Social) Patterns

Coiera et al. (2004) noted that communication patterns among staff and between healthcare provider and patients will be changed after the implementation of HIT, so the integrated design framework will be needed to evaluate health information technologies. According to Leape and Berwick (2005), one of the most common causes of adverse events for hospitalized patients is poor communication between physicians and nurses. There are many information technology devices available— such as EMR, email, and pagers—for digital communications between nurses and physicians. While nurses and physicians are rapidly adopting communication technologies, there is evidence that these technologies contribute to more communication difficulties (Sutcliffe, Lewton, & Rosenthal, 2004). Therefore, to achieve better communication and safer care, it is necessary to investigate how communication technology is being used in healthcare (Chiasson, Reddy, Kaplan, &

Davidson, 2007). Forland (2007) described how the routines of healthcare providers changed after interacting with HIT systems. Face-to-face interaction is replaced with virtual interaction. Before implementing new communication technologies, physicians and nurses would have discussions with a patient face-to-face at the point of care delivery. However, after adopting these technologies, nurses and physicians are often separated by location and time and use different technologies to have their discussions (Ash, Berg, & Coiera, 2004). One issue that may occur when the communication method changes is message ambiguity; this can cause difficulty in discussing patients' situations (Fiore et al., 2010).

Shortliffe (2005) emphasized clinicians' fears of working with IT applications. They are worried about the cultural change and how the diffusion of HIT can depersonalize healthcare. Finch, Mair and May (2007a) mentioned that the routine provision of telemedicine in UK remains limited due to the new ways of working with these applications. Flynn et al. (2009) also focused on information exchange and the concerns of healthcare professionals about changing their relationship with their patients.

Interestingly, there are some studies that support the new ways of communication between patients and healthcare staff. When the staff wants to enter the patient's information, a conversation breakpoint will happen during the interview, and this may allow the patient to think about the interview and add more detail (Doebbeling, Chou, & Tierney, 2006; McGrath, Arar, & Pugh, 2007). One study mentioned that healthcare providers can show patients their own records, and this may enhance the physicians' ability to communicate with them (McGrath et al., 2007). Also, based on this study, patients did not show signs of boredom or frustration while physicians attended to the system.

On the other hand, Reddy (2015) found that patients are unhappy when their doctors spend too much time looking at the computer monitor instead of looking at them. Reddy (2015) found that lack of eye contact is the biggest problem in working with the IT applications, because eye contact leads to trust and bonding with patients.

The communication pattern difficulties will be measured with six items in this study: more online communication among co-workers, spending more time with EMR in comparison with face-to-face communication, number of misunderstandings, spending time looking at the monitor, giving more information about patient, and patients' feelings about EMR.

Personality Factors

Most of the time, personality tests are done to determine the traits or factors that explain human behavior. Cattell (1956) explained that psychologists try to understand the traits or factors that result in predictable behavior or in understanding the ways in which a person feels, acts, or thinks that may cause his/her uniqueness. The first personality tests were developed in 1920 to facilitate hiring employees in the armed forces. However, many different personality tests have since been developed such as Big Five factor, Myers Briggs Type Indicator (MBTI), Minnesota Multiphasic Personality Inventory (MMPI), California Psychological Inventory (CPI), Neo Personality Inventory – Revised (NEO PI-R), Constructive Thinking Inventory (CTI), Washington Psychosocial Seizure Inventory (WPSI), Ten-Item Personality Inventory-(TIPI), and 16 Personality Factors (16PF).

The personality scale utilized within this current study (adapted from 16 personality factors) was developed by Cattell in 1940. 16PF measures sixteen primary traits as well as a version of the Big Five secondary traits. The 16PF is a well-known personality test, which is

available in over 25 languages and is practical for measuring normal personalities. Cattell categorized data from three different information sources: L-data (life record and life observation data), Q-data (questionnaire data and personal self-descriptive data), and T-data (objective measurement of behavior often collected in laboratory settings, experimental situations, or projective tests). The 16PF was standardized in 2000 for a population of over 10,000 people. The latest version of 16 primary traits are warmth (A), reasoning (B), emotional stability (C), dominance (E), liveliness (F), rule-consciousness (G), social boldness (H), sensitivity (I), vigilance (L), abstractedness (M), privateness (N), apprehension (O), openness to change (Q1), self-reliance (Q2), perfectionism (Q3), and tension (Q4). The 16PF test can be scaled upwards to create five second order global traits: extraversion, anxiety, tough-mindedness, independence, and self-control (Samuel, 2007). The focus of this study is to find the most influential personality factors that have an impact on the adaptation of the new technology, and as a result, affect the perception of the performance and satisfaction of nurses after the new health IT application implementation. After reviewing different types of personality inventories and analyzing items that each of them measure, the modified 16PF was chosen for measuring openness to change, apprehension, self-reliance, and perfectionism characteristics in each nurse.

Performance and Satisfaction

One of the most universal definitions of work performance is from Campbell, McHenry, and Wise (1990), who describe it as behaviors or actions that are relevant to the goals of organizations. Koopmans et al. (2011) explained that, based on Campbell's definition, work performance is more about behaviors, not results. Those behaviors are linked to the organization's goals, and work performance is a multidimensional concept.

Viswesvaran and Ones (2000) defined work performance as "scalable actions, behavior and outcomes that employees engage in or bring about that are linked with and contribute to organizational goals" (p. 216). Murphy and Kroeker (1988) defined the domain for individual work performance. Based on their model, work performance has four dimensions: task behaviors, interpersonal behaviors (communicating with others), downtime behaviors (work-avoidance), and destructive/ hazardous behaviors. Campbell's (1990) work performance definition has eight dimensions: job-specific task proficiency, non–job-specific task proficiency, written and oral communications, demonstrating effort, maintaining personal discipline, facilitating peer and team performance, supervision, and management and administration. Koopmans et al. (2011) mentioned that task performance and contextual performance are the most important dimensions in individual performance. They explained task performance as a behavior that contributes to the organization's goals and contextual performance as a behavior that supports organizational, social, and psychological environment of the organization. Therefore, this study will investigate the impact of organizational, social, and personal factors on the performance of nurses after the implementation of the new health IT applications.

Zadvinskis, Chipps, and Yen (2014) explained that the new health IT applications can promote efficiency and task achievement for nurses but may also decrease their performance. For example, nurses can increase their accuracy and thoroughness, do the real-time charting, and streamline processes with the barcode medication administration systems (BCMA) and electronic health records (EHR). On the other hand, these new technologies can decrease the nurses' perception of their performance when they require extra steps or hinder the nurses' ability to finish their tasks. Some of the examples of efficiency reduction from the nurses'

point of view are inflexibility of EHR, login problems, reprinting labels, missing medication, reordering lab tests, and time restrictions for entering the patient's physical assessment after the scheduled time block (Zadvinskis et al., 2014). Furthermore, nurses perceive the quality of care through the new health IT applications in different ways. In their opinion, the IT applications can affect the quality of care in both good and bad ways. It can reduce errors and improve patient satisfaction, but it also makes patient services slower, causes delay or missed care, interrupts sleep, results in less nursing time at the bedside, and extends disruption during family visitation.

Job Performance and Job Satisfaction Relationship

Many studies since the 1970s have focused on the relationship of satisfied employees and production. Although there is not enough empirical support for the idea that job satisfaction has an impact on performance, Lawler and Porter (1976) studied the effect of job performance on job satisfaction. Brown and Peterson (1993) mentioned that job performance, personal characteristics, role perceptions, and organizational factors could have an impact on job satisfaction. Locke (1969) defined job satisfaction as a "pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences" (p. 485). Berghe and Hyung (2011) explained that job satisfaction is related to how our personal expectations of work are consistent with the actual outcome. This study will examine nurses' perception of their performance while they are working with EMR and also their satisfaction using EMR.

Meaningful Use

Piscotty, Kalisch, and Gracey-Thomas (2015) explained that meaningful use of healthcare information technology (HIT) is a concept that shows how to receive complete

reimbursement from both Medicare and Medicaid. As an objective of meaningful use, Madison and Staggers (2011) referred to quality and safety assurance while providing and improving healthcare communication and management. Bove and Jesse (2010) mentioned that, based on meaningful use requirements, EHR would face difficulties in acceptance and delivery of care to patients. Murphy (2010) defined meaningful use as "Using electronic health records (EHR) technology to improve quality, safety, efficiency and reduce health disparities; engage patients and family; improve care and coordination, and population and public health; and maintain privacy and security of patient health information" (p. 284). The Centers for Medicare and Medicaid Services (CMS) administers the Medicare and Medicaid EHR Incentive Programs to encourage healthcare professional to use health information technology applications (especially EHR) more. Also, CMS set some criteria and goals as a roadmap for effectively using EHR. EHR is an example of health IT applications and its roadmap could be useful for other applications as well. Meaningful use has three stages: the first stage, 2011–2012, is application adoption and data gathering; the second stage, 2014, is care coordination and exchange of patient information, and the third stage, 2016, is healthcare outcome improvement. Due to the delay in implementing the new IT application, these stages changed, and by 2014, the healthcare staff should have achieved the following 13 goals:

1. use Computerized provider order entry (CPOE) for medication orders;
2. implement drug-drug and drug-allergy interaction checks;
3. maintain an up-to-date problem list of current and active diagnoses;
4. generate and transmit permissible prescriptions electronically (eRx);
5. maintain active medication list;

6. maintain active medication allergy list;
7. record all of the following demographics: (A) Preferred language (B) Gender (C) Race (D) Ethnicity (E) Date of birth;
8. record and chart changes in the following vital signs: (A) Height (B) Weight (C) Blood pressure (D) Calculate and display body mass index (BMI) (E) Plot and display growth charts for children 2–20 years, including BMI;
9. record smoking status for patients 13 years old or older;
10. implement one clinical decision support rule relevant to specialty or high clinical priority along with the ability to track compliance with that rule;
11. provide patients with an electronic copy of their health information (including diagnostic test results, problem list, medication lists, medication allergies) upon request;
12. provide clinical summaries for patients for each office visit;
13. protect electronic health information created (Centers for Medicare and Medicaid Services, 2012).

Summary

This chapter reviewed the relevant literature of information technology in healthcare, the challenges experienced by nurses working with these applications and their perception of performance and satisfaction with EMR. The literature that contributed to the organizational factors and their relation in the healthcare industry were also reviewed in this chapter. There was not, however, any literature regarding the impact of personality factors on the adaptation of EMR among nurses and their perception of performance and satisfaction with EMR. Determining how personality factors impact the perception of performance and satisfaction

in this study will be a valuable contributor to the literature in the field. Also, the communication patterns literature did not emphasize the same items upon which this study focuses. The results of this scale could be a useful addition to the literature.

Chapter 3. Methodology

This chapter will discuss the research method, population, sample, and demographic results. Gender, age, degree, years of experience as an RN, years of experience working with EMR, hospital names, and the type of EMR that they are using is included in the descriptive analysis of the sample. This chapter will also describe the instrument's (scale) measurement, reliability, data collection, data analysis, and the human subject approval.

Research Design

This study used cross sectional methodology. Cross-sectional is a subset of survey research methodology in the quantitative strategy category (Creswell, 2013). The main focus of this study was to examine the strength of relationships between multiple independent variables and the nurses' perception of performance and satisfaction. This study investigated the extent to which differences in task structure, professional autonomy, result observability, perceived barriers, privacy and security anxiety, and communication patterns are related to differences in the nurses' perceptions of the impact of IT applications on their performance.

Population and Sample

A convenience, non-probability-based sampling method was used in this research (Creswell, 2013). The sample comprised registered nurses who are enrolled in the nursing program at one of the mid-size public universities in southeast Michigan. Most nurses in this study work at four different hospitals in southeast Michigan. Hospitals were ranked based on the number of nurses who participated in this study and are working in those four hospitals.

There are first, second, third, and fourth ranked hospitals in this study, and their moderator effect will be measured in Chapter 4. Thirty-five nurses worked in the first rank; 19 nurses worked in the second; likewise, 12 nurses worked in the third rank; and 11 worked in the fourth rank.

All selected nurses in this study are registered nurses and are working in hospitals or health facilities. All of the sample members are in a RN+BSN or Master of nursing program and were registered in the Winter 2016 term. The target population of this study was the students who were registered in face-to-face classes in Winter 2016 because the survey was paper-based. However, with the recommendation of the chair of the nursing department and discussion with the dissertation advisor, the survey was also sent to the online student. A total of 179 students were registered in face-to-face classes and 293 were registered in the online classes.

Response Rate

Out of 179 face-to-face registered students in different classes, 119 of them were accessible. The professors in the other classes did not give permission to access their students. Also, out of 119 students that met in a classroom, 91 of them were present and filled out the paper-based survey and the rest of them were absent. Therefore, the response rate for face-to-face classes was 100%. The online survey was sent to 293 online students and 24 of them responded, this is almost an 8.2% response rate. The total sample is 115 for this study.

Descriptive Sample Information

Table 1 shows the sample demographic information; this includes gender, age, degree, hospitals, job title, EMR applications, years of experience as an RN, and years of

experience with EMR. Most of the sample members are female (85.2%); the male population is 14.8%. Nurses' ages are between 24–58 and the average age is 38.75 years old. Most of the enrolled students are in the RN+BSN program; only 20.9% are in the master's program. The majority of nurses work in Hospital 1 (30.4%), 16.5% in Hospital 2, 10.4% in Hospital 3, and 9.6% in Hospital 4. There are 21 other hospitals and healthcare facilities; 35 sample members work in those facilities; however, the number of sample members in other hospitals is not statistically significant enough to test their moderating effect on the independent and dependent relationships. The four most commonly used EMR applications that nurses are using in their hospitals are MiChart (56.5%), Cerner PowerChart (12.2%), Point Click Care (7%), and CIS PowerChart (3.5%). The nurses' years of experience varied from less than one year up to 30 years. Their experience with EMR, however, ranges from less than one year to the maximum of 17 years.

Table 1

Descriptive Sample Information

Demographic		Frequency	Percent
Gender	Female	98	85.2
	Male	17	14.8
	Missing	0	0
Age	24-38	54	47.0
	39-58	59	51.3
	Missing	2	1.7
Degree	Masters	24	20.9
	RN+BSN	91	79.1
	Missing	0	0
Hospitals	Hospital 1	35	30.4
	Hospital 2	19	16.5
	Hospital 3	12	10.4
	Hospital 4	11	9.6
	Others	35	30.5
	Missing	3	2.6
Job Title	RN	74	65.5
	Staff Nurse	14	12.2
	Others	23	20.6
	Missing	2	1.7
EMR App	MiChart	65	56.5
	Cerner PowerChart	14	12.2
	Point Click Care	8	7.0
	CIS PowerChart	4	3.5
	Others	22	23.4
	Missing	1	0.9
Years of Experience as RN	0.75 – 9 years	70	60.9
	9.33 – 30 years	43	37.4
	Missing	2	1.7
Years of Experience With EMR	0.75 – 5 years	72	62.6
	6 – 17 years	35	30.4
	Missing	8	7

Descriptive Information of Personality Types

This study examined the four different personality types, openness, apprehension, self-Confidence, and perfectionism, as moderator variables. It also examined age, years of experience as an RN, years of experience working with EMR, different hospitals, and different EMR applications. The personality types scales were recoded as a “high” and “low”

measurement. For categorizing the scales to high and low, the mean of that scale was measured (see Appendix A for the descriptive statistics of personality type).

Based on the recoded data for the openness, 54.8% of the sample has the higher level of openness and 43.5% has the lower level of openness. Also, 65.2% of nurses have a higher rate of apprehension and 34.5% have a lower rate of apprehension. More than half of the sample, 50.4%, have a lower self confidence in comparison with the 47.8% of the sample that have a higher level of self-confidence. Interestingly, 63 (54.8%) out of 115 nurses have a higher perfectionism, and 52 people (45.2%) have a lower perfectionism. In summary, the sample of this study has the higher openness, apprehension, and perfectionism, and lower self-confidence, which is remarkable.

Instruments and Measurements

The survey included these different sections: demographic, organizational, social, personality, perception of performance, and satisfaction of working with EMR (see Appendix B for the survey questions). The demographic section contained eight questions about, gender, age, degree, job title, name of the hospital, years of experience, and the EMR application name. The organizational section involved five different subsections: result observability, perceived barriers, professional autonomy, privacy and security anxiety, and task structure. This section had 22 questions. The social section contained six questions. The personality types included four different types, openness, apprehension, self-confidence, and perfectionism. Each personality type had five questions. The perception of performance of working with the EMR section had six questions, and the section of EMR satisfaction had four questions. At the end of the survey, nurses were asked to rate their overall performance and satisfaction working with EMR applications.

Instrument Validity

The validity of the instruments was examined by content validity. After extensive literature review and consulting with experts in the field, the main scales for organizational, social, and personality factors in this study were designed. Two experts from the School of Nursing and two experts from the College of Technology at the mid-size public university in southeast Michigan reviewed the questionnaire and gave their professional opinions. Furthermore, the Gagnon et al. (2003) study provided a comprehensive viewpoint and applicable guide to develop the scales.

Construct validity is an appropriate method in the social sciences and psychology (Westen and Rosenthal, 2003). The convergent and discriminant validity as subtypes of construct validity were run in this study. One of the methods to evaluate a construct validity is through structural equation modeling (SEM) (Westen and Rosenthal, 2003). A SEM determined in this study with SmartPLS software; the results of discriminant validity for the main variables are shown in Tables 2 and 3. As was expected, the convergent correlations between similar constructs are higher, and the discriminant correlations between dissimilar constructs are lower.

Table 2

Organizational and Social Scales Convergent-Discriminant Validity

	Autonomy	**Barrier**	**Performance**	**Privacy**	**Result**	**Satisfaction**	**Social**	**Task**
Autonomy	0.901							
Barrier	0.483	0.664						
Performance	0.547	0.468	0.828					
Privacy	0.141	0.366	0.179	0.847				
Result	0.290	0.322	0.361	-0.013	0.739			
Satisfaction	0.398	0.611	0.529	0.211	0.320	0.892		
Social	0.548	0.557	0.532	0.245	0.373	0.674	0.690	
Task	0.553	0.623	0.429	0.299	0.204	0.565	0.612	0.647

Table 3

Personality Scales Convergent-Discriminant Validity

	Apprehension	Openness	Perfectionism	Performance	Satisfaction	Self-Confidence
Apprehension	1.000					
Openness	0.460	1.000				
Perfectionism	0.032	-0.104	1.000			
Performance	0.117	0.334	0.235	1.000		
Satisfaction	0.234	0.247	0.203	0.514	1.000	
Self-Confidence	0.491	0.338	0.333	0.322	0.177	1.000

Independent Variable: Organizational Scale

Result Observability

The result observability scale in this study was intended to measure the tangible result and objective of the work. It included four items based on a 5-point Likert scale and five anchors (1=strongly disagree to 5=strongly agree). When nurses see more tangible benefits, the scale values are more positive ("more tangible benefits"); if they see fewer tangible benefits, the direction tends be negative ("fewer tangible benefits").

After running the Cronbach's alpha test, it was revealed that Question 4, "If I received a financial incentive to use EMR, it would influence my perception of its effectiveness," reduced the reliability of the scale. Cronbach's alpha was 0.424 before removing Question 4. Besides, Question 5, "I believe the EMR at work improve my chances of getting promotion," seemed to be more relevant to the result observability scale, so it was added. For testing the scale normality, skewness and kurtosis tests were run; the results were

not acceptable. For accepting the result of normality test, the quotient of skewness and its standard error and also the quotient of kurtosis and its standard error should be within ±2.58 ranges. The composite reliability test was also run with SmaprtPLS software. It confirmed the scale reliability. The scale reliability and normality tests are presented in Table 4.

Table 4

Result Observability Scale Normality and Reliability Result

N	Valid	114
	Missing	1
Skewness		-0.720
Std. Error of Skewness		0.226
Kurtosis		1.679
Std. Error of Kurtosis		0.449
Cronbach's Alpha		**0.718**
Number of Items		4
Composite Reliability		**0.826**

Professional Autonomy

The professional autonomy scale in this study was intended to measure the freedom, ability, and flexibility of doing assigned tasks. It included two items based on a 5-point Likert scale and five anchors (1=strongly disagree to 5=strongly agree). The negative direction referred to "less freedom" and the positive direction of the scale was defined as "more freedom."

Question 5 was not related to the professional autonomy and was related more to result observability, so scale reliability was measured without Question 5. The results of skewness and kurtosis tests were acceptable. The scale reliability and normality tests are

presented in Table 5. The composite reliability and Cronbach's alpha showed a satisfactory scale reliability.

Table 5

Professional Autonomy Scale Normality and Reliability Result

N	Valid	115
	Missing	0
Skewness		-0.092
Std. Error of Skewness		0.226
Kurtosis		-0.656
Std. Error of Kurtosis		0.447
Cronbach's Alpha		**0.761**
Number of Items		2
Composite Reliability		**0.897**

Perceived Barriers

The perceived barriers scale was intended to measure the technical and non-technical difficulties and ease of use of the new IT applications/devices. It included seven items based on 5-point Likert scale and five anchors (1=strongly disagree to 5=strongly agree). The negative direction referred to "more barriers" and the positive direction of the scale was defined as "fewer barriers."

More Barriers **(-)** ← **Perceived Barrier** → Fewer Barriers **(+)**

The results of normality tests and scale reliability are shown in Table 6. Cronbach's alpha is quite high, and the composite reliability is acceptable. The data is approximately symmetric and it has a positive kurtosis distribution.

Table 6

Perceived Barrier Scale Normality and Reliability Result

N	Valid	114
	Missing	1
Skewness		-0.577
Std. Error of Skewness		0.226
Kurtosis		1.994
Std. Error of Kurtosis		0.449
Cronbach's Alpha		**0.738**
Number of Items		7
Composite Reliability		**0.826**

Task Structure

The task structure scale in this study was intended to measure task clarification, task description, workflow, and task boundaries. It included five items based on 5-point Likert scale and five anchors (1=strongly disagree to 5=strongly agree). This scale was related to the change of workflow and work process after the implementation of EMR and how nurses deal with the work process change at their job. A negative direction means that the perception of the task becomes harder; a positive direction means that the perception of the task becomes easier.

A problem happened in the online data collection process, namely, question 19 was mistakenly removed from the online survey; therefore, the number of responses for this question was reduced to 91 (only paper-based results). Since the reliability for this scale is questionable, and the inter-correlation between different items is not very significant, it will be shown in the next chapter that since this scale does not significantly contribute to the final

model of this study, it needs to be removed. Table 7 shows the results of normality and scale reliability tests for the task structure scale.

Table 7

Task Structure Scale Normality and Reliability Result

N	Valid	91
	Missing	24
Skewness		-0.431
Std. Error of Skewness		0.253
Kurtosis		0.409
Std. Error of Kurtosis		0.500
Cronbach's Alpha		**0.593**
Number of Items		5
Composite Reliability		**0.699**

Privacy and Security Anxiety

The privacy and security anxiety scale in this study was intended to measure the anxiety and stress of losing data while using the new IT applications/devices. It included three items based on a 5-point Likert scale and five anchors (1=strongly disagree to 5=strongly agree). In the negative side of the scale, the anxiety and concern would increase, while in the positive side of the scale, the anxiety and concern would decrease.

Cronbach's alpha for this scale was questionable, and the composite reliability was reasonable. The results of the scale reliability and normality tests are shown in Table 8.

Table 8

Privacy and Anxiety Scale Normality and Reliability Result

N	Valid	114
	Missing	1
Skewness		-0.346
Std. Error of Skewness		0.226
Kurtosis		0.118
Std. Error of Kurtosis		0.449
Cronbach's Alpha		**0.565**
Number of Items		3
Composite Reliability		**0.741**

Independent Variable: Communication Patterns

The communication patterns scale in this study was intended to measure the communication patterns among healthcare providers and patients while using the new IT applications/devices. It included six items based on 5-point Likert scale and five anchors (1=strongly disagree to 5=strongly agree). Negative values implied decreased quality of communication, whereas positive values implied improved quality.

After running Cronbach's alpha and the correlation tests, it was found that question 23 is not highly correlated with the other items in the scale; removing it from the scale would increase the scale reliability. The communication patterns scale had a good reliability coefficient. The results of scale reliability and normality tests are shown in Table 9.

Table 9

Social Patterns Scale Normality and Reliability Result

N	Valid	111
	Missing	4
Skewness		-0.057
Std. Error of Skewness		0.229
Kurtosis		0.385
Std. Error of Kurtosis		0.455
Cronbach's Alpha		**0.728**
Number of Items		5
Composite Reliability		**0.817**

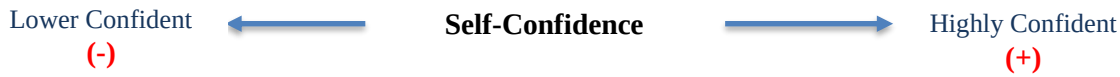
Moderator Variable: Personality Factors

The personality scale was adapted from 16PF that, in turn, was developed by Cattell in 1940. The 16PF measures 16 primary trait constructs, as well as a version of the Big Five secondary traits. The 16PF has 185 multiple-choice items for which the possible answers are yes, no, and I don't know. Based on a 3-point Likert scale, each item is either 0, 1, and 2. The test-retest average reliabilities for the 16PF scale in previous studies was 0.80 over a two-week interval (ranging from 0.69 to 0.87) and 0.70 over a two-month interval (ranging from 0.56 to 0.79). The construct validity of this scale is supported by factor analysis through different studies such as H.E. Cattell (1996), Cattell et al. (1970), Cattell and Krug (1986), Chernyshenko et al. (2001), Conn and Rieke (1994), Hofer et al. (1997), Krug and Johns (1986). The internal scale consistency is measured by Cronbach's alpha coefficient. Values range from 0.64 (Openness to Change, Factor Q1) to 0.85 (Social Boldness, Factor H), with an average of 0.74. (ED4013). The modified 16PF scale was used in this study; of the 16 personality types, only the four most related to this study were measured. The modified scale included Openness to Change, Apprehension, Self-Confidence, and Perfectionism. Each of

these types had five questions based on 5-point Likert scale and five anchors (1=strongly disagree to 5=strongly agree). The following figures show the direction of four different scales of personality types. The openness scale varied between negative, "don't like change," to the positive, "like change."

Apprehension ranged between "more fear" and "low fear/worry."

The self-confidence scale was between "lower confident" and "highly confident.



The perfectionism scale was between "low perfectionism" and "high perfectionism."

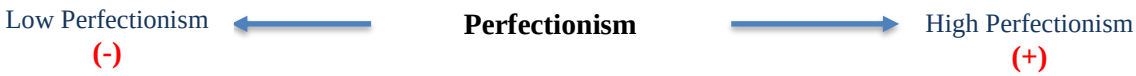


Table 10 shows that the results of personality types reliability were acceptable for the openness and apprehension scales; it was questionable for self-confidence and perfectionism, although the composite reliability was good enough for the self-confidence and perfectionism. The normality tests (skewness and kurtosis) were acceptable in all cases except openness scale.

Table 10

Personality Factors Scale Reliability and Normality Result

Personality Types		**Openness**	**Apprehension**	**Self-Confidence**	**Perfectionism**
N	Valid	113	115	113	115
	Missing	2	0	2	0
Skewness		-0.701	-0.539	0.393	-0.298
Std. Error of Skewness		0.227	0.226	0.227	0.226
Kurtosis		1.388	0.536	-0.018	0.293
Std. Error of Kurtosis		0.451	0.447	0.451	0.447
Cronbach's Alpha		**0.961**	**0.786**	**0.587**	**0.697**
Number of Items		5	5	5	5
Composite Reliability		**0.532**	**0.824**	**0.701**	**0.817**

Dependent Variables

Perception of EMR Performance

The perception of EMR performance scale was designed to measure the perception of the effectiveness of IT applications/devices on the nurses' performance in this study. It included six items based on 5-point Likert scale and five anchors (1=strongly disagree to 5=strongly agree). There was also a single question that asked about the overall rating of perception of performance. The question about the overall performance of nurses was whether the IT applications/devices improves his/her task performance or not. The scale ranged between "bad performance" and "good performance."

This scale had a solid reliability and non-acceptable normality ranges. The Table 11 shows the normality and reliability scores.

Table 11

Perception of Performance Scale Normality and Reliability Scale

N	Valid	113
	Missing	2
Skewness		-1.210
Std. Error of Skewness		0.227
Kurtosis		4.105
Std. Error of Kurtosis		-1.210
Cronbach's Alpha		**0.893**
Number of Items		6
Composite Reliability		**0.928**

EMR Satisfaction

The EMR satisfaction scale was designed to measure the perception of the satisfaction of nurses while working with EMR at their job. It included four items based on 5-point Likert scale and five anchors (1=strongly disagree to 5=strongly agree). Moreover, there was a single question about the overall rating of EMR satisfaction, as nurses are happy and satisfied when they are working with EMR. The direction of the scale was between "dissatisfied" and "satisfied."

The composite and Cronbach's alpha coefficient reliabilities for this scale were meaningful. The reliability and normality information is shown in Table 12.

Table 12

Satisfaction Scale Normality and Reliability Scale

N	Valid	115
	Missing	0
Skewness		-0.686
Std. Error of Skewness		0.226
Kurtosis		1.374
Std. Error of Kurtosis		0.447
Cronbach's Alpha		**0.914**
Number of Items		4
Composite Reliability		**0.940**

Data Collection

The tool for collecting data in this study was a paper-based questionnaire. The total number of questions was 60 plus 8 demographic questions. Nurses took 10–15 minutes to fill out the questionnaire.

The chair of the nursing department at one of the mid-sized public universities in southeast Michigan was the first one who took the survey and gave some useful recommendations. He sent an email to the faculty members who had classes in the Winter 2016 semester and asked for their permission on my behalf to go to their classes and distribute the survey. After that introductory email, the author had contact with the faculty directly and made an appointment to go to their classes. The classes were held in different hospitals in southeast Michigan. Participants were informed about the subject of the study and were allowed to ask any questions regarding the research. Their participation was voluntary, and they were offered a gift card, if they filled out the survey. Since the survey was anonymous, there was no fear of revealing the participants' identity. The data collection process took four weeks.

The chair of the nursing department also sent the online Survey Monkey link to the online RN+BSN students at the same university. The response rate was low, which was expected. The online students were also offered an electronic gift card. A sample survey is shown in Appendix B.

Data Analysis

Univariate and multivariate regression were utilized for analyzing quantitative data in this study to determine the strength and direction of the relationships between the factors: organizational, social, and personality factors, and the responses: perception of performance and the EMR satisfaction. Scale reliability was examined by the Cronbach's alpha and composite coefficients. Data normality was tested by skewness and kurtosis tests. Univariate regression models showed the positive and negative relationships between a single independent variable and dependent variable. Multivariate linear regression was used to build models for the perception of performance and the perception of EMR satisfaction. Furthermore, multivariate regression helped to discover the best predictors for the perception of performance and EMR satisfaction models; statistically-insignificant variables were not included in the models. All statistical procedures were performed using SPSS (Version 23). Composite reliability was determined using the SmartPLS package.

The collected data were recoded, and the missing data were filled with the "500" number. The moderating variables, age, personality factors, and years of experience, were recoded to the "high" and "low" categories. The mean of each moderating scale was calculated, and the scale was divided into two groups below the mean=low and above the mean=high. Then they were recoded again to the nominal data, low=1 and high=2.

Human Subjects

The registered nurses who were in the RN+BSN and Master programs at a mid-sized public school in southeast Michigan were the target sample in this study. This study was approved as exempt, low risk research by the University Human Subject Review Committee. The related document is provided in Appendix C. The consent form and the principal investigator's contact information were provided at the beginning of the survey. The participants had an opportunity to ask their questions.

Summary

Chapter 3 discussed the research method, population and sample, response rate, descriptive demographic information, and descriptive information about the moderating variables. The validity and reliability of the scales, data collection, and data analysis were described in this chapter. Almost all of the scales passed the reliability tests except the task structure. The results of hypothesis testing will be discussed in the next chapter.

Chapter 4. Results

This chapter will test hypotheses with single and multivariate linear regression and Spearman correlation. Furthermore, the moderating effects of personality types, age, years of experience as an RN, and years of experience working with EMR are also examined Most of the respondents work in four mid-large size hospitals in southeastern Michigan, so the four different hospitals and the four most commonly used EMR applications that they used are denoted as moderator variables.

Research Hypotheses

Hypothesis 1: There is a positive relationship between result observability and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

After running the single linear regression between result observability and perception of performance of nurses, it was observed that there is a positive relationship between the independent and dependent variables. The Beta (0.566) is strong and $p<0.1$ is significant. The result observability can explain 12.8% of variation in the dependent variable. Furthermore, for a unit of change in the result observability, the dependent variable will be changed by 0.566 unit. This means how much the nurses see that the tangible benefits of working with EMR, their performance perception will increase by 0.566 (see Table 13).

Table 13

Summary of Direct Relationship of Independent Variables and Dependent Variables

Independent Variables	Perception of Performance				Satisfaction			
	N	R^2	Unstandardized Beta	Sig	N	R^2	Unstandardized Beta	Sig
Result Observability	113	0.128	0.566	0.000	115	0.093	0.356	0.001
Professional Autonomy	113	0.303	1.428	0.000	115	0.160	0.762	0.000
Perceived Barriers	112	0.224	0.453	0.000	114	0.318	0.398	0.000
Task Structure	91	0.096	0.469	0.003	91	0.253	0.510	0.000
Privacy and Security Anxiety	112	0.132	0.835	0.000	114	0.113	0.546	0.000
Communication Patterns (Social)	110	0.247	0.623	0.000	111	0.449	0.619	0.000

The p-value (sig-value) for the result observability and satisfaction relationship is statistically significant. However, the predictor does not adequetly predict the dependent variable and only 9.3% of dependent variation can be explicated by the result observability. Result observability is the least effective variable that can predict the dependent variable (see Table 13).

***Hypothesis 1a*:** The four personality factors moderate the relationship strength between result observability and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

The personality factors have a moderator effect on the relationship between result observability and the nurses' perception of their performance in using IT applications in healthcare. However, lower levels of openness and apprehension increased the strength of result observability and the perception of the nurses' performance relationship (R^2: 0.216, Beta: 0.692, R^2: 0.194, Beta: 0.817 respectively). Furthermore lower apprehension had a strongest moderator effect on the relationship of result observability and the dependent variable (R^2: 0.194 Beta: 0.817). Table 14 encapsulates the result:

Table 14

Personality Types as Moderator Variables Between the Result Observability and the Perception of Performance Relationship

Result Observability	R^2	Beta	Sig
Openness low (n=49)	0.216	0.692	0.001
Openness High (n=62)	0.085	0.490	0.022
Apprehension low (n=39)	0.194	0.817	0.005
Apprehension High (n=74)	0.126	0.544	0.002
Self-Confidence low (n=57)	0.115	0.522	0.010
Self-Confidence High (n=54)	0.132	0.617	0.007
Perfectionism low (n=51)	0.134	0.780	0.008
Perfectionism High (n=62)	0.155	0.456	0.002

All the lower levels of the four different personality factors do not have a significant effect on the strength or weakness of the result observability and satisfaction relationship. Furthermore, the higher levels of openness, apprehension, and perfectionism do have a very slight moderator impact on this relationship ($p<0.05$), and the higher levels of openness and apprehension reinforce the result observability and satisfaction relationship. Table 15 encapsulates the result:

Table 15

Personality Types as Moderator Variables Between the Result Observability and the Satisfaction Relationship

Result Observability	R^2	Beta	Sig
Openness low (n=50)	0.033	0.236	0.205
Openness High (n=63)	0.133	0.409	0.003
Apprehension low (n=40)	0.042	0.348	0.203
Apprehension High (n=75)	0.147	0.390	0.001
Self-Confidence low (n=58)	0.038	0.267	0.144
Self-Confidence High (n=55)	0.071	0.269	0.050
Perfectionism low (n=52)	0.067	0.339	0.063
Perfectionism High (n=63)	0.105	0.361	0.010

***Hypothesis 1b*:** Age, years of experience, different hospital and different EMR applications affect the strength of the relationships between result observability and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Different ages impacted the relationships of the result observability and the nurses' perception of performance. Younger ages have a great impact on the relationship in comparison with the older age range (R^2:0.196, Beta: 1.130).

As expected, the years of experience as an RN has an impact on the relationship of result observability and the nurses' perception of performance. When nurses years of experience increased, it had a greater effect on the relationship of the result observability and the nurses' perception of their performance (R^2: 0.283, Beta: 0.965). The effects of different hospitals on the relationship of result observability and dependent variable are not statistically significant. Among different EMR applications, only the MiChart is statistically significant (R^2: 0.156, Beta: 0.650). In Table 16 the summary of the moderator variable is shown:

Table 16

Age, Years of Experience, Hospitals, and the EMR Applications as Moderator Variables Between the Result Observability and the Perception of Performance Relationship

Result Observability		**R^2**	**Beta**	**Sig**
Age Younger (n=52)		0.196	1.130	0.001
Age Older (n=59)		0.145	0.466	0.003
Years of Experience as RN – less (n=68)		0.073	0.404	0.026
Years of Experience as RN – more (n=43)		0.283	0.965	0.000
Different Hospital	Hospital 1 (n=35)	0.061	0.281	0.160
	Hospital 2 (n =19)	0.158	0.966	0.092
	Hospital 3 (n =12)	0.013	0.589	0.723
	Hospital 4 (n =11)	0.141	0.725	0.254
Different EMR	MiChart (n =65)	0.156	0.650	0.001
	Cerner PowerChart (n = 14)	0.086	0.730	0.308
	Point Click Care (n =8)	0.363	0.744	0.114
	CIS PowerChart (n =4)	0.027	-0.272	0.837

The younger age range has a moderator effect in comparison with the older age range in the relationship of result observability and the satisfaction with EMR.

Fewer or more years of experience as an RN have a significant impact on the result observability and nurses' satisfaction relationship. Fewer years of experience have a greater effect on the dependent and independent relationship. Different hospitals do not have a moderator effect on the result observability and the satisfaction relationship, however, MiChart and Cerner PowerChart among other EMR applications have a better outcome as a moderator variable and could increase the direction of the relationship of the of result observability and the satisfaction relationship. In Table 17 the summary of the moderator variable is shown:

Table 17

Age, Years of Experience, Hospitals, and the EMR Applications as Moderator Variables Between the Result Observability and the Satisfaction Relationship

Result Observability		**R^2**	**Beta**	**Sig**
Age Younger (n=54)		0.136	0.486	0.006
Age Older (n=59)		0.029	0.198	0.199
Years of Experience as RN – less (n=70)		0.055	0.286	0.050
Years of Experience as RN – more (n=43)		0.184	0.483	0.004
Different Hospital	Hospital 1 (n=35)	0.040	0.244	0.251
	Hospital 2 (n =19)	0.134	0.434	0.123
	Hospital 3 (n =12)	0.168	0.932	0.185
	Hospital 4 (n =11)	0.060	0.361	0.467
Different EMR	MiChart (n =65)	0.110	0.410	0.007
	Cerner PowerChart (n = 14)	0.336	1.202	0.030
	Point Click Care (n =8)	0.075	-0.304	0.511
	CIS PowerChart (n =4)	0.075	-0.304	0.511

Hypothesis 2: There is a positive relationship between professional autonomy and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Autonomy has a very strong relationship with the nurses' perception of their performance. If they have more freedom at their job, this will increase dramatically their perception of their performance. Autonomy as a predictor variable can explain 30% of the variation in the nurses' perception of their performance. Also, autonomy is the best predictor of performance perception and a unit change in the autonomy can increase the performance perception by 1.428 (R^2: 0.303, Beta: 1.428; see Table 13).

There is a significant relationship between professional autonomy and the nurses' satisfaction with EMR. As their freedom in working with the EMR applications increased, their satisfaction would increase too. The predictor variable can explain the 16% of the

model variation. With a unit change in the professional autonomy, the satisfaction will increase by 0.762 (see Table 13).

***Hypothesis 2a*:** The four personality factors moderate the strength of relationship between professional autonomy and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Each of the personality dimensions have a moderator effect on the autonomy and performance relationships. With the exception of the perfectionism dimension, the low categories of the personality dimensions reveal a lower beta in comparison the direct relationships. However, a higher level of self-confidence is the most effective variable among the other personality types (R^2: 0.316, Beta: 1.778). Additionally, a lower level of self-confidence is the least effective factor among the other personality variables on the relationship of the autonomy and nurses' perception of their performance. The results are provided in Table 18.

Table 18

Personality Types as Moderator Variables Between the Professional Autonomy and the Perception of Performance Relationship

Professional Autonomy	**R^2**	**Beta**	**Sig**
Openness low (n=49)	0.320	1.228	0.000
Openness High (n=62)	0.307	1.594	0.000
Apprehension low (n=39)	0.253	1.114	0.001
Apprehension High (n=74)	0.325	1.579	0.000
Self-Confidence low (n=57)	0.294	1.073	0.000
Self-Confidence High (n=54)	0.316	1.778	0.000
Perfectionism low (n=51)	0.292	1.574	0.000
Perfectionism High (n=62)	0.344	1.257	0.000

Different ranges of personality factors have a moderating effect on the relationship of professional autonomy and satisfaction. The lower level of perfectionism can increase the

strength of the autonomy and satisfaction relationship (R^2: 0.252, Beta: 0.907). On the other hand, the higher level of perfectionism diminishes the strength of this relationship. The results are provided in the Table 19.

Table 19

Personality Types and Age as Moderator Variables Between the Professional Autonomy and the Satisfaction Relationship

Professional Autonomy	**R^2**	**Beta**	**Sig**
Openness low (n=50)	0.166	0.755	0.003
Openness High (n=63)	0.170	0.802	0.001
Apprehension low (n=40)	0.167	0.808	0.009
Apprehension High (n=75)	0.149	0.713	0.001
Self-Confidence low (n=58)	0.144	0.659	0.003
Self-Confidence High (n=55)	0.126	0.673	0.008
Perfectionism low (n=52)	0.252	0.907	0.000
Perfectionism High (n=63)	0.093	0.615	0.015

***Hypothesis 2b*:** Age, years of experience, different hospital and different EMR applications moderate the strength of relationship between professional autonomy and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

The impact of younger generation of nurses is stronger than older generation of nurses on the relationship of professional autonomy and nurses' perception of performance.

Years of experience have an impact on the relationship of professional autonomy and nurses' perception of performance. Years of experience as a moderator variable is statistically significant. Almost 34% of the dependent variable variation can be explained by the increases in the years of experience.

The first three hospitals in the list have the moderator effect on the professional autonomy and nurses' perception of performance. Furthermore, different EMR applications,

such as MiChart, Cerner PowerChart and Point Click Care, are statistically significant on this relationship. Table 20 condenses these effects:

Table 20

Age, Years of Experience, Hospitals, and the EMR Applications as Moderator Variables Between the Result Observability and the Perception of Performance Relationship

Professional Autonomy		**R^2**	**Beta**	**Sig**
Age Younger (n=52)		0.283	1.729	0.000
Age Older (n=59)		0.348	1.212	0.000
Years of Experience as RN – less (n=68)		0.282	1.479	0.000
Years of Experience as RN – more (n=43)		0.339	1.401	0.000
Different Hospital	Hospital 1 (n=35)	0.307	1.118	0.001
	Hospital 2 (n =19)	0.342	1.821	0.009
	Hospital 3 (n =12)	0.366	2.504	0.037
	Hospital 4 (n =11)	0.318	0.906	0.071
Different EMR	MiChart (n =65)	0.344	1.493	0.000
	Cerner PowerChart (n = 14)	0.459	1.284	0.008
	Point Click Care (n =8)	0.710	1.933	0.009
	CIS PowerChart (n =4)	0.168	3.500	0.590

The older age range has a stronger effect than a younger age range on the professional autonomy and the satisfaction relationship.

The moderating effect of years of experience is statistically significant. However, fewer years of experience result in a more robust effect on the relationship between professional autonomy and satisfaction. Among different hospitals and different EMR applications, there is a substantial difference between hospital one and two which indicates a moderator effect. Also, the Cerner PowerChart have a more durable effect on the professional autonomy and satisfaction relationship. The rest of the hospitals and EMR applications do not have a moderating impact. Each of the betas are substantially low Table 21 presents these effects:

Table 21

Age, Years of Experience, Hospitals, and the EMR Applications as Moderator Variables Between the Professional Autonomy and the Satisfaction Relationship

Professional Autonomy		**R^2**	**Beta**	**Sig**
Age Younger (n=54)		0.147	0.647	0.004
Age Older (n=59)		0.161	0.788	0.002
Years of Experience as RN – less (n=70)		0.189	0.969	0.000
Years of Experience as RN – more (n=43)		0.126	0.529	0.020
Different Hospital	Hospital 1 (n=35)	0.063	0.551	0.147
	Hospital 2 (n =19)	0.485	1.058	0.001
	Hospital 3 (n =12)	0.074	0.496	0.393
	Hospital 4 (n =11)	0.167	0.500	0.213
Different EMR	MiChart (n =65)	0.170	0.779	0.001
	Cerner PowerChart (n = 14)	0.288	0.850	0.048
	Point Click Care (n =8)	0.059	-0.500	0.563
	CIS PowerChart (n =4)	0.059	-0.500	0.563

Hypothesis 3: There is a negative relationship between perceived barriers and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

There is a strong correlation and positive association between the perception of fewer barriers and the higher perception of performance. Perception of barriers can explain the 22.4% of the nurses' perception of performance variation (R^2: 0.224), and if the perception of fewer barrier increased by a unit, the perception of performance will increase by 0.453 unit (see Table 13).

Perceived barrier has the most robust relationship among other independent variables with the satisfaction. It was expected that as the barrier decreased, the satisfaction would increase. There is a good model fit with the R^2: 0.318 and Beta: 0.398 (see Table 13).

***Hypothesis 3a*:** The four personality factors moderate the strength of relationship between perceived barriers and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

The four different personality types have a moderator effect on the relationship of perceived barriers and perception of performance. Different ranges of personality factors are statistically significant at $p<0.01$. Higher levels of openness, apprehension, self-confidence, and a lower level of perfectionism have a greater impact on the relationship of dependent and independent variables. Higher self-confidence has the greatest effect on this relationship (R^2: 0.323, Beta: 0.699). On the other hand, lower levels of openness, apprehension, self-confidence, and a higher level of perfectionism weaken the relationship of dependent and independent variables. A lower level of self-confidence has the least effect on the relationship of perceived barriers and perception of performance of nurses (R^2: 0.110, Beta: 0.243). Table 22 reviews these outcomes:

Table 22

Personality Types as Moderator Variables Between the Perceived Barriers and the Perception of Performance Relationship

Perception of Barriers	**R^2**	**Beta**	**Sig**
Openness low (n=48)	0.303	0.395	0.000
Openness High (n=62)	0.190	0.517	0.000
Apprehension low (n=38)	0.156	0.307	0.014
Apprehension High (n=74)	0.265	0.560	0.000
Self-Confidence low (n=57)	0.110	0.243	0.012
Self-Confidence High (n=53)	0.323	0.699	0.000
Perfectionism low (n=50)	0.194	0.463	0.001
Perfectionism High (n=62)	0.295	0.443	0.000

All different ranges of personality factors have a moderator effect on the perceived barriers and satisfaction relationship. A lower level of perfectionism strengthens barrier

relationship with satisfaction. Higher perfectionism can minimize the strength of barrier and satisfaction relationship. Table 23 reviews these outcomes:

Table 23

Personality Types as Moderator Variables Between the Perceived Barriers and the Satisfaction Relationship

Perception of Barriers	**R^2**	**B**	**Sig**
Openness low (n=49)	0.440	0.415	0.000
Openness High (n=63)	0.240	0.389	0.000
Apprehension low (n=39)	0.397	0.451	0.000
Apprehension High (n=75)	0.254	0.363	0.000
Self-Confidence low (n=58)	0.291	0.352	0.000
Self-Confidence High (n=54)	0.323	0.417	0.000
Perfectionism low (n=51)	0.493	0.454	0.000
Perfectionism High (n=63)	0.175	0.324	0.001

***Hypothesis 3b*:** Age, years of experience, different hospital and different EMR applications moderate the strength of relationship between perceived barriers and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

The nurses' age has a significant effect on the relationship of perceived barriers and the dependent variable. However, younger age range can strengthen the relationship of perception of barriers and perception of performance (R^2: 0.306, Beta: 0.709).

The nurses' years of experience have a significant effect on the perceived barriers and perception of performance relationship. However, the fewer years of experience have a more robust impact on this relationship.

Moreover, different hospitals and different EMR applications do not have a significance influence on the relationship of perceived barriers and the dependent variable. Only, the outcome of the first hospital and the MiChart are counTable. However, their impact

would weaken the perceived barriers and perception of performance relationship. Table 24 summarizes these results:

Table 24

Age, Years of Experience, Hospitals, and the EMR Applications as Moderator Variables Between the Perceived Barriers and the Perception of Performance Relationship

Perception of Barriers		**R^2**	**Beta**	**Sig**
Age Younger (n=51)		0.306	0.709	0.000
Age Older (n=59)		0.203	0.337	0.000
Years of Experience as RN – less (n=67)		0.280	0.479	0.000
Years of Experience as RN – more (n=43)		0.162	0.430	0.007
Different Hospital	Hospital 1 (n=35)	0.396	0.426	0.000
	Hospital 2 (n =19)	0.146	0.434	0.106
	Hospital 3 (n =12)	0.749	0.561	0.749
	Hospital 4 (n =11)	0.230	0.263	0.136
Different EMR	MiChart (n =65)	0.267	0.459	0.000
	Cerner PowerChart (n = 14)	0.272	0.447	0.056
	Point Click Care (n =8)	0.136	0.019	0.136
	CIS PowerChart (n =4)	0.078	0.006	0.078

Different age groups also have a moderator impact on the relationship of perceived barriers and satisfaction, and the younger age groups with R^2: 0.426 strengthen the barrier and satisfaction relationship.

Nurses' years of experience have a significant moderator effect on the perception of barrier and satisfaction relationship. Less experience has a greater impact on the strength of barrier and satisfaction relationship. Three out of four hospitals and EMR applications can be counted as moderator factors in this relationship. However, the first ranked hospital has a more remarkable influence on the relationship of barrier and satisfaction. Also, the MiChart applications with the R^2: 0.480 and Beta: 0.460 have greater effect on the dependent and independent variable relationship. Table 25 summarizes these results:

Table 25

Age, Years of Experience, Hospitals, and the EMR Applications as Moderator Variables Between the Perceived Barriers and the Satisfaction Relationship

Perception of Barriers		**R^2**	**B**	**Sig**
Age Younger (n=53)		0.426	0.431	0.000
Age Older (n=59)		0.276	0.376	0.000
Years of Experience as RN – less (n=69)		0.452	0.490	0.000
Years of Experience as RN – more (n=43)		0.109	0.219	0.031
Different Hospital	Hospital 1 (n=35)	0.577	0.553	0.000
	Hospital 2 (n =19)	0.384	0.343	0.005
	Hospital 3 (n =12)	0.404	0.474	0.026
	Hospital 4 (n =11)	0.256	0.212	0.113
Different EMR	MiChart (n =65)	0.480	0.460	0.000
	Cerner PowerChart (n = 14)	0.309	0.398	0.039
	Point Click Care (n =8)	0.309	0.398	0.039
	CIS PowerChart (n =4)	0.002	-0.026	0.918

Hypothesis 4: There is a positive relationship between task structure and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

It can be seen by $p<0.003$ that there is an association between task structure and nurses' perception of performance, although task structure is not a good predictor and only 9.6% of dependent variable deviation is explicated with this independent variable (R^2: 0.096; see Table 13).

There is a significant relationship between task structure and satisfaction. This is a statistically good model fit with the R^2: 0.253 and Beta: 0.510. In other words, as nurses feel that the task structure after implementing EMR became easier, their satisfaction increases (see Table 13).

***Hypothesis 4a*:** The four personality factors moderate the strength of relationship between task structure and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Nurses' personality types in some cases have a moderator impact on the dependent and independent relationship and in some other cases are not statistically significant. A higher level of openness and lower levels of self-confidence and perfectionism do not have any effect on the main variables. A higher level of self-confidence has the greatest impact on the task structure and the nurses' perception of their performance relationship. Since the data indicate a very low value as compared to those of higher levels, this shows a very strong moderator effect of self-confidence. The summary of the outcome is shown in the Table 26.

Table 26

Personality Types as Moderator Variables Between the Task Structure and the Perception of Performance Relationship

Task Structure	**R^2**	**Beta**	**Sig**
Openness low (n=39)	0.228	0.609	0.002
Openness High (n=51)	0.033	0.303	0.200
Apprehension low (n=33)	0.146	0.489	0.028
Apprehension High (n=58)	0.080	0.467	0.032
Self-Confidence low (n=49)	0.036	0.240	0.190
Self-Confidence High (n=42)	0.148	0.684	0.012
Perfectionism low (n=40)	0.055	0.441	0.145
Perfectionism High (n=51)	0.218	0.516	0.001

All different ranges of personality factors have a moderator effect on the relationship of task structure and satisfaction, with the exception of the lower level of self-confidence with the $p<0.429$. The lower range of openness has greatest effect on the relationship of task structure and the dependent variable (R^2: 0.481, Beta: 0.719). The summary of the outcome is shown in the Table 27.

Table 27

Personality Types as Moderator Variables Between the Task Structure and the Satisfaction Relationship

Task Structure	R^2	Beta	Sig
Openness low (n=39)	0.481	0.719	0.000
Openness High (n=51)	0.098	0.300	0.025
Apprehension low 33	0.268	0.599	0.002
Apprehension High (n=58)	0.229	0.455	0.000
Self-Confidence low (n=49)	0.429	0.184	0.429
Self-Confidence High (n=42)	0.331	0.577	0.000
Perfectionism low (n=40)	0.268	0.559	0.001
Perfectionism High (n=51)	0.276	0.509	0.000

***Hypothesis 4b*:** Age, years of experience, different hospital and different EMR applications moderate the strength of relationship between task structure and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

The influence of younger age ranges is not significant as a moderator factor. However, the older age range can be counted as a moderator variable, but doing so will decrease the impact of the relationship of task structure and the nurses' perception of their performance.

There is a moderator effect of nurses' years of experience on the task structure and perception of their performance relationship. Nurses with more experience have a robust effect on the task structure and the dependent variable relationship (R^2: 0.144, Beta: 0.659 $p<0.05$). The first ranked hospital in terms of the number of nurses working there and who participated in this survey has a moderator effect and for a unit change in task structure the perception of performance will increase by 0.662. MiChart and Cerner PowerChart also have a moderator effect on the relationship of dependent and independent variable (see Table 28).

Table 28

Age, Years of Experience, Hospitals, and the EMR Applications as Moderator Variables Between the Task Structure and the Perception of Performance Relationship

Task Structure		**R^2**	**Beta**	**Sig**
Age Younger (n=41)		0.075	0.605	0.083
Age Older (n=50)		0.157	0.425	0.004
Years of Experience as RN – less (n=54)		0.089	0.428	0.029
Years of Experience as RN – more (n=35)		0.144	0.659	0.025
Different Hospital	Hospital 1 (n=35)	0.430	0.662	0.000
	Hospital 2 (n =19)	0.075	0.582	0.287
	Hospital 3 (n =12)	0.002	0.150	0.895
	Hospital 4 (n =11)	0.050	-0.201	0.776
Different EMR	MiChart (n =65)	0.233	0.655	0.000
	Cerner PowerChart (n = 14)	0.415	1.059	0.024
	Point Click Care (n =8)	0.341	0.484	0.168
	CIS PowerChart (n =4)	0.166	-0.995	0.593

Both young and old ranges of ages have a major impact on the relationship of task structure and satisfaction. Although older age ranges have a stronger effect than the younger ages, both of them weaken the relationship of task structure and the dependent variable.

Different years of experience have a moderating effect statistically, although fewer years of experience have a stronger effect on the relation of task structure and satisfaction. Among different EMR applications, MiChart has a moderator effect on this relationship and the other EMR applications do not have a moderating effect. The first and second ranked hospitals also have statistically significant effects on the task structure and satisfaction relationship. The information is presented in Table 29.

Table 29

Age, Years of Experience, Hospitals, and the EMR Applications as Moderator Variables Between the Task Structure and the Satisfaction Relationship

Task Structure		**R^2**	**Beta**	**Sig**
Age Younger (n=41)		0.211	0.503	0.003
Age Older (n=50)		0.266	0.492	0.000
Years of Experience as RN – less (n=54)		0.335	0.630	0.000
Years of Experience as RN – more (n=35)		0.120	0.331	0.041
Different Hospital	Hospital 1 (n=35)	0.390	0.670	0.000
	Hospital 2 (n =19)	0.460	0.648	0.003
	Hospital 3 (n =12)	0.004	-0.092	0.855
	Hospital 4 (n =11)	0.050	-0.134	0.776
Different EMR	MiChart (n =65)	0.347	0.596	0.000
	Cerner PowerChart (n = 14)	0.035	0.178	0.563
	Point Click Care (n =8)	0.028	0.161	0.719
	CIS PowerChart (n =4)	0.028	0.161	0.719

Hypothesis 5: There is a negative relationship between privacy and security anxiety and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

The p-value (p<0.01) for the positive relationship of fewer privacy and security anxiety and the higher nurses' perception of performance is statistically significant. Although, only 13.2% of the dependent variable variation can be described by the privacy and security anxiety, but any unit change in this variable can change the dependent variable by 0.835 (see Table 13).

Although privacy and security anxiety is statistically related to satisfaction, it is not a good model predictor, since it only predicted 11.3% of the dependent variable variation. As the privacy and security anxiety decreased, the satisfaction would increase (see Table 13).

***Hypothesis 5a*:** The four personality factors moderate the strength of relationship between privacy and security anxiety and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

The personality factors have a moderator effect on this relationship. The higher level of self-confidence has the strongest impact among other personality factors on the privacy and security anxiety and the nurses' perception of their performance relationship (R^2: 0.120, Beta: 1.146 $p<0.01$). Remarkably, the higher level of perfectionism among other personality factors has the least impact on this relationship and its moderator effect will weaken the association of privacy and security anxiety and the performance perception of nurses (R^2: 0.101, Beta: 0.548 $p<0.01$). Table 30 presents the summary of personality factors as a moderator variable.

Table 30

Personality Types and Age as Moderator Variables Between the Privacy and Security Anxiety and the Perception of Performance Relationship

Privacy and Security Anxiety	**R^2**	**Beta**	**Sig**
Openness low (n=49)	0.386	0.149	0.386
Openness High (n=62)	0.131	0.978	0.004
Apprehension low (n=39)	0.156	0.832	0.013
Apprehension High (n=73)	0.125	0.889	0.002
Self-Confidence low (n=57)	0.158	0.692	0.002
Self-Confidence High (n=53)	0.120	1.146	0.011
Perfectionism low (n=51)	0.167	1.145	0.003
Perfectionism High (n=61)	0.101	0.548	0.012

All of the personality types, except the lower level of apprehension, have a moderating impact on the relationship of privacy and security anxiety and satisfaction, but their impacts are very small and in most cases weaken the strength of dependent and independent relationship. A higher level of self-confidence strengthens the relationship of

privacy anxiety and satisfaction (R^2: 0.196, Beta: 0.862). Table 31 presents the summary of personality factor as a moderator.

Table 31

Personality Types as Moderator Variables Between the Privacy and Security Anxiety and the Satisfaction Relationship

Privacy and Security Anxiety	**R^2**	**Beta**	**Sig**
Openness low (n=50)	0.112	0.494	0.018
Openness High (n=63)	0.132	0.655	0.003
Apprehension low (n=40)	0.062	0.443	0.120
Apprehension High (n=74)	0.123	0.579	0.002
Self-Confidence low (n=58)	0.070	0.391	0.044
Self-Confidence High (n=54)	0.196	0.862	0.001
Perfectionism low (n=52)	0.099	0.540	0.023
Perfectionism High (n=62)	0.119	0.534	0.006

***Hypothesis 5b*:** Age, years of experience, different hospital and different EMR applications moderate the strength of relationship between privacy and security anxiety and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Younger age groups have a significant moderator effect on the relationship of dependent and independent variable. As the years of experience are divided into "less" and "more" categories, the fewer years of experience have a significant impact on the privacy and security anxiety and the dependent variable relationship, however, more years of experience are not significant as a moderator variable. The first ranked hospital has a significant moderator effect and strengthen the dependent variable relationship with privacy and security anxiety. Additionally, three of the most standard EMR have moderator effects on this relationship. Table 32 displays the summary information.

Table 32

Age, Years of Experience, Hospitals, and the EMR Applications as Moderator Variables Between the Privacy and Security Anxiety and the Perception of Performance Relationship

Privacy and Security Anxiety		**R^2**	**Beta**	**Sig**
Age Younger (n=51)		0.196	1.124	0.001
Age Older (n=59)		0.098	0.644	0.016
Years of Experience as RN – less (n=67)		0.219	1.074	0.000
Years of Experience as RN – more (n=43)		0.057	0.564	0.122
Different Hospital	Hospital 1 (n=35)	0.167	0.743	0.018
	Hospital 2 (n =19)	0.144	1.039	0.109
	Hospital 3 (n =12)	0.127	1.685	0.256
	Hospital 4 (n =11)	0.061	0.262	0.464
Different EMR	MiChart (n =65)	0.150	0.851	0.002
	Cerner PowerChart (n = 14)	0.341	1.230	0.028
	Point Click Care (n =8)	0.726	1.737	0.007
	CIS PowerChart (n =4)	0.743	4.971	0.138

Older age ranges in comparison with the younger ranges have a stronger effect on the relationship of privacy and security anxiety and satisfaction. The fewer years of experience as a moderator effect is stronger than more years of experience on the relationship of privacy and security anxiety and satisfaction. Different hospitals do not have a moderating effect on this relationship. However, the MiChart moderating effect is noteworthy. Table 33 displays the summary information.

Table 33

Age, Years of Experience, Hospitals, and the EMR Applications as Moderator Variables Between the Privacy and Security Anxiety and the Satisfaction Relationship

Privacy and Security Anxiety		**R^2**	**Beta**	**Sig**
Age Younger (n=53)		0.116	0.417	0.013
Age Older (n=59)		0.127	0.700	0.006
Years of Experience as RN – less (n=69)		0.121	0.604	0.003
Years of Experience as RN – more (n=43)		0.093	0.446	0.046
Different Hospital	Hospital 1 (n=35)	0.087	0.568	0.090
	Hospital 2 (n =19)	0.201	0.589	0.054
	Hospital 3 (n =12)	0.307	1.154	0.062
	Hospital 4 (n =11)	0.113	0.272	0.312
Different EMR	MiChart (n =65)	0.141	0.582	0.002
	Cerner PowerChart (n = 14)	0.226	0.835	0.086
	Point Click Care (n =8)	0.017	-0.237	0.760
	CIS PowerChart (n =4)	0.017	-0.237	0.760

Hypothesis 6: There is a positive relationship between communication patterns and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

The communication patterns have a strong correlation with the nurses' perception of their performance. The straightforward social patterns that can improve the quality of communicaitons have a positive relationship with the higher perception of performance.The p-value is significant (p<0.000) and 24.7% of the model is described by the predictor variable. Also, a unit of change in communication patterns can change the perception of performance by 0.623 (see Table 13).

Communication patterns scale is the best predictor among other predictors for satisfaction. The predictor can explain 30% of dependent variable variation. This result has shown that if the way of communication after implementing the IT applications remained the same, the quality may improve, and the satisfaction would increase (see Table 13).

***Hypothesis 6a*:** The four personality factors moderate the strength of relationship between communication patterns and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

All ranges of personality factors have a significant moderator effect on the relationship of social patterns and perception of performance. However, the lower level of perfectionism as a moderator factor can strengthen the relationship of the dependent variable and independent variable more than other personality factors (R^2: 0.263, Beta: 0.766 p<0.00). The lower level of self-confidence is the least effective moderator factor that can decrease the impact of predictor variable to 16.8%. The information is presented in Table 34.

Table 34

Personality Types as Moderator Variables Between the Communication (Social) Patterns and the Perception of Performance Relationship

Communication Patterns	**R^2**	**Beta**	**Sig**
Openness low (n=49)	0.280	0.618	0.000
Openness High (n=60)	0.219	0.611	0.000
Apprehension low (n=39)	0.173	0.484	0.008
Apprehension High (n=71)	0.277	0.686	0.000
Self-Confidence low (n=56)	0.168	0.461	0.002
Self-Confidence High (n=52)	0.281	0.731	0.000
Perfectionism low (n=49)	0.263	0.766	0.000
Perfectionism High (n=61)	0.251	0.483	0.000

The nurses' personality types have a moderating impact on the relation of communication patterns and satisfaction. The low level of openness has a greater moderating effect on the relationship of communication patterns and satisfaction relationship (R^2: 0.399, Beta: 0.649). The information is presented in Table 35.

Table 35

Personality Types as Moderator Variables Between the Communication (Social) Patterns and the Perception of Performance Relationship

Communication Patterns	R^2	Beta	Sig
Openness low (n=49)	0.399	0.649	0.000
Openness High (n=61)	0.487	0.605	0.000
Apprehension low (n=39)	0.322	0.615	0.000
Apprehension High (n=72)	0.518	0.617	0.000
Self-Confidence low (n=56)	0.356	0.604	0.000
Self-Confidence High (n=53)	0.491	0.568	0.000
Perfectionism low (n=50)	0.433	0.600	0.000
Perfectionism High (n=61)	0.461	0.634	0.000

***Hypothesis 6b*:** Age, years of experience, different hospital and different EMR applications moderate the strength of relationship between communication patterns and the nurses' perception of their performance and satisfaction in using IT applications in healthcare.

Younger age groups have a stronger impact rather than older age groups on the relationship of social patterns and perception of performance. The nurses' years of experience have a statistically significant impact as a moderator variable on the social pattern and perception of performance relationship. Both ranges of experience almost have the similar effect. Three out of four ranked hospital have a moderator impact as well. MiChart has the most moderator impact among other EMR applications on the relationship of social pattern and perception of performance. Table 36 shows the summary of results.

Table 36

Age, Years of Experience, Hospitals, and the EMR Applications as Moderator Variables Between the Communication (Social) Patterns and the Perception of Performance Relationship

Communication Patterns		**R^2**	**Beta**	**Sig**
Age Younger (n=50)		0.279	0.828	0.000
Age Older (n=58)		0.283	0.526	0.000
Years of Experience as RN – less (n=66)		0.260	0.619	0.000
Years of Experience as RN – more (n=42)		0.240	0.649	0.001
Different Hospital	Hospital 1 (n=35)	0.393	0.482	0.000
	Hospital 2 (n =19)	0.348	1.000	0.008
	Hospital 3 (n =12)	0.338	1.529	0.048
	Hospital 4 (n =11)	0.019	0.156	0.707
Different EMR	MiChart (n =65)	0.318	0.643	0.000
	Cerner PowerChart (n = 14)	0.001	-0.044	0.899
	Point Click Care (n =8)	0.644	0.783	0.016
	CIS PowerChart (n =4)	0.508	2.378	0.495

Both younger and older age ranges have moderating effects on the strength of this relationship. Moreover, the older age range can strength the social patterns and satisfaction relationship more. Years of experience have a moderator effect on the social patterns and satisfaction. Fewer years of experience have a stronger effect than more years of experience on the social patterns and the dependent variable relationship (R^2: 0.466, Beta: 0.676). Three out of four hospitals, MiChart, and Cerner PowerChart have moderators effect on the relationship of social patterns and satisfaction. The Table 37 shows the summary of results.

Table 37

Age, Years of Experience, Hospitals, and the EMR Applications as Moderator Variables Between the Communication (Social) Patterns and the Satisfaction Relationship

Communication Patterns		R^2	Beta	Sig
Age Younger (n=51)		0.389	0.510	0.000
Age Older (n=58)		0.484	0.657	0.000
Years of Experience as RN – less (n=67)		0.466	0.676	0.000
Years of Experience as RN – more (n=42)		0.420	0.520	0.000
Different Hospital	Hospital 1 (n=35)	0.493	0.589	0.000
	Hospital 2 (n=19)	0.707	0.695	0.000
	Hospital 3 (n=12)	0.703	0.971	0.001
	Hospital 4 (n=11)	0.000	0.004	0.991
Different EMR	MiChart (n=65)	0.487	0.595	0.000
	Cerner PowerChart (n= 14)	0.548	0.735	0.002
	Point Click Care (n=8)	0.034	0.163	0.660
	CIS PowerChart (n=4)	0.034	0.163	0.660

Hypothesis 7: There is a positive relationship between nurses' perception of performance and satisfaction with EMR

Perception of performance as a predictor can explain 29.4% of the variation in the satisfaction as a dependent variable. Perception of performance and satisfaction have a significant linear relationship and with a unit change in perception of performance, the satisfaction will increase by 0.399 (see Table 38).

Table 38

Perception of Performance as a Predictor in the Satisfaction Model

Independent Variable	N	R^2	Unstandardized Beta	Sig
Perception of Performance	113	0.294	0.399	0.000

Hypothesis 8: There is a positive relationship between openness and self-confidence, and the nurses' perception of performance and satisfaction with EMR.

There is not any direct relationship between the openness and self-confidence and the perception of performance and satisfaction with EMR (see Tables 39 and 40).

Table 39

Openness and Self-Confidence as Predictors in the Perception of Performance Model

Independent Variable	N	R^2	Unstandardized Beta	Sig
Openness	111	0.003	0.085	0.551
Self-Confidence	111	0.026	0.284	0.092

Table 40

Openness and Self-Confidence as Predictors in the Satisfaction Model

Independent Variable	N	R^2	Unstandardized Beta	Sig
Openness	113	.002	.048	.648
Self-Confidence	113	.017	.159	.174

Hypothesis 9: There is a negative relationship between apprehension and perfectionism, and the nurses' perception of performance and satisfaction with EMR.

There is not any significant relationship between the apprehension and perfectionism, and the nurses' perception of performance and satisfaction with EMR (see Tables 41 and 42).

Table 41

Apprehension and Perfectionism as Predictors in the Perception of Performance Model

Independent Variable	N	R^2	Unstandardized Beta	Sig
Apprehension	113	0.001	0.034	0.764
Perfectionism	113	0.013	-0.256	0.235

Table 42

Apprehension and Perfectionism as Predictors in the Satisfaction Model

Independent Variable	N	R^2	Unstandardized Beta	Sig
Apprehension	115	0.022	0.130	0.113
Perfectionism	115	0.031	-0.293	0.061

Research Questions

Research Question One

What are the most important predictors (independent variables) for the nurses' perception of performance relationship?

Multivariate regression was used to determine the best-fit models between the dependent and independent variables. The R square value of 37.7% of the observed variability in perception of performance is explained by the six independent variables. This is a good result with the real world data, although it is not as good as when each independent variable was examined alone. The R with the value of 0.614 shows the good correlation coefficient between the observed value of the dependent variable and the predicted value based on the regression model. The observed value of 0.377 is large enough and indicates that the linear regression model predicts well (see Table 43).

Table 43

Multivariate Variate Regression Between Independent Variables and the Perception of Performance

R	R Square	Adjusted R2	Std. Error of the Estimate	Sig. F
0.614	0.377	0.332	3.511	0.000

The information in the ANOVA Table tested this null hypothesis that there is no linear relationship in the population between the dependent variable and the independent

variables (Norusis, 2006). Also, all of the population regression coefficients are zero, and R^2 is zero. Since the observed significance level of F is less than 0.0005, the null hypothesis is rejected, which shows that there is a linear relationship between the perception of performance and the independent variables (see Table 44).

Table 44

ANOVA Between Independent Variables and the Perception of Performance

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	612.716	6	102.119	8.284	.000b
	Residual	1010.834	82	12.327		
	Total	1623.551	88			
a. Dependent Variable: Performance Scale b. Predictors: (Constant), Social Scale, Result Observability Scale, Privacy Scale, Autonomy Scale, Barrier Scale, Task Structure Scale						

Table 45 shows that the coefficient for autonomy and privacy scales are not zero and for social and result observability scales are almost zero (p<0.06 close to 0.05); therefore the null hypothesis is rejected. However, the null hypotheses for barrier and task structure scales cannot be rejected and the coefficients for these two scales may be zero. In fact, this result does not mean that task structure and barrier are not good predictors alone or in combination with other variables, they just do not contribute significantly to the model being considered (Norusis, 2006; see Table 45).

Table 45

Coefficient of Independent Variables in the Perception of Performance Model

	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
	B	**Std. Error**	**Beta**	**t**	**Sig.**	**Zero-order**	**Partial**	**Part**	**Tolerance**	**VIF**
(Constant)	3.514	3.534		.994	0.323					
Result Observability Scale	0.286	0.150	0.177	1.899	0.061	0.299	0.205	0.166	0.878	1.139
Autonomy Scale	0.872	0.315	0.306	2.765	0.007	0.482	0.292	0.241	0.620	1.612
Barrier Scale	0.166	0.113	0.169	1.472	0.145	0.426	0.160	0.128	0.573	1.745
Task Structure Scale	-0.263	0.187	-0.174	-1.403	0.164	0.297	-0.153	-0.122	0.492	2.031
Privacy Scale	0.486	0.230	0.200	2.116	0.037	0.292	0.228	0.184	0.848	1.179
Social Scale	0.290	0.152	0.219	1.902	0.061	0.449	0.206	0.166	0.575	1.740
a. Dependent Variable: Performance Scale										

Tolerance and VIF (Multicollinearity)

Tolerance (=1/VIF) was measured to check the strength of the linear relationships among the independent variables. The tolerance and VIF values of the listed independent variables is shown in Table 45. When VIF is >10, it means that an independent variable is highly correlated with another independent variable. In this case, multicollinearity is not an issue in this model (Norusis, 2006).

Stepwise variable selection

The goal of regression model building is to build a simple model that predicts well (Norusis, 2006). Although there are many different internal and external factors that contribute to the perception of performance, only six were selected in this study, and out of six variables, some of them are not particularly good predictors. A simpler model is better; including insignificant variables in a model do not improve a model's predictive ability; instead, they will increase the standard errors of the coefficients (Norusis, 2006).

The R square became better after running stepwise regression several times to find the most appropriate predictors. The new model with the four predictors can explain 42.2% of the perception of performance variability (see Table 46). The ANOVA Table shows the significant linear relationship between four independent variables and the dependent variable (see Table 47). This study tried to improve the model with the stepwise variable selection. Based on this method, the new model was built with four independent variables out of six variables. Autonomy, social, privacy and security anxiety, and result observability scales respectively are the best predictors for the perception of performance (see table 48).

Table 46

Stepwise Variable Selection for the Perception of Performance

R	R Square	Adjusted R Square	Std. Error of the Estimate	Sig. F Change
0.553[a]	0.306	0.299	30.554	0.000
0.602[b]	0.362	0.350	30.423	0.003
0.624[c]	0.390	0.372	30.363	0.031
0.651[d]	0.424	0.402	30.284	0.015

a. Predictors: (Constant), Autonomy Scale
b. Predictors: (Constant), Autonomy Scale, Social Scale
c. Predictors: (Constant), Autonomy Scale, Social Scale, Privacy Scale
d. Predictors: (Constant), Autonomy Scale, Social Scale, Privacy Scale, Result Observability Scale
e. Dependent Variable: Output Performance Scale

Table 47

ANOVA Based on the Stepwise Method for the New Model of Perception of Performance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	825.332	4	206.333	19.136	.000
	Residual	1121.384	104	10.783		
	Total	1946.716	108			

a. Dependent Variable: Performance Scale
b. Predictors: (Constant), Social Scale, Result Observability Scale, Privacy Scale, Autonomy Scale

Table 48

Coefficient of New Model of Perception Based on Stepwise Method

	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	4.256	2.712		1.569	0.120					
Autonomy Scale	0.867	0.233	0.337	3.721	0.000	0.553	0.343	0.277	0.673	1.485
Social Scale	0.228	0.118	0.181	1.934	0.056	0.500	0.186	0.144	0.630	1.588
Privacy Scale	0.476	0.185	0.207	2.578	0.011	0.354	0.245	0.192	0.862	1.160
Result Observability Scale	0.321	0.129	0.201	2.482	0.015	0.366	0.236	0.185	0.847	1.180
a. Dependent Variable: Performance Scale										

Research Question Two

What are the most important predictors (independent variables) for the nurses' satisfaction with EMR relationship?

A multivariate regression model was built for the satisfaction dependent variable. Based on R square, 47.9% of the observed variability in satisfaction is explained by the six independent variables and their interactions. (see Table 49).

Table 49

Multivariate Variate Regression Between Independent Variables and the Satisfaction

R	R Square	Adjusted R2	Std. Error of the Estimate	Sig. F
.692	.479	.440	2.144	.000

Based on the information in the ANOVA Table, there is a linear relationship between the independent variables and satisfaction (see Table 50).

Table 50

ANOVA Between Independent Variables and the Satisfaction

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	612.716	6	102.119	8.284	.000b
	Residual	1010.834	82	12.327		
	Total	1623.551	88			

a. Dependent Variable: Satisfaction Scale
b. Predictors: (Constant), Social Scale, Result Observability Scale, Privacy Scale, Autonomy Scale, Barrier Scale, Task Structure Scale

Based on Table 51, the coefficients for result observability, autonomy, privacy, and task structure scales are not zero and for social and barrier scales are zero (p<0.000 and p<0.013, respectively). As it was mentioned in the perception of performance model building section, it could not be concluded that the result observability, autonomy, privacy, and task structure scales are not a good predictor alone or in combination with other variables; they just do not contribute significantly to the model being considered (Norusis, 2006).

Tolerance and VIF (Multicollinearity)

The tolerance and VIF information is presented in Table 51. All VIF values are < 10. Thus, there is no evidence of collinearity (Norusis, 2006).

Table 51

Coefficient of Independent Variables in the Satisfaction Model

	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
	B	**Std. Error**	**Beta**	**t**	**Sig.**	**Zero-order**	**Partial**	**Part**	**Tolerance**	**VIF**
(Constant)	3.006	2.158		1.393	.167					
Result Observability Scale	-.018	.092	-.017	-.199	.843	.133	-.022	-.016	.878	1.139
Autonomy Scale	-.188	.193	-.099	-.977	.331	.335	-.107	-.078	.620	1.612
Barrier Scale	.174	.069	.266	2.529	.013	.541	.269	.202	.573	1.745
Task Structure Scale	.100	.114	.099	.875	.384	.494	.096	.070	.492	2.031
Privacy Scale	.151	.140	.093	1.075	.286	.289	.118	.086	.848	1.179
Social Scale	.413	.093	.466	4.434	.000	.630	.440	.354	.575	1.740

a. Dependent Variable: Satisfaction Scale

Stepwise variable selection

Based on the stepwise variable selection method, social and barrier scales are the two most important predictors for the satisfaction. The simpler model is the better model; so the other four independent variables were removed from the model. The R square improved and 50.2% of the variation of the satisfaction was explained by the barrier and social scales (see Tables 52 and 53).

Table 52

Stepwise Variable Selection for the Satisfaction

R	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**Sig. F Change**
.708[a]	.424	.402	3.284	.015

a. Predictors: (Constant), Social and Barrier Scale
b. Dependent Variable: Satisfaction Scale

Table 53

Coefficient of New Model of Satisfaction Based on Stepwise Method

	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	3.115	1.287		2.420	.017					
Social Scale	.488	.075	.526	6.507	.000	.671	.532	.444	.713	1.403
Barrier Scale	.191	.057	.270	3.339	.001	.552	.307	.228	.713	1.403
a. Dependent Variable: Satisfaction Scale										

Research Question Three

How do nurses rate their overall performance and satisfaction in working with EMR?

The result of overall evaluation of performance and satisfaction of nurses showed that more than half of the sample population are satisfied with the EMR applications implementation in their hospital. In other words, only 14.8% of the population were unsatisfied with the EMR applications (see Table 54). Furthermore, 93% of the sample have good, very good, or excellent perception about their performance with the IT applications at their work (see Table 55).

Table 54

Overall Satisfaction with EMR

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor	4	3.5	3.5	3.5
	Fair	13	11.3	11.3	14.8
	Good	43	37.4	37.4	52.2
	Very Good	40	34.8	34.8	87.0
	Excellent	15	13.0	13.0	100.0
	Total	115	100.0	100.0	

Table 55

Overall Performance in EMR

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Fair	8	7.0	7.0	7.0
	Good	43	37.4	37.4	44.3
	Very Good	43	37.4	37.4	81.7
	Excellent	21	18.3	18.3	100.0
	Total	115	100.0	100.0	

Research Question Four

Do financial incentives impact the nurses' perception of EMR effectiveness?

The question about the influence of financial incentive on the perception of EMR effectiveness was reviewed as a single item because it did not match with any other scales. It has to be mentioned that 51% of the sample strongly agreed or agreed that financial incentives could influence their perception about the EMR effectiveness. Moreover, 27% neither agreed nor disagreed. Only 20.8% of the sample disagreed or strongly disagreed about the relationship of financial incentives and the EMR effectiveness (see Table 56).

Table 56

Frequency of Financial Incentive's Influence on the Perception of EMR Effectiveness

A Financial Incentive Would Influence my Perception of EMR effectiveness					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	12	10.4	10.5	10.5
	Disagree	12	10.4	10.5	21.1
	Neither Agree nor Disagree	31	27.0	27.2	48.2
	Agree	28	24.3	24.6	72.8
	Strongly Agree	31	27.0	27.2	100.0
	Total	114	99.1	100.0	
Missing	500	1	.9		
Total		115	100.0		

Research Question Five

Do nurses have sufficient training to learn how to use EMR?

It was interesting to know what percentage of the sample had sufficient training before or during EMR implementation at their hospitals. Almost 73% of the sample declared that they had sufficient training, 12.2% neither agreed nor disagreed, and 14.8% thought that they did not have sufficient training (see Table 57).

Table 57

Frequency of Sufficient Training to Learn EMR

I had sufficient training learning EMR					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	6	5.2	5.2	5.2
	Disagree	11	9.6	9.6	14.8
	Neither Agree nor Disagree	14	12.2	12.2	27.0
	Agree	65	56.5	56.5	83.5
	Strongly Agree	19	16.5	16.5	100.0
	Total	115	100.0	100.0	

Summary

This chapter presented the statistical results based on the data that were collected in the study and examined different hypotheses of nurses' perception of their performance and satisfaction. It was found that professional autonomy, privacy and security anxiety, result observability, and social patterns scales are some of the most important factors in predicting the nurses' perception of performance. Moreover, based on this study, it was revealed that the social patterns and barrier scales are good predictors for the perception of EMR satisfaction. The personality factors, years of experience, age, hospitals, and EMR applications have moderator effects on the relationship of dependent variables and independent variables. Further research implications will be discussed in the next chapter.

Chapter 5. Conclusion and Implication

Chapter 5 reviews the final results and findings of this study on the organizational and social factor relationships with the perception of performance and satisfaction with EMR. Personality factors as moderator variables are tested for the first time in this field on the relationship of organizational and social variables and the perception of performance and satisfaction with EMR. The discussion of the results is provided in this chapter. The research's implications, limitations, and future study are shown in other sections of this chapter.

Discussion

After testing different hypotheses and investigating the research questions, several valuable findings are revealed in this field of study. The following discussions present the findings of this study.

Based on the first hypothesis, there is a positive relationship between result observability and the perception of performance and satisfaction with EMR. This means that as nurses see more tangible benefits of EMR at their workplace, their perception of performance, and satisfaction with EMR will increase. Result observability is a better predictor for the perception of performance in comparison to satisfaction.

Personality factors have a moderator effect on the relationship of result observability and the perception of performance. It can be inferred that nurses with a lower level of apprehension can see the tangible benefits of result observability, and this has an impact on their perception of performance working with EMR. On the other hand, nurses with a higher level of openness can notice the concrete benefits of result observability and its relationship with the perception of performance. Based on the literature review and investigation in the

field, it is expected that nurses who have a higher level of openness and self-confidence will be more open to change and adapt more easily with the implementation of EMR technologies at their workplace. Conversely, it is also expected that nurses who have a higher level of apprehension and perfectionism will be more resistant to change and have more difficulties in adapting to a new technology.

The finding shows that nurses' age and years of experience have a dramatic impact on the relationship of result observability and the perception of performance and satisfaction with EMR. This study expects that younger generation of nurses would be more flexible with the changes and be more confident about the implementation of new technology and its benefits. This hypothesis is accepted in this study.

The results of the second hypothesis display the positive relationship between professional autonomy and the perception of performance and satisfaction with EMR. Professional autonomy is the most important predictor of perception of performance. Nurses' responses in the survey indicated that as their professional autonomy increased, their perception of performance and satisfaction with EMR increased, as well.

Personality factors have a significant moderator effect on the relationship of professional autonomy and the perception of performance and satisfaction with EMR. More self-confident nurses perceive more professional autonomy, and their perception of their performance is higher.

According to the findings of this study, younger groups of nurses perceive the relationship of professional autonomy and perception of performance more strongly than those in the older age ranges. Although, in the satisfaction relationship with professional autonomy, older age ranges strengthen this relationship. Interestingly, fewer years of

experience have a more robust impact on the relationship of professional autonomy and the perception of performance and satisfaction. It can be concluded that nurses with more years of experience need more professional autonomy, which is not met with the framework of EMR applications. Nurses with more years of experience are looking for a higher level of professional autonomy at their workplace. However, the structure of applications was designed by some third party companies, and as a computer software, EMR has a limited flexibility in order to delegate autonomy to users.

The findings of the third hypothesis reveal that there is a negative relationship between perceived barriers and the perception of performance and satisfaction. As nurses perceive fewer barriers in adaptation of EMR at their workplace, their perception of performance and satisfaction will increase.

Among different personality factors, nurses with higher self-confidence are realizing that ease of use and fewer barriers are the causes of higher perception of performance. However, nurses with the lower level of perfectionism can perceive fewer barriers and as a result, their satisfaction would be higher.

Younger groups of nurses will perceive higher performance and satisfaction with EMR, if barriers decrease. Furthermore, decreasing the number of barriers among nurses with fewer years of experience will result in increasing their perception of performance and satisfaction.

The forth hypothesis results indicate that there is an association between task structure and perception of performance and satisfaction. However, task structure is a better predictor for satisfaction rather than performance.

The findings of this study present that nurses with higher self-confidence perceive their task easier after the implementation of EMR, and as a result of this, their perception of performance in working with EMR are increased. Although, it was expected that nurses with the higher level of openness would perceive tasks as easier after the implementation of EMR, nurses with the lower level of openness are actually more likely to have an effect on the relationship of task structure and satisfaction. The result of this finding merits further study.

The results also reveal that the older groups of nurses with more years of experience observe tasks as easier, and their performance is higher. On the other hand, younger group of nurses with fewer years of experience are more satisfied with EMR after considering their task structure more straightforward.

Hypothesis 5's results show that privacy and security anxiety has a negative effect on the perception of performance and satisfaction. By accepting this hypothesis, it is stated that as the anxiety about privacy and security of health information record increased, the performance and satisfaction of working with IT applications would decrease.

This study shows that self-confident nurses are less concerned about the privacy and security of data and as a result, they have a higher perception of performance and satisfaction. Furthermore, younger nurses with fewer years of experience have less fear of privacy and losing patients' data than the older nurses. Therefore, they have a higher performance perception. There is a conflict in the relation of age and years of experience in this hypothesis. In general, younger nurses have fewer years of experience and older nurses have more. It is astounding that nurses with less years of experience and older nurses both have moderator effects on the privacy and security anxiety and satisfaction relationship.

The other accepted hypothesis in this study is the positive relationship of communication patterns and the perception of performance and satisfaction. Communication patterns among nurses with other staff and patients have changed after the implementation of new IT application in healthcare. If nurses perceived the new patterns of communication as easy to use, less complicated, and better than the paper based patterns, then they would have a higher perception of performance and satisfaction.

More self-confident nurses and nurses with the lower level of perfectionism observe the ease of use and usefulness of new communication patterns and their performance perception is higher. Contrary to the study assumption, nurses with a lower level of openness perceive the benefits of new communication patterns more and, in comparison to the higher level of openness, have a higher satisfaction.

Again, it was expected that younger nurses with less years of experience have a better opinion about the quality of new communication patterns and higher performance and satisfaction. However, the effect of age and years of experience are inconsistent with each other. Younger age groups of nurses and nurses with more years of experience recognized the quality of communication patterns after the implementation of EMR, and this affects their perception of performance. On the other hand, older age groups and nurses with fewer years of experience observe better communication patterns with EMR and have a higher satisfaction.

Although, the purpose of this study was not measuring the impact of perception of performance on satisfaction with EMR, the findings show that perception of performance and satisfaction have a significant linear relationship. The positive relationship presents that as the perception of performance increases, the satisfaction increases as well. However, there

are other important factors that have an impact on satisfaction more than perception of performance.

Interestingly, the findings of this study show that personality factors, such as openness, self-confidence, apprehension, and perfectionism, do not have a direct relationship with the perception of performance and satisfaction. However, their moderating effects on the relationship of organizational and social factors and the perception of performance and satisfaction are notable and worth investigating more in future studies.

This study also sought to find answers for five research questions. Below is the discussion of the most important predictors of nurses' perception of performance and satisfaction.

This study, by applying multivariate regression, analyzed the relationship of independent variables and the perception of performance. The results are remarkable for this question. Professional autonomy, privacy and security anxiety, result observability, and communication patterns are the most important predictors for the perception of performance relationship. One of the reasons that perceived barriers and task structure were not selected in the group of main predictors was that perceived barriers were highly correlated with result observability, task structure, and communication patterns scales and task structure scale is highly correlated with the autonomy, barrier, and communication patterns scales. Therefore, they are not as effective as other independent variables in the perception of performance relationship. The other reason was related to the reliability of task structure scale. Task structure per se was not a good scale. Although it passed the validity tests, the nurses' responses to the items of this scale were not consistent enough. Due to the unfamiliarity of younger and less experienced nurses with the workflow and work process at their workplace

and their inability to compare the new work process with the previous one, some ambiguity in their responses was observed.

Another finding refers to the important predictors in the satisfaction relationship. Communication patterns and perceived barriers are the most effective factors in the satisfaction relationship. Other predictors had a partial correlation with each other, and they were not significant contributors to this relationship. The result of this question is so consistent with the fact that, in the environment with better and easier ways of communication and fewer barriers, the employee satisfaction would be higher.

Before and during the data collection process, the researcher spoke with several nurses as a friend, as a patient, or as a researcher. Surprisingly, their stories about using EMR at their workplaces were different from the result of this study. However, all of them recognized the new IT application as huge organizational and social changes, though each had a different feeling about it. Some of them were happy about this change, some were confused, and others were unhappy. Their main complaints were about the lack of communication among health staff and patients and the time consuming process of entering data in the electronic system. Of course, different internal and external factors are contributing to their experiences with EMR. According to Satir change model, after the significant change—in this case the implementation of new IT application—the performance would decrease, and after training and increasing nurses' awareness and introducing the new possibilities and benefits, the performance would increase again and pass the performance level prior to the change. Overall, based on their written responses, almost 75 percent of the sample were satisfied with working with EMR, and 93 percent of the sample rate their perception of performance as good, very good, or excellent.

It is remarkable that based on the Satir model, the employee with more awareness and openness would be more willing to adapt to change, yet this study revealed that the higher level of self-confidence is the key factor to adapting change and perceiving the higher performance. It is noteworthy that low perfectionism and low openness are the most important personality characteristics for the nurses with the higher level of satisfaction. Another notable result is that nurses with fewer years of experience are more satisfied with the EMR applications and younger generation of nurses perceive higher performance while they are working with EMR. The findings of this study indicate that the first and second ranked hospitals have moderating effects on the perception of performance and satisfaction more than other hospitals. Also, MiChart is the most implemented EMR among different hospitals and has the most impact as a moderator variable on the perception of performance and satisfaction.

Two other outcomes of this study relate to financial incentives and sufficient training. More than half of the sample agreed or strongly agreed that financial incentives could influence their perception of EMR effectiveness. Hospitals and physicians' offices are offered financial incentives to encourage the implementation and use of EMR. However, nurses or other healthcare staff are not offered financial incentives to adopt and adapt EMR at their workplace. Furthermore, the majority of the sample declared that they had sufficient training to learn how to use EMR. Therefore, different EMR or hospitals are not performing dramatically different in terms of EMR training, and this is not an effective factor to consider as a predictor for the perception of performance or satisfaction.

Research Implication

The findings of this study demonstrate the importance of organizational and social factors in adapting new EMR applications in healthcare. The healthcare administrators and information technology managers in the healthcare industry could focus on increasing the awareness of their employees about the results and tangible benefits of EMR applications and its effects on their performance and satisfaction. EMR development companies in collaboration with healthcare administrators could design the EMR applications more flexible in terms of professional autonomy and give the healthcare staff more freedom to make decisions and deliver care to patients. Moreover, EMR companies may need to reconsider the communication patterns among healthcare staff and patients. In both groups of users who are involved in the process of using EMR, most are dissatisfied about the usage of monitor instead of looking at the patients and the lack of communications between staff in comparison with the paper-based charting system. Further, the healthcare administrators and EMR companies may need to make sure about the privacy and security concerns of users and reduce the chance of data loss and violating HIPAA compliance in EMR applications.

This dissertation has contributed to the HIT implementation field of study. First, this study examined the organizational and social factor effects on the perception of performance and satisfaction. Second, professional autonomy and task structure effects were not measured directly on the performance and satisfaction of nurses in previous studies. Third, personality factors as moderating variables investigated in this study and the high level of self-confidence and the low level of perfectionism were determined as the most important characteristics for the performance and satisfaction respectively. Fourth, age and years of experience were defined as moderating factors in this study in adapting new EMR and its

impact on their perception of performance and satisfaction. Fifth, financial incentives and EMR training effects on the perception of performance and satisfaction of nurses were measured in this study.

Limitation

Some limitations in this study are worth consideration in future studies.

The first limitation was the sample; the selected population included registered nurses, who are working in the southeast of Michigan hospitals and are currently registered in a RN+BSN program in the Winter 2016 semester. Providing a bigger sample with more variety of nurses may affect the results of this study. The second limitation is that the personality factors scale only included four specific characteristics with only five items in each scale; more types of personality with more precise measurement tools and a larger number of questions may affect the findings of this study. The third limitation is that this study used quantitative methodology. Applying some qualitative or experimental methodologies could affect the results and may clarify some findings of this study. The fourth limitation is the measurement of organizational and social factors; with a bigger research team, it is possible to consider more sub-categories in organizational and social variables and possibly discover more specific findings.

Future Research

Different researches can be conducted in the future based on the findings of this study. The main focus of this study was on nurses; however, the results of studying the perception of performance and satisfaction of physicians and administrators with EMR could be different than nurses. Extending this research to the different states and hospitals also could be a topic for the future study.

There are other organizational factors that were not mentioned in this study but worth study in the future. Moreover, technical and environmental factors contribute to the adaptation of new technology in hospitals. Studying these two factors is recommended based on the literature that was reviewed in this study.

Another possible future study is benchmarking the perception of performance and satisfaction with EMR in the United States with other countries that have already implemented EMR.

Future researchers can examine the impact of more moderating and mediating variables on the relationship of organizational and social factors other than the personality factors. They can also test a motivation and reward system as a dependent variable.

By implementing the new IT application in any organizations, employee job descriptions need to be changed. Job redesign is another possible future study in this field. Researchers can study job responsibilities and tasks after IT implementation. Job satisfaction and productivity could be studied in the job redesign context.

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Appendices

Appendix A – Descriptive Information of Personality Types

Moderating Variable		Openness	Apprehension	Self Confidence	Perfectionism
Mean		17.41	18.23	19.38	13.50
Variance		7.94	12.83	5.86	3.49
Normality	Skewness	-.701	-.539	.393	-.298
	Kurtosis	1.388	.536	-.018	.293
Minimum		7	7	14	8
Maximum		25	25	25	18
Missing		2	0	2	0
Recode Range	Low	7-17	7-17	14-19	8-13
	High	18-25	18-25	20-25	14-18
Percent	Low	%43.5	%34.8	%50.4	%45.2
	High	%54.8	%65.2	%47.8	%54.8

Appendix B – Dissertation Survey

In this study the Electronic Medical Records (EMR) is interchangeable with the Electronic Health Record (EHR). Each hospital has its own vendor for installing these applications. Please answer the following questions based on the customized EMR systems that is installed in the hospital or healthcare facility that you are working now.

1- What is your gender. ☐Female ☐Male ☐Others

2- What is your age. --------

3- Which degree are you seeking for. ☐RN+BSN ☐Masters

4- Name of hospitals or healthcare facility that you are working----------

5- Approximately, what year did you become an RN. --------Years -------Months

6- Are you currently using any types of Electronic Medical Record applications?

☐Yes ☐No

If yes, how long have you been working with EMR. --------Years ------Months

7- What is the title of your job? ----------

8- What is the name of the applications that you most often use for recording the patient information?

☐Electronic Medical Record (EMR)

☐MiChart (Epic) or MyChart Epic Health System

☐Cerner PowerChart (Cerner Millennium)

☐CIS PowerChart (Clinical Information System)

☐NextGEN Platform

☐Others (Please specify) ----------

Please indicate your agreement or disagreement with each of the following items. (Please check one for each row.)	**1 Strongly Disagree**	**2 Disagree**	**3 Neither Agree/Disagree**	**4 Agree**	**5 Strongly Agree**
1-I can see the tangible benefit of the Electronic Medical Record (EMR) in comparison with the old system					
2-I am aware of the objectives of the Electronic Medical Record (EMR) implementation in our workplace					
3-Using the Electronic Medical Record (EMR) has had a positive impact on the patient quality of care					
4-If I received a financial incentive, it would influence my perception of the effectiveness of the Electronic Medical Record (EMR)					

Please indicate your agreement or disagreement with each of the following items. (Please check one for each row.)	**1 Strongly Disagree**	**2 Disagree**	**3 Neither Agree/Disagree**	**4 Agree**	**5 Strongly Agree**
5-I believe using the Electronic Medical Record (EMR) at work improves my chances of getting a promotion					
6-Using the Electronic Medical Record (EMR) has limited my freedom (autonomy) at work					
7-The Electronic Medical Record (EMR) has undermined my ability to find my own solutions at work					

Please indicate your agreement or disagreement with each of the following items. (Please check one for each row.)	**1 Strongly Disagree**	**2 Disagree**	**3 Neither Agree/Disagree**	**4 Agree**	**5 Strongly Agree**
8-In general, I have found that the Electronic Medical Record (EMR) is complicated					
9- In general, I have found that it is difficult for me to learn how to work with the Electronic Medical Record (EMR)					
10-I believe I had a sufficient training to learn how to use the Electronic Medical Record (EMR)					
11-I had a sufficient time for transition to the Electronic Medical Record (EMR)					
12-Using the Electronic Medical Record (EMR) in my job, has increased my workload					
13-I am satisfied with the amount of technical support that is provided for the Electronic Medical Record (EMR)					
14-Recording patient's information with the Electronic Medical Record (EMR) takes reasonable amount of time					

Please indicate your agreement or disagreement with each of the following items. (Please check one for each row.)	**1 Strongly Disagree**	**2 Disagree**	**3 Neither Agree/Disagree**	**4 Agree**	**5 Strongly Agree**
15-I have a clear understanding of what is expected of me at work					
16-The implementation of the Electronic Medical Record (EMR) changed the workflow within my work unit					
17-The implementation of the Electronic Medical Record (EMR) added steps to the work process within my work unit					
18-The the Electronic Medical Record (EMR) does not fit with the existing work process within my work unit					
19-My RN duties are overlapping with other medical staff after the Electronic Medical Record (EMR) implementation					

Please indicate your agreement or disagreement with each of the following items. (Please check one for each row.)	**1 Strongly Disagree**	**2 Disagree**	**3 Neither Agree/Disagree**	**4 Agree**	**5 Strongly Agree**
20- I am anxious about losing patient data when using the Electronic Medical Record (EMR)					
21- I am afraid of violating the HIPAA Privacy Rule when using the Electronic Medical Record (EMR)					
22- The Electronic Medical Record (EMR) has a sufficient level of security					

Please indicate your agreement or disagreement with each of the following items. (Please check one for each row.)	**1 Strongly Disagree**	**2 Disagree**	**3 Neither Agree/Disagree**	**4 Agree**	**5 Strongly Agree**
3The Electronic Medical Record (EMR) requires that I communicate more with my co-worker(s) via its interface					
24-Communication via the Electronic Medical Record (EMR) takes more time in comparison with the face-to-face communications					
25-Communicating with my supervisor via the Electronic Medical Record (EMR) has reduced the number of our misunderstandings					
26-I have to spend more time looking at the monitor instead of looking at the patient					
27-The Electronic Medical Record (EMR) gives me more information about the patient					
28-While I am working with the Electronic Medical Record (EMR) and talking with the patient, it seems that the patient feels good about this communication					

Please indicate your agreement or disagreement with each of the following items. (Please check one for each row.)	**1 Strongly Disagree**	**2 Disagree**	**3 Neither Agree/Disagree**	**4 Agree**	**5 Strongly Agree**
29-I am original, coming up with new ideas					
30-I am curious, like to learn new things					
31-I am intelligent , a deep thinker					
32-I prefer work that is not routine					
33-I am sophisticated in art, music, or literature					

	1 Strongly Disagree	**2 Disagree**	**3 Neither Agree/Disagree**	**4 Agree**	**5 Strongly Agree**
34-I have almost uncontrollable fears or distastes for some things, e.g., an animal, a particular place, etc.					
35-I have strong emotional moods, e.g., anxiety, laughter, sadness, etc.					
36-I am easily upset by discouraging circumstances					
37-I like to have responsibility					
38-I have good physical endurance					

	1 Strongly Disagree	2 Disagree	3 Neither Agree/Disagree	4 Agree	5 Strongly Agree
39-I am confident in my own ability to deal with life					
40-When I do something myself, I take pride in doing it alone					
41-I care more about my own self-perception rather than what other people think of me					
42-I am confident in my own ability to learn a new task without help					
43-I trust myself					

	1 Strongly Disagree	2 Disagree	3 Neither Agree/Disagree	4 Agree	5 Strongly Agree
44-It is important to me that tasks are done just right					
45-I would do a task again if it is not done correctly					
46-I keep working on a task until I feel it is perfect					
47-I believe the quality of my work reflects the quality of my character					
48-I don't try anything new unless I am sure I can do it					

Using the Electronic Medical Record (EMR) at work has increased my ability to	**1 Strongly Disagree**	**2 Disagree**	**3 Neither Agree/Disagree**	**4 Agree**	**5 Strongly Agree**
49- Record patient demographics (sex, ethnicity, date of birth, date and preliminary cause in the event of death)					
50- Record vital signs and chart changes (height, weight, blood pressure, and body-mass index)					
51- Maintain up-to-date lists of current problems and active diagnoses					
52- Maintain current medication and medication allergy list					
53- Record patient's habits like smoking, drinking, etc.					
54-On request, I can easily provide patients with clinical summaries or a copy of their health information (including diagnostic-test results, problem list, medication lists, medication allergies)					

Please indicate your agreement or disagreement with each of the following items. (Please check one for each row.)	**1 Strongly Disagree**	**2 Disagree**	**3 Neither Agree/Disagree**	**4 Agree**	**5 Strongly Agree**
55-I am satisfied with the ease of data entry with the Electronic Medical Record (EMR)					
56-I am satisfied with the ability of accessing and working with data with the Electronic Medical Record (EMR)					
57-I am satisfied with the technical skills that I have learned after using the Electronic Medical Record (EMR)					
58-I am satisfied with the output of the Electronic Medical Record (EMR)					
59-Overall, how would you rate your satisfaction with the Electronic Medical Record (EMR)	**1 Poor**	**2 Fair**	**3 Good**	**4 Very Good**	**5 Excellence**
60-Overall, how would you rate your performance working with the Electronic Medical Record (EMR).					

Comments: ----------

Appendix C – Human Subject Approval

RESEARCH @ EMU

UHSRC Determination: **EXEMPT**

DATE: **March 21, 2016**

TO: **Sadaf Ashtari**
College of Technology
Eastern Michigan University

Re: **UHSRC: # 875215-1**
Category: Exempt category *2*
Approval Date: March 21, 2016

Title: **How the Nurses Perceived the Impact of IT Applications on Their Performance: Examining the Organizational, Social and Personal Factors**

Your research project, entitled **How the Nurses Perceived the Impact of IT Applications on Their Performance: Examining the Organizational, Social and Personal Factors,** has been determined **Exempt** in accordance with federal regulation 45 CFR 46.102. UHSRC policy states that you, as the Principal Investigator, are responsible for protecting the rights and welfare of your research subjects and conducting your research as described in your protocol.

Renewals: Exempt protocols do not need to be renewed. When the project is completed, please submit the **Human Subjects Study Completion Form** (access through IRBNet on the UHSRC website).

Modifications: You may make minor changes (e.g., study staff changes, sample size changes, contact information changes, etc.) without submitting for review. However, if you plan to make changes that alter study design or any study instruments, you must submit a **Human Subjects Approval Request Form** and obtain approval prior to implementation. The form is available through IRBNet on the UHSRC website.

Problems: All major deviations from the reviewed protocol, unanticipated problems, adverse events, subject complaints, or other problems that may increase the risk to human subjects **or** change the category of review must be reported to the UHSRC via an **Event Report** form, available through IRBNet on the UHSRC website

Follow-up: If your Exempt project is not completed and closed after **three years**, the UHSRC office will contact you regarding the status of the project.

Please use the UHSRC number listed above on any forms submitted that relate to this project, or on any correspondence with the UHSRC office.

Good luck in your research. If we can be of further assistance, please contact us at 734-487-3090 or via e-mail at human.subjects@emich.edu. Thank you for your cooperation.

Sincerely,

Sonia Chawla, PhD
Research Compliance Officer

RESEARCH @ EMU

Determination: **EXEMPT REQUEST FOR REVISIONS**

DATE: **March 18, 2016**

TO: **Sadaf Ashtari, PhD**
Eastern Michigan University

Re: **UHSRC: # 875215-1**
Category: Exempt

Title: **How the Nurses Perceived the Impact of IT Applications on Their Performance: Examining the Organizational, Social and Personal Factors**

Your project entitled **How the Nurses Perceived the Impact of IT Applications on Their Performance: Examining the Organizational, Social and Personal Factors** qualifies for Exempt review. In order to ensure compliance with EMU policy, the following revisions must be made:

Consent form:

1. The protocol states that signed consent will be obtained, but the consent form does not have signature lines. Signed consent is not required (the study is Exempt). The PI should change the application and protocol to state that signed consent will not be obtained and change the last sentence of the consent form to "By completing the survey, I indicate my consent to participate."

2. The Voluntary Participation section states "You may request, in writing, that your identifiable information be destroyed." This sentence should be removed, as the PI is not collecting identifiable information.

Please respond to each point above, point-by-point, in a cover letter and submit **two** copies of the revised consent form: one copy with changes highlighted or otherwise tracked and a second clean copy.

You may **not** begin human subject research on this study until your response has been reviewed and you have received your final determination letter.

If you have any questions, please contact the UHSRC at human.subjects@emich.edu or 734-487-3090.

Sincerely,

Sonia Chawla, PhD
Research Compliance Officer