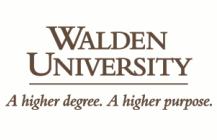

2015

An Examination of Physician Resistance Related to Electronic Medical Records Adoption

Terrence Duncan
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This is to certify that the doctoral study by

Terrence Duncan

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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2015

Abstract

An Examination of Physician Resistance Related to Electronic Medical Records Adoption

by

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MBA, Park University, 2006

BS, Park University, 2003

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Business Administration

Walden University

August 2015

Abstract

The 2009 American Recovery and Reinvestment Act, signed under the Obama administration, mandated physicians to complete certification for electronic medical records (EMRs). Despite these mandates and the increased access to information technology, slow adoption rates persist on the use of EMRs. Guided by the theory of planned behavior and the technology acceptance model, the purpose of this quantitative study was to examine the relationship between the independent variables perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, attitudes toward EMR, and the dependent variable user acceptance. This study identified physicians in the United States as end-users of EMRs. In this study, 76 randomly selected physicians in the United States, identified as end-users of EMRs, completed an electronic survey requiring responses to a 5-point Likert Scale model. Standard multiple regression analysis served as the means used to analyze the regression model. Despite the regression model being statistically significant, none of the individual independent variables had statistical significance in predicting user acceptance. Interdependence and homoscedasticity likely contributed to this phenomenon. Social change implications include understanding of physician perceptions and beliefs--how physician perceptions and beliefs affect EMR adoption. Because adoption rates did not achieve 100% certification by end-users, another social change implication includes the necessity of examining how end-user acceptance could decrease medical errors, increase efficiencies in physician workload, and improve communication within the health care industry.

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Dedication

Without my Lord and Savior, Jesus Christ, finishing this doctoral study was not possible. For the trials, challenges, and tribulations I have experienced, His strength has guided me from beginning to end. This journey would never been completed without His guiding hand.

I dedicate this journey to my two wonderful sons, Jaylen and Isaiah Duncan. I acknowledge everyone who has assisted me in this journey. I call it a journey, as this process was a test of strength, will, character, and faith. I thank my wife, Renee Picot-Duncan, and my parents, CMSGT (Retired) Walter Duncan, Jr. and Dr. Ella M. Duncan, for their continued support, faith, and love. I also thank my brother and sister who provided me balance in perspective, Reginald and April Duncan. Special thanks to my family, friends, and colleagues who provided emotional support and encouragement through this journey: Mr. and Mrs. Frank and Tammi Picot, Mr. and Mrs. Michael and Mary Picot, and Lonnie Pirtle. Additional thanks to my supportive friends: Fritz Bush, Angello Campbell, Dr. Wayne Richards, Deidra Moore, Trina Jimmar, Deangelo Smith, Adenike Dodolewa, Dr. David Weitz, Kim Hills-Stone, Rachel Seipel, Bridget Havens, Damon Selvey, Kevin McCarty, and Brandon Palmer.

Finally, I acknowledge and thank my committee for their assistance in seeing me through this journey, Dr. Eric Massey, who has also become a friend, Dr. Michael Ewald, Dr. Judith Blando, Dr. Reginald Taylor, and Dr. Freda Turner, and Walden University. For those who I did not name, family and friends I may have omitted, I apologize, but know that you helped shape this journey.

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Section 1: Foundation of the Study

Health care costs in the United States have increased quickly since the 1980s. Such costs affect the national economy, as well as the operations and workflow of physicians. Despite being the largest health care system in the world, several problems exist. In 2009, $2.2 trillion, or approximately 17.3% of the U.S. gross domestic product (GDP) consisted of health care spending (Zhang et al., 2013). Researchers at the Congressional Budget Office and the Centers for Medicare and Medicaid Services Office of the Actuary reported that spending grew 3.9% in 2011, with health care accounting for 17.9% of the economy (Goozner, 2013). An additional $4.5 trillion, or 19.3%, of the U.S. GDP projected by 2019 illustrates the necessity of identifying ways to control and contain costs (Zhang et al., 2013).

Despite the widespread implementation of technology in numerous industries, the health care industry has deficiencies. Results from a 2009 survey for the American College of Physician Executives indicated 42% of physicians used electronic prescriptions. Of the physicians who used or planned to use information technology (IT), 33% stated IT reduces liability and medical errors, 28% said IT led to more accurate recordkeeping, and 21% were trying to stay current (Weimar, 2009). Improved technology could have helped to avoid approximately 20% of duplicate laboratory orders and other medical processes (Huerta, Thompson, Ford, & Ford, 2013).

The signing of the 2009 ARRA mandated the adoption of electronic medical records (EMRs) by physicians in different practices that affected the health care industry. The challenges of meeting this mandate spanned several areas, such as fragmentation of

the health care industry and delivery systems, end-user acceptance, and barriers to adoption (Fontenot, 2014). The goal of this study was to examine, in detail, the factors that led to the slow rate of EMR adoption by end users.

Background of the Problem

A 2001 Institute of Medicine reported indicated that more people in the United States died from medical errors than from major illnesses, highway accidents, and work-related injuries. The findings from this particular report emphasized that redesigning systems to use IT more efficiently would lead to safer and higher quality care (Honoré et al., 2011; Kellermann & Jones, 2013). Medical errors cause approximately 44,000 deaths in the United States annually (Patel et al., 2012). The medical errors result from process errors and failing to provide recommended treatment plans. Medical errors are a significant area to address, as health care costs in the United States comprise an estimated 17% of the GDP (Malhotra & Lassiter, 2014).

Major barriers affecting the reform of health care delivery systems include lack of technological advances, innovation, user involvement, and a negative financial effect on operations (Murphy, 2011). Since the mid-1990s, these barriers have remained consistent as additional researchers continued to address the problem (Illie, Van Slyke, Parikah, & Courtney, 2009; Kane & Borgatti, 2011; Thakur, Hsu, & Fontenot, 2012). The 2001 Institute of Medicine report served as the virtual blueprint for this study, as the authors called for significant improvements, innovation, and advancements to health care delivery systems.

This study included a detailed and structured look into the relationships between end users and technology and into how such a correlation has affected health care delivery systems. The effort and push toward sustainable IT systems in other business processes made similar efforts within the health care system important. As significant technological advances in numerous industries and business models continue, an exploration of the relationship between technology and health care delivery systems was necessary to determine if such relationships benefited efforts related to IT adoption. A developed understanding of the relationships and their end users was critical to determine what future policy or actions to implement to expedite the development of improved delivery systems.

Problem Statement

Despite approximately $30 billion in incentives available in the health care industry, providers have not fully embraced the adoption of EMRs (DesRoches, Worzala, & Bates, 2013). The ARRA referred to the need to reduce excessive spending by enacting a mandate for EMR adoption by providing incentives for implementation by 2011 and penalties for providers not certified by 2015. The general problem is that despite estimated potential savings of $200-300 billion per year due from EMR adoption, health care providers have been relatively slow in adopting the technology (Bruen, Ku, Burke, & Buntin, 2011; DesRoches et al., 2013; Harrington, Kennerly, Johnson, & Snyder, 2011). The specific problem is some providers do not understand the relationship between their perceptions of perceived ease of use, perceived usefulness,

perceived behavioral control, perceived social influence, attitudes toward EMRs, and user acceptance.

Purpose Statement

The purpose of this quantitative correlational study was to examine the relationship between physician perceptions, as end users of EMRs and related to EMR adoption. The independent variables were perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, and attitudes toward EMRs. The dependent variable was end-user acceptance of EMRs. The target population was physicians in the United States. Physicians were the selected population based on the focus within the ARRA on EMR adoption and physician reimbursement implications resulting from not obtaining certification by 2015. The implications for positive social change are the additional insights provided to the challenges associated with technology adoption.

Nature of the Study

The qualitative method involves open-ended data and fact finding through interviews or observations of the targeted population (Hatton, Schmidt, & Jelen, 2012). A qualitative method received consideration for this study but was not suitable because interviewing participants would have been difficult. The general daily activities of the participants made it difficult to conduct interviews based on the population's workload and the uncertainties of the population's work schedule.

Mixed-methods studies involve both qualitative and quantitative research (Bryman, 2012). When performing a mixed-methods study, the qualitative method

occurs first, and the development of the quantitative method derives from a survey based on the qualitative data (Bryman, 2012). Despite the potential for additional examinations of barriers to adoption, a mixed-methods study would have been difficult to conduct because of the time extra it would have taken to complete the study.

I selected a quantitative correlation design for this study. A nonexperimental design was suitable based on the intent to examine whether or how the variables correlated (Bryman, 2012; Field, 2013). As the nature of the study was to examine the relationship between the variables, a nonexperimental correlation design was suitable. An experimental design was not appropriate for this study, as it would have been necessary to examine a manipulative variable or a treatment applied to a participant group (Bernard, 2013). An experimental design was not ideal for this study based on the research question did not require manipulating a variable or applying a treatment to a participant group. A nonexperimental design was suitable based on the intent to examine whether a correlation existed among the variables (Bryman, 2012; Field, 2013). A nonexperimental correlation design was most suitable for this study, as the nature of this study was to examine the relationship between the variables.

Research Question

The central question for this study was as follows: What is the relationship between physician perceptions and user acceptance towards EMR adoption? Perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, and attitudes toward EMR were the independent variables, and user acceptance was the dependent variable. To obtain an understanding of the relationship between end-

user perceptions and the adoption of IT in health care delivery systems, appropriate research questions were necessary. The research questions provided below prompted testable hypotheses:

RQ1: What is the relationship between physicians' perceived ease of use of EMRs and user acceptance of EMR adoption?

RQ2: What is the relationship between physicians' perceived usefulness of EMRs and user acceptance of EMR adoption?

RQ3: What is the relationship between physicians' perceived behavioral control and user acceptance of EMR adoption?

RQ4: What is the relationship between physicians' perceived social influence and user acceptance of EMR adoption?

RQ5: What is the relationship between physicians' attitudes toward EMRs and user acceptance of EMR adoption?

Hypotheses

The dependent variable was end-user acceptance. The independent variables were as follows: perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, and attitudes toward EMR. The hypotheses follow:

$H1_0$: There is no relationship between physicians' perceived ease of use of EMRs and end-user acceptance.

$H1_a$: There is a relationship between physicians' perceived ease of use of EMRs and end-user acceptance.

$H2_0$: There is no relationship between physicians' perceived usefulness of EMRs and end-user acceptance.

$H2_a$: There is a relationship between physicians' perceived usefulness of EMRs and end-user acceptance

$H3_0$: There is no relationship between physicians' perceived behavioral perception toward EMRs and end-user acceptance.

$H3_a$: There is a relationship between physicians' perceived behavioral perception toward EMRs and end-user acceptance.

$H4_0$: There is no relationship between physicians' perceived social influence toward EMRs and end-user acceptance.

$H4_a$: There is a relationship between physicians' perceived social influence toward EMRs and end-user acceptance.

$H5_0$: There is no relationship between physicians' attitudes toward EMRs and end-user acceptance.

$H5_a$: There is a relationship between physicians' attitudes toward EMRs and end-user acceptance.

Interview/Survey Questions

As the purpose of this quantitative correlational study was to examine end-user resistance toward EMR adoption, the questions designed for this study captured the data needed for ongoing analysis. The statements related to the independent variables appear in Appendix A. Participants responded to the statements by marking the appropriate response using a 5-point Likert-type scale. The questions relating to the participants'

demographics and characteristics were not open ended. Participants responded to the following questions prior to selecting their responses for the statements related to the independent variables:

1. Please indicate your gender.

____ Male

____ Female

2. What age group are you in?

____ 30 years old or younger

____ 31 to 40

____ 41 to 55

____ 56 years or more

3. Please indicate the appropriate type of practice you are associated with.

____ General Practice

____ Emergency/Operating Room

____ Orthopedic/Occupational Medicine

____ Dental Surgery/Medicine

____ Physician Assistants

____ Other (specify)_____

4. Please indicate the size of your practice.

____ Solo

____ Two or three physicians/Small practice physician group

____ Academic/University hospital group

____ Large provider group (Health systems/large hospital facility)

5. Please indicate the length of time you have been practicing medicine.

____ 0 to 5 years of practice

____ 6 to 10 years of practice

____ 11 to 15 years of practice

____ 15 to 20 years of practice

____ 21 years of practice or more

6. Please indicate the type of population environment that best fits your location.

____ Urban/metropolitan

____ Rural

7. Are you EMR certified as mandated under the 2009 American Reinvestment and Recovery Act?

____ Yes (100% certified/operable)

____ Will be certified before 2015

_____ May be certified relatively soon after 2015

_____ Have not started/significant delay after 2015

After determining the demographics of the participants, participants responded to a series of statements based on a Likert-type scale. The range of the responses was from 5 for *strongly agree* to 1 for *strongly disagree*. The response to the statements related to the respective independent variables: perceived ease of use, perceived usefulness,

perceived behavioral control, perceived social influence, and attitudes toward EMR. The statements are in Appendix B.

Theoretical Framework

Studying the adoption of EMRs and the individual attitudes and behavior toward new IT necessitated a review of several theoretical models. Such models included the innovation diffusion theory, technology acceptance model (TAM), theory of reasoned action, and theory of planned behavior (TPB, Ajzen, 1988; Barnett, Pearson, Pearson, & Kellermanns, 2014; Davis, Bagozzi, & Warshaw, 1989; Zemore & Ajzen, 2014). Researchers have used these theories in a variety of studies relating to electronic records adoption and its effect on end users (Illie et al., 2009; Seeman & Gibson, 2009).

The focus of TAM is the behavioral intention to use a system affected by two beliefs: perceived usefulness and perceived ease of use. The focus within TAM is the effects on external variables, such as development process, training, and system characteristics by perceived ease of use (Barnett et al., 2014; Davis et al., 1989). The TPB is a theoretical model that posits behavioral control reflects an individual's belief regarding the ease of performing or completing a task (Ajzen, 1988; Seeman & Gibson, 2009). Both models derived from the theory of reasoned action.

The purpose of TAM is to examine computer use behavior. The theoretical framework of TAM is from the theory of reasoned action to determine the causal relationships between perceived usefulness and perceived ease of use and users' attitudes, intentions, and computer adoption behavior (Davis et al., 1989). When users develop a positive attitude toward a technology, they perceive it to be useful, as well as easy to use.

Under TAM, perceived use and perceived ease of use are variables to determine user acceptance. The focus of perceived usefulness is how a person believes that use of a particular type of technology improves job performance. Perceived ease of use indicates that a person believes using a particular type of technology will be free of effort (Barnett et al., 2014; Davis et al., 1989). Perceived usefulness is also a fundamental driver of user intentions; therefore, the influence changes over time with increased experience using the system (Barnett et al., 2014; Davis et al., 1989).

Despite the frequency with which researchers have used TAM to study information systems and user influence, noted limitations exist (Cheung & Vogel, 2013). A reliance on this theory can result in several dysfunctional outcomes, including overlooking important phenomena, ignoring IT artifact design and evaluation, identifying the full range of consequences of IT adoption with little investigation, and limited usefulness in the evolution of the IT adoption context (Cheung & Vogel, 2013; Venkatesh, Thong, & Xu, 2012). As TAM does not account for personal and social influences, a reliance on TAM by itself results in a major limitation for its intended result (Teo, 2011).

A combination of TPB, TAM, and other theories is beneficial to perform an analysis of predicting the acceptance of EMRs (Seeman & Gibson, 2009). Seeman and Gibson used the central constructs of TAM relating to perceived ease of use and perceived usefulness of EMRs. Seeman and Gibson used the central constructs of TPB relating to perceived behavioral control, attitudes toward EMR technology, perceived social pressure regarding EMR use, and relative advantages offered by EMR rather than

traditional written records and the relative advantage construct derived from the diffusion theory items. A combination of the theories could explain greater amounts of variance than the often-used TAM construct perceived ease of use.

The effects of IT in health care are the focus of numerous studies. Researchers used the most popular and commonly used model, TAM, in studies in which the variables were often perceived use and perceived ease of use (Illie et al., 2009; Moores, 2012; Terzis & Economides, 2011). The focus of TPB was behavioral control, attitudes, and perceived social pressure toward IT adoption. Both theories derived from the theory of reasoned action. A review of the purposes of both theories and of how similar they are in scope revealed that combining both theories was beneficial for this study.

Definition of Terms

Clinical informatics: Clinical informatics describes the use of computers and other related software to manage, store, and share clinical information (Garcia-Smith & Effken, 2013).

Electronic health record (EHR): An electronic health record refers to the health care record captured in digital format with information exchanged between other digital systems of health care facilities (Bruen et al., 2011).

Electronic medical record (EMR): An electronic medical record refers to the health record used to gather, store, retrieve, and analyze medical information; synonymous with EHR (Richards, Prybutok, & Ryan, 2012).

End-user: An end-user describes the last person in the process of using IT. The end-user is identified as an important participant in TAM and TPB models (Ajzen, 1988; Illie et al., 2009).

Independent practices: Independent practices are practices where physicians operate independently from hospitals. Physicians of independent practices perform services of care within hospitals on a contractual basis (Sherer, 2010).

Integrated health care: An integrated health care is a complex phenomenon encompassing health care as an entity that follows economic functionalities relating to financing with multiple providers and encompassing coordinated activities for patients' benefits that function synchronously (Strandberg-Larsen & Krasnik, 2009).

Technology acceptance model: The technology acceptance model is an information systems theory with a focus on user acceptance and using a specific technology (Davis et al., 1989).

Theory of planned behavior: The theory of planned behavior is a predictive model theory with a focus on the link between user behavior and beliefs (Ajzen, 1988).

Assumptions, Limitations, and Delimitations

Assumptions

Physicians tend to be pragmatic in their attitudes and perception toward technology use based on the usefulness of the technology. Assumptions within this study were that such barriers to adoption would include some form of psychological barriers, such as resistance to change and introduction to a new concept that alters the affected parties, as well as barriers from a technical standpoint (Bishop, Press, Mendelsohn, &

Casalino, 2013). I assumed that all participants in this study were physicians currently practicing within the health care industry and voluntarily participated. Another assumption was that physicians' personal preferences would affect the selections made throughout the survey. A final assumption was the survey responses by the participants were honest and forthcoming as confidentiality and anonymity were preserved.

Limitations

Technology acceptance model and the theory of planned behavior are effective models to use to determine why there are problems associated with EMR adoption exist. Despite the use of theories for this study, limitations existed. A limitation for this study using these theories do not account for external factors and emotional habits of the participants (Rocheleau, 2013; Sherer, 2010; Venkatesh et al., 2012). Time was another limitation for this study. I conducted the survey prior to the 2015 mandate, and participant responses may vary if administered at a different time. Another limitation for this study was the method selected. Use of a quantitative method does not address emergent thoughts and feelings of the participants.

Delimitations

The boundary for this study was the health care industry, with physicians as the focal point. Despite the use of EMRs by different professionals such as nurses, administrative staff, and managers, the focus of this study was physicians as participants. Selecting physicians as the survey participants was effective, as their workload and decisions relating to IT have a significant effect in operations and health care delivery (Sherer, 2010). The focus of the study was on physicians who, according to the ARRA

and the U.S. Department of Health and Human Services, are responsible for adopting and implementing EMRs and earning certification by the Certification Commission for Health IT by 2015 (Bardhan & Thouin, 2013; Hoffman & Podgurski, 2011). This delimitation excludes physicians in different specialties as identified under ARRA.

Significance of the Study

Contribution to Business Practice

Although EMRs and other electronic records are available, physician throughout the United States have not widely accepted and implemented them. The ARRA mandated certified EMR implementation and use before 2015. With low adoption rates nationwide, an apparent problem with adoption of the technology exists; but, researchers and those responsible for implementation do not know all the reasons or answers. Researchers have conducted numerous studies on the problem. In this study, I addressed gaps relating to (a) small practice physicians and their lack of accessibility to the resources required to implement electronic records adoption (Illie et al., 2009); (b) user participation, prior use, and previous user experience; and (c) barriers to EMR adoption (Heselmans et al., 2012).

Implications for Social Change

Several barriers exist regarding EMR adoption. Despite these noted barriers, additional research was necessary to address the root causes of delays regarding adoption (Gagnon et al., 2014). With health care costs consuming 17% of the national GDP, reducing health care costs may provide immediate benefit to the U.S. economy. Upon examination of the correlations of the barriers to adoption from physicians, developers of additional business policy and discussions for those at the advocacy level may benefit

from the study results. If the recommendations and the intended output related to this study become a part of some business decisions, an enhanced health care delivery system could result. Such changes and a review of policies could help physicians with smaller practices to create competitive advantages in their respective markets, reduce errors, and increase productivity while using fewer resources. By taking advantage of these efficiencies and eliminating the cognitive functions associated with health care IT (e.g., EMR, EHR, and information transfer), physicians and the affected stakeholders may benefit.

A Review of the Professional and Academic Literature

A review of the professional and academic literature provided a foundation for this study. The review revealed the need for the study, and the research cited helped to emphasize the factors considered in the study. The literature review involved an exhaustive web-based review using several databases.

Database searches resulted in numerous scholarly, peer-reviewed articles and other pertinent publications from databases including ABI Inform Global, Academic Search Complete, Business Source Complete, CINAHL, EBSCO, MEDLINE with Full Text, ProQuest, and Science Direct. *ARRA* and *federal government intervention, health care system framework, health care delivery systems, IT in health care settings, adoption of IT in health care*, and *end-user effects*. Books and other pertinent materials related survey methods received consideration as well. A breakdown of the search results appears in Appendix C.

American Reinvestment and Recovery Act of 2009

Federal privacy laws and agencies contribute to shaping the health care landscape and provide protective legal rights for patients. These laws and agencies help design policy and monitor compliance for the industry. The Health Insurance Portability and Accountability Act of 1996 (HIPAA) is an important piece of legislation in health care. Despite the use of HIPAA to protect patients' rights, the application and interpretation of HIPAA has a limitation concerning IT because HIPAA does not address the evolution of the digital age and e-health in the health care industry, particularly with electronic records such as EMRs and EHRs (Martin, Lassman, Washington, & Catlin, 2012).

The focus of ARRA was to improve IT in health care delivery settings. The foremost challenge in executing this legislation was the reluctance of physicians to implement different types of IT (DesRoches et al., 2013). The reluctance to adopt new technology existed prior to the signing of the act, which necessitated an examination of this matter (Hoffman & Podgurski, 2011). To gain a better understanding of this problem, an examination of the relationships among those responsible for the decision-making associated with the use of IT was necessary.

External factors affect the rate of EMR adoption. Despite the external factors designed to influence adoption, such as pay-for-performance programs, government agencies such as the Centers for Medicare and Medicaid Services, outside vendors, and government legislation, such factors may not translate into swifter or more efficient rates of adoption. In response to this problem, federal health IT policy makers focused on promoting technical interoperability, privacy, and security (Liu & Zhu, 2013). The

requirement within the ARRA that health care providers must earn EMR certification before 2015 enhanced the technology adoption dilemma. Medicare and Medicaid costs could represent 25% of the U.S. economy by 2050, with a 2% annual GDP growth rate if the problem remains unaddressed (Sairamesh et al., 2011).

The federal government legislated emphasis and incentives for data sharing among multiple care providers through ARRA. Launching multiple pilot programs and integrating the numerous independent units and physicians could help decrease medical errors in documentation and create patient care plans. Policy interoperability is critical as multiple policy barriers and underexplored areas are available.

In 2009, President Obama pledged more than $50 billion for the next 5 years toward health IT and almost $20 billion in the 2009 economic stimulus package in the ARRA to assist providers making the initial push (Diana et al., 2014). However, the legislation did not affect all who practice medicine. Eligible physicians under ARRA include doctors of medicine, osteopathy, and dental surgery, as well as podiatrists, optometrists, chiropractors, and physician assistants. The legislation excluded hospital-based professions such as pathologists, emergency room physicians, and anesthesiologists.

As part of the certification process, the ARRA included definitions of the criteria for meaningful use, which were as follows: (a) improve quality, safety, and efficiency, and reduce health disparities; (b) engage patients and families; (c) improve care coordination; (d) improve population and public health; and (e) ensure adequate privacy and security protections for personal health information (Friedman, Parrish, & Ross,

2013; Murphy, 2011). The ARRA includes 14 core objectives for hospitals and 15 for providers (Friedman et al., 2013; Murphy, 2011). If the providers and hospitals do not meet the meaningful use criteria, they face financial penalties under the legislative act.

A nationally interoperable EMR system includes information synchronized among payers, patients, and providers. The ARRA and its federal funding led to the designation of regional centers to help practicing physicians select a certified EHR system, achieve implementation, modify clinical and administrative workflow, and achieve compliance (DesRoches et al., 2013, Diana et al., 2014). This federal funding helped to promote a national program for health IT implementation and use and assisted with redesign efforts.

The Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009, which is a part of the federal stimulus bill, provides the allocation of funding for different providers (DesRoches et al. 2013; Diana et al., 2014). The federal government has provided approximately $600 million to assist in the development of essential financial resources for the IT infrastructure (Yeager, Walker, Cole, Mora, & Diana, 2014). The investment by the federal government was to encourage the adoption of EMRs.

Despite the enactment of HITECH and ARRA, these acts did not follow organizations whose leaders have adopted and effectively implemented a health information exchange. The focus of ARRA is to demonstrate improved quality, cost efficiency, and population health using health IT in communities with high rates of IT adoption (Smith, Bradley, Bichescu, & Tremblay, 2013; Yeager et al., 2014). Despite the

availability of federal funds, providers have not embraced the opportunities. For example, 60% of hospital exchange reports transmit through a health information exchange, whereas a 40% exchange rate exists among clinical care summaries (Yeager et al., 2014).

Members of the health care community have created new measures regarding how to help physicians meet the meaningful use criteria. The rules, initially developed and published in 2010, outline meaningful use objectives (Graham-Jones, Jain, Friedman, Marcotte, & Blumenthal, 2012). The Department of Health and Human Services and the Centers of Medicare and Medicaid Services further addressed meaningful use objectives by making the objectives a part of their ongoing accreditation process. By developing such initiatives and examining additional opportunities, more options became available to assist physicians who meet the meaningful use criteria (Graham-Jones et al., 2012).

Electronic records adoption and the concept of reducing costs and quality are relatively new and in transition. The true savings from reducing costs and the desired efficiency toward quality, patient safety, and decreasing medical records by means of electronic records adoption are too early to determine (DesRoches et al., 2010). An area of concern relating to the intended purposes of cost reduction and improved health care quality from adoption was that most research related to this topic did not reflect general medical practices.

DesRoches et al. (2010) examined cost reduction and improved health care quality, and further investigated the relationship between the adoption of EHRs and primary individual functions, as well as metrics of health care quality and efficiency. The

purpose of their study was to examine how EHR adoption affected such measures of institutions that had either comprehensive EHRs or basic EHRs. The findings indicated that some of the legislative changes from ARRA affected functions and processes. In contrast, some functions and processes did not have a relationship with EHR adoption. The results reflected new legislation that could produce different results if a study had a larger sample size consisting of more providers who had improved or increased their IT infrastructure (DesRoches et al., 2010).

DesRoches et al. (2013) indicated concern regarding the adoption of electronic records after the HITECH and ARRA laws passed. Such concern involved the speed at which providers and physicians were attempting to implement electronic records, which resulted in poor execution and presented adverse consequences for health care efficiency. The adoption of basic or comprehensive electronic records increased from 8.7% in 2008 to 11.9% in 2009 (Jha, DesRoches, Kralovec, & Joshi, 2010). Further review indicated the limited nature of the data.

Insufficient data have been available since the passage of ARRA from other federal agencies. Surveys from organizations such as the American Hospital Association, were suitable for determining adoption rates (Jha et al., 2010). The data produced from an American Hospital Association included important items since the law passed concerning changes in adoption rate, how many hospitals reached the meaningful use category as defined by the U.S. Department of Health and Human Services, and the evaluation of criteria (Jha et al., 2010). Another critical area to address since the law passed was the characteristics of the hospitals that have adopted records (Xiao et al.,

2012). Larger hospitals and those in the Midwest region had higher adoption rates. Public and rural hospitals had lower rates of adopting a basic electronic record. Such a gap between larger, major hospitals and public and rural hospitals could have significant consequences for quality of care for Americans (Jha et al., 2010).

Federal government leaders have an interest in the quality and efficiency of health care delivery and health care quality, as evidenced by federal legislative endeavors. The purpose of federal intervention is to provide incentives; assist both urban and rural providers in improving delivery systems; create a nationally interoperable EHR system; and improve work processes for end users. Researchers of existing studies, as well as studies conducted by representatives of different federal agencies and cooperative efforts, indicated that such changes in IT are beneficial for standard quality of care and lowering costs in U.S. health care delivery systems (Jha et al., 2010).

Health Care System Framework

The health care system framework is unique because it resembles a complex and dynamic marketing force. The health care system framework is dynamic, and its market effects have factors that affect the adoption of technology, especially in smaller physician practices (Menachemi, Mazurenko, Kazley, Diana, & Ford, 2012). The health care system framework is a marketing force driven by supply and demand, along with consumers and providers. Despite working as a dynamic marketing force, organizational factors have more influence on adoption than market factors (Zhang et al., 2013).

Fragmentation within the health care marketing system often exists at the organizational level. The health care marketing system is a complex marketing system

that involves numerous interactions among numerous providers. Twelve billion U.S. dollars of annual waste in hospitals occur from communication inefficiency among care providers (Gastaldi, Lettieri, Corso, & Masella, 2012). Hospital administrators and managers, despite their titles, have little effect on major decision-making. The providers responsible for administrating care within many hospital facilities are rarely employees of the organization itself. This dysfunction reveals a deeper issue to consider with health care providers, managers, and administrators involved in decision-making.

The health care industry is highly fragmented because many providers within the industry are relatively small in scope and have a difficult time achieving economies of scale. The result is complex systems are generally not cost effective (Kellermann & Jones, 2013). The health care industry lacks standards at the basic levels. A return of investment has not occurred in some improvements in productivity and technology. After the completed investment, a lag exists between the initial investment and the realization of financial gains. Technology in the health care industry has continued to lag behind in processes, as most improvements in health care address ancillary or secondary business processes or stakeholders.

Major inefficiencies and waste exist in the U.S. health care industry (Zhang et al., 2013), and costs in the U.S. health care industry are higher than industrialized countries with similar or better health care systems (Alkire, 2012). The health care industry's major inefficiencies include high costs, medical errors, and poor coordination of care (Alkire, 2012). Health information is highly sensitive, which has resulted in regulatory issues and concerns about privacy and security (Patel et al., 2012).

Medical errors exist in handwritten notes and electronically. Physicians often handwrite prescriptions and orders are subject to misunderstanding by individuals filling the order. Data in electronic medical records are more complete than paper-based records. However, data errors occur by humans when performing data entry. Such data are prone to error and bias (Abdel-Qader, Cantrill, & Tully, 2011).

A large number of physicians in the United States are more than 55 years old, which underscores a larger problem for health care access, as the makeup of the existing practices and providers has varying levels of adoption (Decker, Jamoom, & Sisk, 2012). Approximately one third of physicians practice in solo and two-physician practices, and smaller physician practices provide a large proportion of physician care in the United States (Casey, Moscovice, & McCullough, 2013). Despite the large number of small practices, larger practices have had higher adoption rates (McClellan, Casalino, Shortell, & Rittenhouse, 2013). The problems with health care delivery access extend to different population cores and present challenges to create uniformity and effective collaboration.

Innovation in the health care industry is necessary to promote technology adoption. Innovation helps to create new ideas and to improve areas of deficiencies in existing processes (Lazarus & Fell, 2011). Electronic medical records are an innovative improvement to existing processes, and this innovation and ongoing implementation process will involve an attempt to address the barriers relating to health care quality, increasing costs, and decreasing medical errors.

The value of innovations exists from widespread diffusion and adoption (Adams, Tranfield, & Denver, 2011). Inefficiencies in health care still exist, and there is a limited

understanding of how to overcome such inefficiencies using innovations in health care (Thakur et al., 2012). Widespread diffusion is a recommendation for increasing the adoption of a new innovative technology in a health care setting.

Health Care Delivery Systems

Health care delivery systems are a complex set of frameworks that feature fragmentation, regardless of the area studied. Health care systems lack focus on the value of innovative products, as well as on the facilitation on products and services and on how the lack of innovation affects costs through network integration (Thakur et al., 2012). A recurrent theme in numerous articles pertaining to health care delivery systems was that EHRs, EMRs, and the transfer of information are the major areas of focus within health care delivery systems.

To develop an understanding of the health care model, the dimensions of the system underwent examination. The six dimensions were safety, effectiveness, patient-centeredness, timeliness, equity, and efficiency (Murphy, 2011). Information and the transfer of information are critical pieces involving health care delivery systems. In this study, health care delivery systems referred to the form of delivery for information by electronic and technological means.

Integrated health care is a complex phenomenon that encompasses two categories (Strandberg-Larsen & Krasnik, 2009). The first category encompasses health care as an entity that follows economic functionalities relating to financing with multiple providers. The second category encompasses a coordination of activities for patient benefits that functions synchronously. Integrated health care is complex because of difficulties

measuring the effectiveness of integrated health care delivery, as the metrics are not well-defined (Strandberg-Larsen & Krasnik, 2009).

The speed and urgency in administering health care delivery affect physicians and their workload. Physicians indicated that more uniformity in workflows, improved efficiency, and improvement in the quality of care are noted motivators for EMR and IT adoption (Gagnon et al., 2014). An effective flow of electronic communication helps enhance the transfer of information and helps physicians perform their duties more fluidly.

Electronic medical records are a benefit for physicians in managing patient care (Cunningham, 2013). Looking up information, delivering results, and using electronic prescriptions are valued functions for EMR systems (Gagnon et al., 2014). Delays occur when clinical information is not readily available, along with systemic delays associated with prolonged processing time from physicians entering information (Coleman & Pon, 2013).

Additional benefits exist with EMR adoption pertaining to cost containment. Leaders in the health care industry have spent more than $10 billion on transcription and managing costs, and providers who effectively implement EMRs save at least 50% of these costs (Kumar & Bauer, 2011). Adoption of EMR addresses coding errors that further enhanced cost-containment measures (Kumar & Bauer, 2011).

Information Technology in Health Care Settings

Electronic medical records are difficult to define by conventional definitions as they rapidly evolve and have variability across clinical settings. The use of IT ranges

from basic EMRs and EHRs to a national health IT infrastructure that consists of basic, comprehensive, and national elements (Liu, Baier, Gardner, & Trivedi, 2012). Outside the current legislative push for EMRs, EHRs and personal health records are rapidly gaining momentum for implementation across the United States. The continued use of EMRs, EHRs, and personal health records continues to generate interest in ongoing studies to explore gaps related to adoption (Illie et al., 2009; Patel et al., 2012; Seeman & Gibson, 2009).

Electronic medical records and EHRs are interchangeable synonyms in health IT settings (Richards et al., 2012). Despite the interchangeable use of EHR and EMR, EMRs are the only IT application that has a statistically significant effect on patient safety (Audet, Squires, & Doty, 2014). Such an interpretation is difficult to understand, and additional research is necessary to understand why other IT applications are not translating the results intended to affect health care delivery systems.

Electronic medical records are difficult to define by a conventional definition, as they have rapidly evolved and have variability across clinical settings. Prior to implementing EMRs, IT administrators should develop a more detailed picture of the targeted users, anticipated workflow, and context to develop their implementation project more effectively. The effective use of EMRs could create more efficiency in work processes for physicians (Richards et al., 2012).

Adoption of Information Technology in Health Care Settings

The health care industry is a dynamic industry and the largest employer in the United States that comprises approximately 17% of the U.S. GDP (Martin et al., 2012).

Despite its effect on the U.S. GDP, the lack of effective technology adoption is challenging. The challenges of adopting a new technology in health care include productivity disruption, data security and access control concerns, and integrating a newer technological system with an older technological system (Martin et al., 2012). Despite benefits reported in different nations with similar industrial characteristics as the United States, the United States continues to lag behind in EMR adoption.

Using certified EMRs improves the quality and efficiency of care (Xiao et al., 2012). Electronic medical records collected and populated data in real time are beneficial in recording the sequential development of patient care. Electronic medical records allow physicians to transfer important medical information from one software application to another with minimal complications.

Despite these benefits, IT implementation requires attention to detail, includes a need for provider and patient privacy, and provides users with exclusive control and security over the data within EMRs (Shachak & Reis, 2009). Electronic medical records help physicians accomplish information-related tasks, including checking and clarifying information; preparing medication lists, refills, and other prescriptions filled by other physicians; assisting in immediate prescription renewal; and identifying any potential mailing problems and monitoring adherence (Shachak & Reis, 2009).

Small practice physicians and general clinics are important in the framework of health care delivery systems and provide the majority of primary care in the United States. Despite their importance, they were the least likely to develop EMRs, which was significant as their low adoption rates translate to a lack of access to the resources

required for rural and underserved populations (Audet et al., 2014). Additional studies on EMR document barriers to EMR adoption based on size of the physician practice setting, and age (Audet et al., 2014; Decker et al., 2012). Some of the barriers associated with small-practice physicians included lack of expertise, costs, and technical support infrastructure (Audet et al., 2014; Patel, Jamoom, Hsiao, Furukawa, & Buntin, 2013).

Barriers to EMR adoption for small-practice and rural physicians include the cost of EMR software and hardware, perceived loss of productivity, and lack of financial incentives for adoption (Liu et al., 2012). Physicians cited anticipated financial cost as a major barrier by physicians in EMR adoption. Organizational factors that remain barriers include a lack of expertise and access to support resources, which is a major undertaking (Liu et al., 2012).

EMR Adoption

Despite the integration of EMRs in the 1990s, the pace of change and acceptance of IT has been slow, which has prompted more change (Harrington et al., 2011). Several researchers who analyzed adoption noted that physicians, primary care physician groups, and hospital administrators were primarily responsible for the acceptance, implementation, and end-user involvement in IT that affect health care delivery systems (Harrington et al., 2011). Developing an understanding of the health care delivery system in the context of a marketing system is critical to understanding that IT connects the supply-chain relationship prevalent in the business model for health care delivery systems.

The focus of a study involving EMR adoption in hospitals was how leaders of larger hospitals, for-profit hospitals, and teaching hospitals were more likely to adopt EMRs than were their smaller and nonprofit counterparts (Kazley & Ozcan, 2009). Also addressed was whether leaders of rural hospitals are less likely than leaders of urban hospitals to adopt EMRs (Kazley & Ozcan, 2009). Future discussions concerning EMR adoption on a nationwide scale should highlight those more likely to encounter adoption barriers based on the size, scope, and operations of the provider.

High resistance among physicians occurred as physicians are the frontline users of EMRs. Resistance from physicians toward IT adoption includes interactions with the technical interface (Gagnon et al., 2014; Mettler, Fitterer, Rohner, & Winter, 2014). The need to interface the new technology with existing management practices and EMRs is critical in a study of physicians (Mettler et al., 2014). As a result, physicians' support and use affect other user groups.

IT affects different industries by increasing productivity growth. Emerging technology in the health care industry has numerous obstacles to overcome. Such obstacles include financial barriers, resistance to change, size and scope of providers, and concerns about costs of implementation and use. Adopting emergent technologies such as EMRs, computerized physician order entries, and EHRs benefits providers; however, those responsible for implementation and decision-making in the adoption process should continue to develop an understanding of their stakeholders and of how they affect the change process.

End-User Effects

Although there are many people are involved in the use of IT in health care delivery systems, physicians were the designated focal group of this study. As more physicians are moving to independent and group practices outside traditional hospital settings, a focus on this group was applicable because of their involvement in the financial and administrative decision-making that affects their operations. Physicians are the central piece of the health care delivery system. Strong physician leadership, project management, clinical data standards, and staff training are important elements to determine the intermediate and long-term success of EMR adoption (Ludwick, Manca, & Doucette, 2010). Physicians are the most responsible regarding the nature of the patient-centered relationship, decision-making, and financial outcomes toward operation. For any health care framework, physician use affects the integration of the health care system.

Identifying the barriers to adoption of electronic medical records is critical, because barriers interfere with the purpose of the intended IT and derail the goals to streamline costs and work processes. Perceived barriers to adoption include system downtime, an increase in physician time management, initial and ongoing maintenance costs, purchase costs, and an inability to find EHRs that meet practice requirements (Hussain, 2011). Barriers to EMR adoption include high ongoing costs, uncertainty regarding return on investment, lack of computer skills by physicians and staff, lack of customizability, interconnectivity issues, and time restraints (McAlearney, Hefner, Sieck,

Rizer, & Huerta, 2014). Shortcomings from organizational issues occur frequently over technological issues (McAlearney et al., 2014).

Psychological and social barriers exist regarding EMR adoption among physicians. Psychological ownership has an effect on IT adoption. Electronic medical record adoption requires physicians to develop a more sophisticated understanding of how it affects their practice dynamics (Peterson, Ford, Eberhardt, Huerta, & Menachemi, 2011). End users have hands-on experience and a perspective on the design and implementation phase. Despite this fact, limited research is available on psychological ownership in relation to IT adoption. Barriers include (a) lack of belief in EMRs, (b) need for control, (c) lack of support from external parties, (d) perceived interference of the doctor–patient relationship, (e) lack of support from other colleagues, and (f) lack of support from the management level (Bishop et al., 2013).

Electronic medical records affect patient–doctor communication during the consultation process (Shachak & Reis, 2009). This communication process is a dynamic that hinges on effective communication and a personable relationship between the two parties. Patient-centered care depicts the relationship and context between the patient and the doctor, wherein the physician studies the disease and the patient. This, in turn, promotes patient empowerment and involvement. Electronic medical records could have a negative effect on rapport development and could detract from the patient–physician experience (Shachak & Reis, 2009).

Disadvantages of EMRs include altering the process of clinical reasoning that results in loss of information, more or new work for physicians, changes in clinical

workflow, high system demands, and new types of errors (Shachak & Reis, 2009). Despite the push for health IT, ambulatory settings suffer inefficiencies, as many systems in this setting fail to provide sufficient decision support. In addition, EMRs can involve HIPAA concerns if security is not sufficient.

Despite the disruptions present during the communication exchange, a recommended solution exists (Shachak & Reis, 2009). To keep the relationship personable and continue effective communication, it would be beneficial for physicians to review the EMR prior to calling the patient into the office (Shachak & Reis, 2009). For those who have started implementing EMRs, training should focus on incorporating their use in the patient–physician encounter (Shachak & Reis, 2009).

To be effective and successful, new IT in health care must fit within the organizational culture and its processes. The organizational culture and landscape in health care is diverse and varied based on the setting of care administration. Most physician practices are under university and hospital settings, small practice and solo physician groups, urban practices, and rural practices.

Several distinct differences exist between academic or hospital settings and rural practices. University and academic medical settings tend to have strong IT infrastructure and support new technology based on their emphasis of new IT as a component of their education (Arora et al., 2011; Barrett, Lipsky, & Lutfiyya, 2011). University and academic medical practices, also called urban practices, tend to be in urban areas. Despite the apparent differences in the practices from a larger perspective, a clear and

concise distinction between adopting new technologies in rural settings and in urban settings is lacking (Singh, Lichter, Danzo, Taylor, & Rosenthal, 2012).

To underscore the organizational culture and landscape between rural and academic or hospital practices, an examination of the settings and composition is necessary. The settings and composition of the workplace are larger in scope for academic or hospital settings practices, wherein the rural providers are smaller and maintained by different personnel. For example, in rural settings and with smaller practice groups, the physician is normally responsible for keeping the records. In academic or hospital settings, information and delivery of care flow downward to other staff (Ludwick et al., 2010). Physicians in urban settings have more opportunities to consult another physician regarding EMR use or experience, which provides more influence to make decisions relating to the use, implementation, and advocacy of EMRs. Sharing experience is beneficial and can help to dismiss a few uncertainties that persist with rural physicians (Ludwick et al., 2010).

Electronic medical records adoption requires significant buy-in from smaller, independent practices (Sherer, 2010). High implementation and maintenance costs exist during the implementation process. Independent physicians rely on the participation of their staff, including nurses, administrative staff, and office managers. These smaller physician practices are different from their larger counterparts, as the larger groups and hospital settings have committees, advisory groups, and other decision-making arms that influence and likely implement adoption more quickly (Sherer, 2010). Larger provider

groups pass the costs down to other financial centers, thus decreasing the burden of the high implementation and maintenance costs of IT adoption.

The financial incentives and effects of operating costs could affect decision-making by physicians. A 2005 RAND study indicated that the health care industry could save $142 to 371 billion in the United States through adopting interoperable electronic records (Higgins et al., 2012; Sherer, 2010; Winston & Medlin, 2011). In a 2008 survey of 3,000 physicians nationwide, only 13% had used a basic electronic records system, and only 4% of physicians had a fully functional system (Sherer, 2010). Despite the intent of government incentives toward IT adoption by physicians, the incentives alone may not help sustain operations. For example, smaller practices sustained $174,000 to $296,000 in costs, which exceeded the incentive payments (Sherer, 2010).

A trend exists toward closer physician–hospital relationships (Sherer, 2010). The legislative changes requiring EMR adoption have led to a closer relationship between the two parties to encourage improved communication. Independent physician practices are more inclined, if they have admitting privileges to hospitals, to share information via adopted electronic health systems. More pressure exists to adopt EHRs based on the hospital–physician relationship.

One study involved examining physician perceptions regarding the implementation and use of EMRs in a study of EMR implementation in a family practice setting (Gagnon et al., 2012). The findings indicated that savings (i.e. not having to search for paper records or calling another provider for additional information) were

available after EMR implementation. However, effective EMR adoption would not exist without leadership (Gagnon et al., 2012).

Although some physicians accept and embrace IT in health care delivery settings, detractors exist as well. According to the 2009 survey by the American College of Physician Executives, frustrations originated from the lack of input concerning the design and implementation of health IT (Weimar, 2009). Some physicians surveyed noted that such implementation focused more on the administrative aspects of the workload than on the physician aspects of the workload. In health care settings, an implemented new technology may not fit well with a user's workflow. Despite the fit of new technology, changes in technology continue to force the health care industry to evolve (Richards et al., 2012).

Theoretical Development

The TAM variables perceived usefulness and perceived ease of use were common threads when Gagnon et al. (2012) surveyed physicians. TAM2, an extension of TAM did not appear to reveal that subjective norm, an independent variable associated with TAM2, had a significant effect on examining resistance toward adoption. Despite the length of time between the research toward new technology adoption methods, modifications to the original TAM addressed the adoption of new technology (Barnett et al., 2014; Gagnon et al., 2012; Terzis & Economides, 2011).

Theory of planned behavior has been effective in studies on electronic records adoption, as it assists in evaluating the positive or negative effect of technology use; perceptions and opinions of those affected by electronic records adoption; and perception

of the skills, resources, and opportunities necessary for an individual involved in electronic records adoption (Seeman & Gibson, 2009). As an extension of TAM, TPB is effective in examining other variables involving technology adoption (Hung, Ku, & Chien, 2012). Ongoing research conducted about technology adoption by end users continues to include different variations of research theories (Chen & Hsiao, 2012; Garcia-Smith & Effken, 2013).

Research revealed that comparison TAM and TPB for observing medical practitioners (i.e., physicians, nurse practitioners, physician assistants) provided additional insight (Seeman & Gibson, 2009). Based on the complexity of the professionals' workload, the high level of education, and working in highly stressful environments, Seeman and Gibson posited that TAM may not be effective and conducted a review of TPB to determine if another theory could be more effective in developing an understanding of user acceptance (Seeman & Gibson, 2009). As such, the survey instrument included the TPB variables perceived behavioral control, perceived social influence, and attitudes toward EMR.

Transition and Summary

Section 1 was an introduction to associate physicians with their end-user involvement to develop a further understanding of their effects on health care delivery systems. With the push toward implementation and certification of IT software and processes such as EMRs, a sense of urgency exists to address these major areas of concern. Despite this knowledge, an ongoing need for additional research exists to determine obstacles to implementation. The important social issue associated with this

study was the improvement and increasing efficiency in IT related to health care delivery systems. A quantitative study was suitable for generating the hard data that might help future scholars and practitioners to overcome these obstacles and eliminate these barriers in an efficient and effective manner.

The scope of this study was physicians as end users and the effects of their acceptance on health care delivery systems. The rationale for this study was IT in health care is inefficient and not widely embraced within the industry. Because of these inefficiencies, there have been a high number of deaths associated with medical errors, high costs associated with health care delivery systems and IT, and a legislative push for implementing and certifying EMRs. Decision-making involving IT and end-user involvement affects those involved in health care policy making and administration, which for the purpose of this study consisted of physicians.

The focus of Section 2 is the project, data collection, survey instrument, tests of reliability and variability, and organization of the data. After properly assessing the features of the survey and its administration to the target population, the presentation of the results, along with the application to social change and additional afterthoughts of the study conducted I presented in detail in Section 3

Section 2: The Project

Gaylin, Moiduddin, Mohamoud, Lundeen, and Kelly (2011) noted that IT is an integral element of improving efficiencies related to health care delivery systems and improving the quality of health care. Numerous researchers have conducted studies to examine this relationship and to determine why technology is not as efficient in the health care arena compared with other business models (Gagnon et al., 2014; Gaylin et al., 2011; Seeman & Gibson, 2009). This doctoral study involved examining and providing additional insight into why such inefficiencies exist and to address how the study can provide additional value to policy decision-making and enhancing health care delivery systems.

A 2005 RAND study estimated that the health care industry could save $142 billion to $371 billion in the United States through adopting interoperable electronic records (Sherer, 2010; Winston & Medlin, 2011). In a 2008 survey of 3,000 physicians throughout the United States, only 13% had used a basic electronic records system, and only 4% had a fully functional system (Sherer, 2010). Because there continues to be a concerted effort to implement IT into health care delivery systems, there are also challenges to address. The scope of this study was to develop a fundamental and theoretical understanding regarding how end-user perceptions, attitudes, and behaviors affect the implementation and adoption of health care delivery systems.

Purpose Statement

The purpose of this quantitative correlational study was to examine the relationship between physician perceptions as end users of EMRs and their perceptions

related to EMR adoption. The independent variables included perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, and attitudes toward EMRs. The dependent variable was end-user acceptance of EMRs. The population was physicians in the United States. The implications for positive social change was the potential to provide additional insight into the challenges associated with adoption of EMRs and the examination of end-user involvement during the adoption process of an emergent technology such as EMRs.

Role of the Researcher

My role as the researcher for this quantitative study was to administer the study, gather the related data, interpret the data for the study, and present the results of the survey. While working in different positions in the health care industry, I had exposure to medical documentation that indicated a lack of true EMRs, excessive use of paper, and poor communication between stakeholders involved in the treatment process. In a large, private, skilled-nursing rehabilitation facility, numerous interactions occurred daily between physicians and other providers that involved the transfer of medical information. Physicians were the target population based on their influence on the EMR adoption process (Illie et al., 2009; Seeman & Gibson, 2009). The participants in this study did not have a financial or personal relationship through my employer.

Participants

End users and their acceptance and use of new IT, including EMRs, in health care delivery systems were the focus of this study. Researchers have focused on IT adoption with physicians the identified target population (Gagnon et al., 2014; Seeman & Gibson,

2009). I selected physicians as the target population, which maintained the consistency used by other scholars in conducting quantitative research studies involving technology adoption and end-user resistance, as demonstrated in the literature review.

Random sampling, systematic sampling, and stratified sampling are different sampling approaches used when conducting a quantitative study (Green & Salkind, 2011). Random selection was appropriate, as it gives potential participants an equal opportunity to participate. The study involved a simple, one-stage sample survey method. Using the GPower3 software helped determine the appropriate sample size for the study. According to the GPower3 software, to perform a quantitative analysis with multiple linear regression, five independent variables, and one dependent variable, a sample size of 74 was necessary. The number of completed responses was 76.

The database made available through the SurveyMonkey provided the available listings of the participants. I informed the selected participants via an introduction that I selected them to take part in the doctoral study voluntarily and that their responses would remain confidential. To protect the rights of the participants, I informed them of the approval of the Institutional Review Board (IRB) at Walden University and provided the approval number within the consent form. Walden University's approval number for this study is 02-12-13-0156081. The informed consent included (a) an invitation to consent, (b) background information, (c) procedures, (d) voluntary nature of the study, (e) risks and benefits of participating in the study (f) compensation, (g) confidentiality, (h) contacts and questions, and (i) statement of consent. Appendix D includes the consent

process, which was consistent with ethical research and the consent process in the data collection process (Babbie, 2010).

Research Method

A quantitative method was suitable for this study. Use of the independent variables to examine user acceptance assisted to determine any correlation to the dependent variable and explaining user behavior (Davis et al., 1989). Researchers of quantitative studies should build knowledge, formulate hypotheses, develop measures, pick analytical techniques, and plan data collection (Corner, 2002). The quantitative research method results include numerical data for ongoing analysis by me and by other researchers seeking to examine barriers to EMR adoption.

A qualitative research method was not appropriate for this study. Few studies on EMR adoption exist that include quantitative methodologies and that provide data to examine consumer attitude toward health IT (Gaylin et al., 2011; McAlearney, Robbins, Kowalczyk, Chisolm, & Song, 2012). Descriptive quantitative studies are suitable to assess the differences and effect of implementation and use. Predictive analysis performed on health IT has the potential to transform health care delivery, as the empirical research evidence base supporting its benefits has limitations (Cheung & Vogel, 2013; Seeman & Gibson, 2009; Venkatesh et al., 2012).

Mixed-methods research, which is a combination of both qualitative and quantitative methods, would not have effectively achieved the purpose of this study. Mixed-methods results produce varying results from those who conduct research using a single method (Malina, Nørreklit, & Selto, 2011). Using a mixed methods approach

would have required additional time and resources not readily accessible to me. This study involved examining technology adoption using a more grounded approach based on data rather than on a combination of both theories (Malina et al., 2011).

The quantitative method was suitable for several reasons. The most widely applied model in information systems research is TAM (Illie et al., 2009), which provides stability for a theoretical foundation. Additional research included variations to TAM that examines other factors that affect technology adoption (Illie et al., 2009; Seeman & Gibson, 2009; Thakur et al., 2012). Examining physician perceptions using TPB enhanced the constructs of this study (Seeman & Gibson, 2009). Gaps exist in the use of quantitative method to examine end-user perceptions toward technology adoption in general (Gagnon et al., 2014, Seeman & Gibson, 2009).

Research Design

To address the baseline questions, further review of the literature and a review of previous quantitative studies relating to this matter were useful for the construct portion of the survey. The study included a correlational design to compare and determine the relationship between perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, and attitudes toward EMR and the dependent variable user acceptance. Implementing a survey that included a Likert-type scale to measure results was meaningful for assessing survey responses and coding responses accurately (Bhatnager & Srivastava, 2012).

To determine the appropriate sample size, I conducted a power analysis using GPower3 software. The a priori analysis helped determine the required significance

level, desired statistical power, and the to-be-detected population effect size (Faul, Erdfelder, Buchner, & Lang, 2009; Song et al., 2014). The sample size needed to reach statistical validity was 74. During the data collection process, I secured 76 respondents in a 4-week collection period.

The variables perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, and attitudes toward EMR consisted of several interrelated statements concerning EMRs and end-user acceptance. Using null and alternative hypotheses, I input the data into the SPSS statistical software and generated the output by performing a multiple regression analysis. Using a multiple regression analysis helps researchers determine any correlations from the independent variables and the dependent variable. To address accuracy for the quantitative analysis, the study includes a discussion of the threats to its validity and factors that could create respondent bias.

As TAM derived some of its elements from TPB, TPB was suitable for developing an understanding of user acceptance as well. With the theory of TPB, end users' attitudes, subjective norms, and perceived behavioral control related positively to planned and actual behavior concerning acceptance (Seeman & Gibson, 2009). This study conducted about EMR acceptance included different multiple regression analyses for predicting acceptance of technology. The survey consisted of a Likert-type scale that had central constructs from both theories. Analysis of survey responses indicated that a combination of the two theories provided better explanatory power than conducting the

surveys in an isolated fashion (Seeman & Gibson, 2009). To perform a stronger analysis of user acceptance, a combination of both theories was appropriate.

Population and Sampling

As the focus of EMR adoption and legislation was physicians obtaining certified, operable systems by 2015, I randomly selected the physician participants for this study. The focus of studies on EMR adoption should be on those likely to encounter adoption barriers based on size, scope, and operational processes (Kazley & Ozcan, 2009). Researchers have often identified physicians as a focus group for research concerning IT adoption (Cheung & Vogel, 2013; Illie et al., 2009; Seeman & Gibson, 2009).

The population consisted of physicians in the United States. The study conducted throughout the United States featured a mixture of urban and rural physicians to help reduce bias. With higher adoption rates, physician input as participants provide additional opportunities for additional research toward EMR adoption. Selecting a population randomly means the members of the general population have an equal opportunity for selection, which helps reduce bias in participant selection (Campbell & Stanley, 1963). Random selection represented a true experiment in this doctoral study. Physicians' decision, attitudes, and perception regarding EMR adoption that had a significant effect on hospital operations were the basis for participant selection (Chen & Hsiao, 2012).

Ethical Research

To ensure the research process was ethical, the study included several thorough steps as part of the data collection process. The SurveyMonkey website indicated that the

site adheres to IRB standards, and other researchers have used this site to perform different variations of sampling for surveys. The time provided to the participants was 30 minutes. The randomly selected participants received an e-mail invitation for this study (see Appendix B). The invitation notified the selected participants of the nature and purpose of this study and requested their informed consent through the website (see Appendix D). Within the informed consent, I notified the participants of my role as the researcher and the nature of completing a doctoral study for Walden University. Participants received background information of the nature of the study, which was to conduct a quantitative correlational survey on physician perceptions and EMR adoption.

I informed the participants their participation was voluntary. The participants who elected to complete the survey received notification they had 60 minutes to complete the survey, that an equal opportunity of selection existed, that no consequences for not participating in this study existed, and that their participation would be confidential and anonymous. I informed the participants of the encryption protocols implemented in the survey, which provided protection of their identity, as well as confidentiality. Participants were aware that Walden University, the medical community, and I did not know the identity of the participants. To ensure that electronic consent remained confidential, SSL encryption and Internet protocol addresses provided through the database masked the consenting participant's identity.

After voluntarily participating in this survey, the participants received notification that there was no foreseeable risk or benefit in participation. Participants understood they would receive no compensation for participating. Prior to the participants acknowledging

consent, they received contact information for the university and for me in case any questions arose relating to the nature of the study.

Instrumentation

This study included a survey instrument to collect the data. The survey instrument included a combination of Davis's TAM, as well as Ajzen's TPB (Ajzen, 1988; Davis et al., 1989; Seeman & Gibson, 2009). I tested and used the constructs of the survey focused on technology adoption with physicians as the selected participants. Despite modifications from other researchers, the survey instrument used by Seeman and Gibson (2009) provided a more current view into barriers toward electronic adoption. The questions used in the survey were specific to EMR adoption, physician perceptions, and attitudes toward EMRs (Davis et al., 1989; Seeman & Gibson, 2009; Teo, 2011; van Offenbeek, Boonstra, & Seo, 2013).

The survey instrument was a preexisting survey used by Seeman and Gibson (2009). I reviewed the survey and determined that the elements of the survey met the criteria of an ongoing discussion examining end-user perceptions and attitudes toward technology adoption. The survey included questions related to each variable, and the respondents responded to the statements using a Likert-type scale that ranged from 5 for *strongly agree* to 1 for *strongly disagree*. A Likert-type scale is a widely used instrument used by researchers conducting assessments on technology-based research (Seeman & Gibson, 2009; Yilmaz, Aktas, Ozer, & Ozcan, 2013). I obtained permission from Seeman and Gibson to use the survey instrument for this study, and no modifications to the survey were necessary (see Appendix G). The participant responses produced data

that reflected variances in physician perceptions based on each individual statement regarding EMR adoption.

Data Collection Technique

Conducting quantitative research using electronic media has become more prevalent in the 21st century. Using electronic media to perform quantitative research introduces different opportunities into data collection, including access to larger target populations and dissemination of information (Morey, 2013). Using electronic media to conduct quantitative studies saves money, saves time, and provides quicker access to the intended target population.

SurveyMonkey was the Internet-based survey provider selected to administer surveys and questionnaires to the targeted research participants. SurveyMonkey assisted in collecting the data. Using the web-based service provider was appropriate based on its access to a large database of participants in the health care field. The services provided to users from the web-based service provider have tiered plans that users can purchase to increase their search grid with available customer support.

SurveyMonkey provided access to an e-mail distribution service that provided a distribution link to access the survey. For confidentiality purposes, the web-based provider did not capture the respondents' Internet protocol address. This aspect of the service was essential to ensure respondents' privacy and confidentiality. The informed consent notified participants selected of the purpose of the survey and the reason for collecting data. The data collection period lasted 4 weeks. Appendix B includes a copy of the survey reminder e-mail from the SurveyMonkey database. The participants

received a notification of their completion and a note thanking them. To confirm the authentic nature and adherence to IRB guidelines, I confirmed the effectiveness of SurveyMonkey in the process of data collection, as outlined in Appendix E.

By using the intended survey for data collection, SurveyMonkey provided me the ability to administer the study and calculate the data. After the participants voluntarily consented to participate in the research and their participation ended, I downloaded the data received via SurveyMonkey into an Excel spreadsheet, and I converted the data downloaded from the Excel spreadsheet to the SPSS software for analysis.

During the data collection process, the randomly selected participants received a link to the survey. Securing access to the exclusive database to administer the survey via e-mails involved a nominal fee. Potential participants received a copy of the consent form, as shown in Appendix D, for review prior to voluntarily consenting to participate in the survey. The required sample size took 4 weeks to secure and to run the data analysis.

Data Organization Techniques

SPSS, a statistical software program, was suitable for organizing the data. The study involved collecting participants' responses from the SurveyMonkey website, extracting the data, and downloading the data into the SPSS software. The data collected were confidential and the identities of the respondents remained confidential and anonymous. In the process of collecting the data from the survey responses, I entered the data into the SPSS program to analyze, interpret, and present the data in a narrative format in Section 3 (Green & Salkind, 2011). The results appear in narrative format in

Section 3, with tables of the output provided as well. The data collected for the study will remain on a password-protected computer drive for 5 years.

Data Analysis

The purpose of this quantitative study with a correlational design study was to examine the relationship between perceived ease of use, perceived usefulness, behavioral perception, social influence, attitude toward EMRs, and end-user acceptance. The study involved collecting data from participants who voluntarily consented to take part in the online survey. Questions relating to the type of physician practice, size, and number of physicians within a practice led to the descriptive statistics needed. The initial portion of the survey included seven questions on the demographics of the participants (see Appendix F). The results of those seven questions included the data needed to run descriptive statistics. Descriptive statistics helped outline specific areas where gaps exist in EMR adoption (Encinosa & Jaeyong, 2013; Liu et al., 2012).

After responding to questions relating to demographics, the participants reviewed statements relating to EMR adoption. After each statement, the participant selected a response by using a Likert-type scale with responses ranging from 5 for *strongly agrees* to 1 for *strongly disagree*. Each statement on EMR adoption related to the five independent variables (see Appendix A). The hard data collected from the survey results relating to TAM and TPB helped to determine what affects EMR adoption. Use of statistical analysis via SPSS software helped to determine correlations. I used multiple regression analysis to examine the relationship between the five independent variables and the dependent variable. When performing quantitative statistics, a strengthened

hypothesis occurs if a high correlation exists (Campbell & Stanley, 1963). If the results of the analysis indicated there was no statistical significance, I rejected the alternate hypothesis and accepted the null hypothesis.

The purpose of performing multiple regression analysis was to examine how the independent variables predict the dependent variable. Using information on independent variables improves accuracy in predicting the values of a dependent variable (Nimon & Oswald, 2013). Using multiple regression analysis helps determine how much independent variables explain the variation in the dependent variable (Nimon & Oswald, 2013).

Prior to performing the data analysis through SPSS, participants responded to statements presented in a Likert-type scale format. The statements addressed different variables relating to the constructs of this study, as shown in Appendix A. Data analysis performed on the survey responses followed a simple scoring method (Yilmaz et al., 2013). The responses ranged from 5 for *strongly agree* to 1 for *strongly disagree*. After the participant completed the survey responses, I inputted the data generated from the Likert-type scale statements in the SPSS software in a normal scoring format. The scores inputted in SPSS reflected the responses from the participants ranging from 5 for *strongly agree* to 1 for *strongly disagree*.

Multiple regression analysis provided results that predicted new values for the dependent variable given the independent variables and determined how much the independent values explain the variation in the dependent variable (Green & Salkind, 2011). For a multiple regression analysis to be valid, the following assumptions must

hold: (a) independence of errors, (b) linear relationship between the predictor variables and the dependent variable, (c) homoscedasticity of residuals, (d) no multicollinearity, (e) no significant outliers or influential points, and (f) normal distribution of residuals (Dormann et al., 2013; Green & Salkind, 2011).

I used probability plots (P-Ps) and histograms to examine the distribution of the dependent variable, user acceptance, and the independent variables perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, and attitude toward EMRs. Graphical interpretations such as histograms provided me an opportunity to assess that normality existed in the analysis. Boxplots further demonstrated whether outliers existed in the data analysis.

I used multiple regression analysis to produce the results for further interpretation, analysis, and presentation. The independent variables served to predict the dependent variable, which was user acceptance. The regression equation was

$$y = b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_0,$$

where y was the dependent variable; x_1, x_2, x_3, x_4, and x_5 were the independent variables; and b_1 to b_5 were the slope weights.

The correlation coefficient (R) is an index that indicates the degrees that predicted scores correlated with observed scores (Green & Salkind, 2011). In performing the analysis, R ranges from 0 to 1. If R has a value of 0, there was no linear relationship between the independent and dependent variables. However, if R has a value of 1, a perfect linear relationship existed. Multiple regression analysis includes an assumption of a normal distribution of the variables in the population and that the scores are

independent of other scores of the same variable. After performing the analysis, I evaluated the relationship between the independent variables and the dependent variables by evaluating the strength of the relationship between the variables. The output and analysis appear in Section 3.

Reliability and Validity

Reliability

The survey instrument was a preexisting reliable study used by Seeman and Gibson (2009) for their study on EMR adoption. The published study appeared in a peer-reviewed journal. Research questions should communicate meaning and substance uniformly (Wikman, 2005), and (a) concomitant variation between the variables of interest, (b) evidence of clear temporal ordering of the variables, and (c) controlling all other spurious influences can determine causation (Echambadi, Campbell, & Agarwal, 2006). Seeman and Gibson validated and used the survey instrument prior to this study. The survey instrument blended the constructs of two prominent theories in information research: TPB and TAM. The two theoretical models appear in Appendix H and I, respectively. A review of existing literature indicated that using the two theories addresses possible areas of deficiencies not addressed on their own accord (Seeman & Gibson, 2009). The questions developed by Seeman and Gibson were specific to their own research on EMR adoption. As other researchers in the field related to TAM and TPB had validated the instrument, the survey instrument was reliable (Ajzen, 1988; Venkatesh et al., 2012; Zemore & Ajzen, 2014).

Despite the popularity of using TAM to address information systems research, other researchers made variations. Different variations of TAM created by different scholars enhanced their interpretation abilities (Pai & Huang, 2011). Such variations included mediators found in different theories such as TPB. Pai and Huang (2011) noted that studying the combined models led to creating better predicting models. This study did not include any modifications or alterations to the original survey instrument.

Validity

This study included several areas of concerns and threats to validity. Threats to validity can arise from internal threats and external threats (Campbell & Stanley, 1963; Graf, Vetschera, & Zhang, 2013). For this study, external threats were maturation and selection. Time was an element, as the focal point of the study was implementation prior to 2015. As such, survey results will change over the course of time. The closer the date of survey administration was to the 2015 mandated deadline, the more likely the participants would adapt to such technological changes. To address this threat, the administration of the survey occurred prior to the mandated deadline. To minimize the threat of selection, the randomly selected participants had an equal chance of selection to avoid selection bias.

Threats existed to external validity during the participant selection process. Internal threats included selection and instrumentation. External threats included interaction of selection and treatment. Despite discussions of external threats and indications of how to develop a cognitive sense of the threats in the literature, developing the appropriate constructs and address each threat was necessary by the researcher

(Echambadi et al., 2006). I analyzed the data carefully. Poor construct measurement and potential bias could cause Type I and Type II errors (Echambadi et al., 2006). I determined causation after a careful review of all data and measures such as variation and Cronbach's alpha.

Transition and Summary

The objective of Section 2 was to discuss the scope of the project, describe my role as the researcher, identify the participants, discuss data collection and analysis, and discuss threats to validity. Information technology plays a critical role in business operations, as more integration has occurred to physicians' workflow and business processes. As EMR adoption rates are low nationwide, this study was critical to understand why barriers exist to EMR adoption from a physician's perspective. Performing a quantitative analysis can help provide more uniform, concrete responses regarding why such barriers exist. Electronic medical record adoption involves more than installing new software and hardware, and expecting end users to embrace the change. The barriers that exist stem from perception, attitudes, and behavior toward EMRs and EMR adoption in general. Although research on the problem exists, the data from the research is insufficient. Therefore, a need exists for ongoing conversation and research conducted regarding this problem.

In information systems research, the TAM is a widely used and accepted theoretical model to address the variables perceived usefulness and perceived ease of use. Based on a review of other literature relating to electronic records adoption, TPB serves as a balance of sorts to help answer some of the questions that the TAM may not. I

created the constructs of the variables and hypotheses from this dual theoretical model framework.

The study involved administering questions significant to the variables perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, and attitudes toward EMR to a random population in the United States to determine how the independent variables affect the dependent variable user acceptance. This study included multiple regression analysis to determine if the hypotheses discussed in Section 1 were statistically significant. From these results, I analyzed the data, as presented in Section 3, which resulted in a contribution to the area of study. The results of the data collected and analyzed may provide an opportunity to effect positive social change in assisting the medical community, practitioners, and researchers to address the challenges associated with a low adoption rate of EMRs and to meet the goal of EMR system certification by 2015.

Section 3: Application for Professional Practice and Implications for Social Change

Section 1 included the foundation of the study, purpose of the study, nature of the study, and theoretical framework. Section 1 also included the literature review related to the study. Section 2 included a discussion of the research method and design of the study, target population and sample size, and a thorough review of the data collection process, ethical research, data analysis, and the validity and reliability of the survey.

Section 3 begins with an overview of the study. After the overview of the study, I present the findings and describe how the findings apply to professional practice. A discussion of how the findings might influence social change and recommendations for action and further study appear following the findings. Section 3 concludes with my reflections and observations as a researcher and a summary of the study.

Overview of Study

A review of the literature prior to conducting the study revealed low EMR adoption rates despite the legislative mandate to earn EMR certification before 2015. The intent of this study was to examine the relationship between user acceptance by physicians and perceptions toward EMR adoption. In 2009, the Obama administration enacted the ARRA, which mandated physicians to earn EMR certification before 2015. The review of literature in Section 1 revealed the low EMR adoption rates throughout the United States and the need for additional research. Additional insight from the study could help determine what causes slow adoption and how to improve adoption rates, while understanding what barriers may exist toward adoption. I referenced two theories for this study: TAM and TPB. The dependent variable was user acceptance. The

independent variables were perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, and attitudes toward EMRs.

During the data collection process and analysis phase of the study, I was able to draw upon conclusions based on definitive data provided from the survey responses. I coded the responses from the survey using a Likert-type scale. The following section includes the finding of the study.

Presentation of Findings

The central research question guiding this study was as follows: What is the relationship between perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, attitudes toward EMRs, and user acceptance? Prior to performing the data analysis, I developed five research subquestions that prompted the testable hypotheses:

RQ1: What is the relationship between physicians' perceived ease of use of EMRs and user acceptance of EMR adoption?

RQ2: What is the relationship between physicians' perceived usefulness of EMRs and user acceptance of EMR adoption?

RQ3: What is the relationship between physicians' perceived behavioral control and user acceptance of EMR adoption?

RQ4: What is the relationship between physicians' perceived social influence and user acceptance of EMR adoption?

RQ5: What is the relationship between physicians' attitudes toward EMRs and user acceptance of EMR adoption?

The dependent variable was end-user acceptance. The independent variables for this study were as follows: perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, and attitudes toward EMR. Technology acceptance model is an information systems theory concerning user acceptance and use of a specific technology (Davis et al., 1989). I also included the variables perceived ease of use and perceived usefulness from the constructs of TAM. Theory of planned behavior is a predictive model theory concerning the link between user behavior and beliefs (Ajzen, 1988; Zemore & Ajzen, 2014). I included the variables perceived behavioral control, perceived social influence, and attitudes toward EMR from the constructs of TPB. Testing the five hypotheses produced answers to the research question and its subquestions:

$H1_0$: There is no relationship between physicians' perceived ease of use of EMRs and end-user acceptance.

$H1_a$: There is a relationship between physicians' perceived ease of use of EMRs and end-user acceptance.

$H2_0$: There is no relationship between physicians' perceived usefulness of EMRs and end-user acceptance.

$H2_a$: There is a relationship between physicians' perceived usefulness of EMRs and end-user acceptance.

$H3_0$: There is no relationship between physicians' perceived behavioral perception toward EMRs and end-user acceptance.

$H3_a$: There is a relationship between physicians' perceived behavioral perception toward EMRs and end-user acceptance.

$H4_0$: There is no relationship between physicians' perceived social influence toward EMRs and end-user acceptance.

$H4_a$: There is a relationship between physicians' perceived social influence toward EMRs and end-user acceptance.

$H5_0$: There is no relationship between physicians' attitudes toward EMRs and end-user acceptance.

$H5_a$: There is a relationship between physicians' attitudes toward EMRs and end-user acceptance.

In this section, I will present the descriptive statistics, discuss testing of the assumptions, present results of the inferential statistic, provide a theoretical conversation pertaining to the findings, and conclude with a summary. To combat the possible influence of assumption violations and to confirm appropriate confidence intervals, I performed the bootstrapping method. I used bootstrapping to examine any possible influence of assumption violations.

Descriptive Statistics

Prior to performing the multiple regression analysis, I provided the descriptive statistics. The descriptive statistics did not test the hypothesis but provided a snapshot of the demographic attributes of the respondents (Wild, Pfannkuch, Regan, & Horton, 2011). I administered 105 surveys during a 4-week collection period and received 88 responses. I eliminated 12 records because of missing data, which resulted in 76 records

used in the analysis. The descriptive statistics of the study variables are in Table 1. The frequencies and percentages for the qualitative variables are in Table 2.

Table 1

Means, Standard Deviations, and Bootstrap 95% Confidence Internals for Quantitative Study Variables

Variable	*M*	*SD*	Bootstrap 95% CI (*M*)
End user acceptance	2.93	1.33	[2.63, 3.23]
Ease of use	19.66	6.74	[18.11, 21.27]
Usefulness	21.08	7.89	[20.12, 23.72]
Behavioral control	17.08	4.77	[16.08, 18.28]
Social influence	13.97	4.34	[12.96, 14.93]
Attitudes toward EMR	27.63	8.93	[25.68, 29.76]

Note. $N = 76$. CI = confidence interval.

Table 2

Frequency and Percentages for Qualitative Variables

Variable and category	*n*	%
Gender		
Female	29	38.2
Male	47	61.8
Age group		
30 years or younger	7	9.2
31 to 40	8	10.5
41 to 55	22	28.9
56 or more	39	51.3
Type of practice		
General practice	23	30.3
Emergency/operating room	7	9.2
Dental surgery/medicine	7	9.2
Other	39	51.3
Size of practice		
Solo practice	23	30.3
Two or three physicians	14	18.4
Academic/university hospital group	12	15.8
Large provider group	27	35.5
Years of practice		
0 to 5 years	12	15.8
6 to 10 years	4	5.3
11 to 20 years	15	19.7
21 or more years	45	59.2
Location		
Urban/metropolitan	55	72.4
Rural	21	27.6
EMR certified		
Yes (100% certified/operable)	44	57.9
Will be certified before 2015	3	3.9
May be certified relatively soon after 2015	9	11.8
Have not started/significant delay after 2015	20	26.3

Note. $N = 76$.

Test of Assumptions

Testing assumptions of the statistical test is a critical step when conducting a multiple regression model. The assumptions tested in a multiple regression model help researchers determine if a valid multiple regression model exists. Assumption violations can create problems in a multiple regression model. Problems involved in assumption

violations include biased estimates of relationships, incorrect confidence estimates of regression coefficients, and untrustworthy confidence intervals (Williams, Grajales, & Kurkiewicz, 2013). I evaluated the assumptions of multicollinearity, outliers, normality, homoscedasticity, and independence of residuals prior to examining the multiple regression model (Williams et al., 2013). Bootstrapping, a common method used to review confidence intervals for efficiency, addressed any potential concerns relating to influence of assumption violations (Williams et al., 2013). Bootstrapping provides a robust goodness of fit indicator in a regression model (Austin & Small, 2014; Ieveris-Landis, Burant, & Hazen, 2011). For this study, I used 1,000 bootstrapping samples in the computation.

Multicollinearity. Multicollinearity occurs when two or more predictor variables highly correlate in a multiple regression model (Dormann et al., 2013). I evaluated multicollinearity by viewing the correlation coefficients among the predictor variables. Multicollinearity exists if any of the bivariate correlations exceeds .90 between the predictor variables (Dormann et al., 2013). When evaluating the correlation coefficients for this study, as presented in Table 3, no bivariate correlations exceeded .90. I concluded that no violation of the assumption of multicollinearity occurred.

Table 3

Correlation Coefficients Among Study Predictor Variables

Variable	1	2	3	4	5
1. Ease of use	1.00	.818	.629	.593	.692
2. Usefulness	.818	1.00	.601	.704	.796
3. Behavioral control	.629	.601	1.00	.761	.723
4. Social influence	.593	.704	.761	1.00	.790
5. Attitudes toward EMR	.692	.796	.723	.790	1.00

Note. $N = 76$.

Outliers, normality, linearity, homoscedasticity, and independence of residuals. Outliers, normality, linearity, homoscedasticity, and independence of results test assumptions to ensure no serious violations existed. Williams et al. (2013) noted that testing the assumptions applies regardless of simple or multiple linear regression models. These assumptions assisted to determine whether serious violations existed.

For this study, I evaluated the assumption tests by examining the normal P-P of the regression standardized residual (see Figure 1) and the scatterplot of the standardized residuals (see Figure 2). Scatterplots test homoscedasticity (Nimon, 2012). Researchers visually check normality by using P-P plots (Ghasemi & Zahediasl, 2012). The evaluation of the plots indicated that a violation of an assumption occurred.

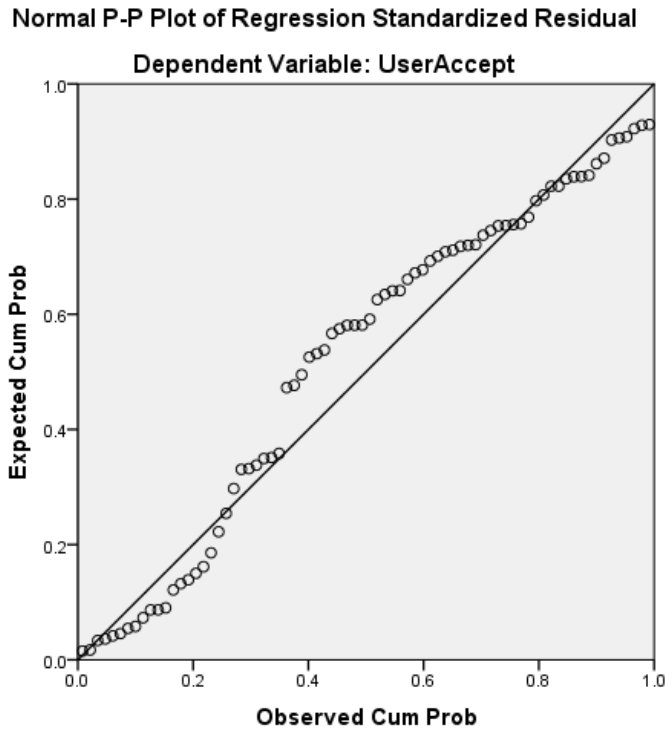

Figure 1. Normal probability plot (P-P) of the regression standardized residual.

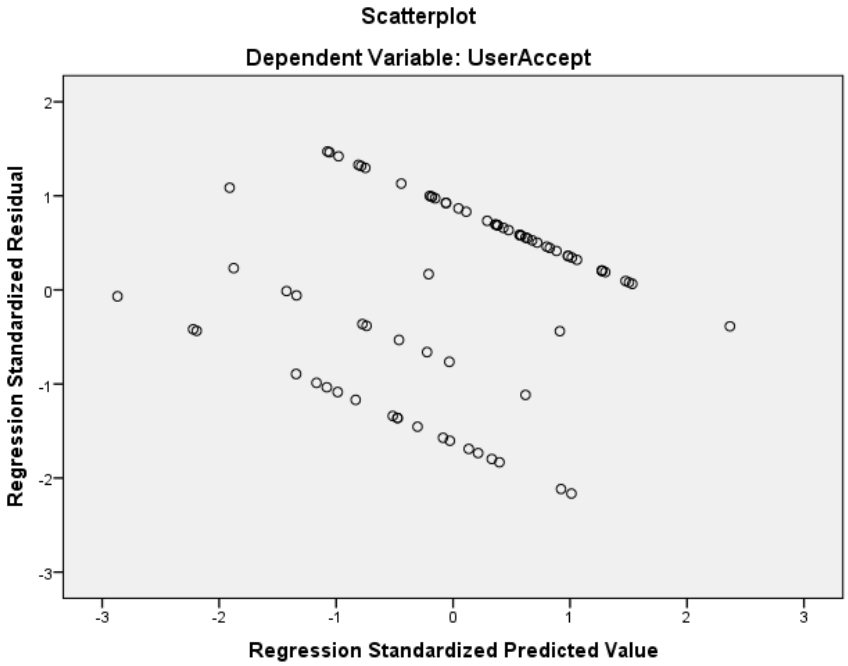

Figure 2. Scatterplot of the standardized residuals.

The line in the P-P plots and the scatterplot should be diagonal from bottom left to top right to show normal distribution (Ghasemi & Zahediasl, 2012). Several dots deviated from the diagonal line in Figure 1. Figure 2 lacked a clear pattern in the scatterplot. An evaluation of the scatterplot revealed a violation of the assumption of homoscedasticity. The violation of the homoscedasticity assumption occurred because of the effect of the sample size having too much weight (Garcia-Perez, 2012).

Inferential Results

I performed a standard multiple linear regression using SPSS, $\alpha = .05$ (two-tailed), to examine the effectiveness of perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, and attitudes toward EMR in predicting user acceptance. The independent variables for this study were as follows: perceived ease of use, perceived usefulness, perceived behavioral control, perceived social

influence, and attitudes toward EMR. The dependent variable was user acceptance. The null hypothesis was that perceived use, perceived ease of use, perceived behavioral control, perceived social influence, and attitudes toward EMR would not significantly predict user acceptance. The alternative hypothesis was that perceived use, perceived ease of use, perceived behavioral control, perceived social influence, and attitudes toward EMR would significantly predict user acceptance.

Using SPSS, I performed a preliminary analysis and testing of the assumptions to confirm whether the regression model violated the assumptions of multicollinearity, outliers, normality, linearity, homoscedasticity, and independence of residuals. In the evaluation of the preliminary analysis, a violation of homoscedasticity occurred.

The regression model run through SPSS was able to predict user acceptance, $F(5,75) = 4.609$, $p < .001$, $R^2 = .248$. The R^2 value (.248) indicated that the linear combination of the predictor variables (perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, and attitudes toward EMR) accounted for approximately 25% variance in user acceptance. Table 4 depicts the regression analysis summary. The predictive equation is as follows:

User acceptance =

.919 - .030(ease of use) - .040 (usefulness) + .072 (behavioral control)

+ .061(social influence) + .051(attitude toward EMR)

Table 4

Regression Analysis Summary for Predictor Variables

Variable	*B*	*SE B*	*β*	*t*	*p*	*B* 95% bootstrap CI
Constant	.919	.532		1.730	.089	[-.143, 1.981]
Ease of use	-.030	.038	-.154	-.805	.423	[-.106, .045]
Usefulness	-.040	.038	-.240	-1.063	.291	[-.116, .035]
Behavioral control	.072	.049	.260	1.464	.148	[-.026, .171]
Social influence	.061	.060	.200	1.022	.310	[-.058, .181]
Attitude toward EMR	.051	.031	.341	1.617	.110	[-.012, .113]

Note. $N = 76$. CI = confidence interval.

In this regression model, none of the individual variables were statistically significant. Two likely reasons for this phenomenon were a violation of the homoscedasticity assumption and interdependence among predictors. Violations of assumptions can lead to serious Type I or Type II errors, overestimation of inferential measures, and overestimation of effect sizes (Hoekstra, Kiers, & Johnson, 2012). Interdependence between variables prompts researchers to analyze the cause and determine what remedies are sufficient for the regression model (Farrar & Glauber, 1967).

A researcher may misunderstand a variable's true relative contribution because of the shared explanatory variance created to the first variable entered into the regression equation (Tonidandel & LeBreton, 2011). The relationship between user acceptance and the five independent variables may feature interdependence. In this model, the growth of interdependence between the independent variables and the dependent variable increases rapidly and destabilizes the sample significance of the independent variable's explained variance (Farrar & Glauber, 1967).

Analysis Summary

The purpose of this study was to examine the relationship of perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, and attitudes toward EMR in predicting user acceptance. I did not detect any serious violations of assumptions when performing the multiple regression analysis. The model was able to significantly predict user acceptance, $F(5,75) = 4.609$, $p < .001$, $R^2 = .248$. Despite the model significantly predicting user acceptance, none of the independent variables provided useful information about user acceptance. I attributed this phenomenon to a violation of the assumption of linearity, and an interdependence between the independent and the dependent variables. Because of the alpha values exceeding .05 for each independent variable in the regression model, I accepted the null hypothesis for each independent variable.

Theoretical conversation on findings. User acceptance by end users was a focal point of the entire study. The overarching focus by other researchers has been EMR adoption and physician resistance. The mandated 2015 deadline for EMR certification presents a solid theme for developing an understanding why barriers exist toward EMR adoption, despite noted consequences for noncompliance. The findings from this study were a combination of the constructs of TAM and TPB in predicting user acceptance. I used a model that combined both theories to predict user acceptance in performing a simple multiple regression model. Other researchers took other liberties in their research.

In the previous survey administered by Seeman and Gibson (2009), TAM and TPB combined in predicting user acceptance by using multiple regression models

separately for the TAM and TPB constructs, whereas Gagnon et al. (2014) used TAM and three other theoretical models to examine user acceptance. Gagnon et al. noted that perceived ease of use was among the strongest predictors of physician intention to use EHRs. Jackson, Yi, and Park (2013) used three different models, including TPB, to examine user acceptance. Despite the combination of different theories to predict user acceptance, TAM was the most common theory used prior to adding different constructs. Each of the researchers noted above indicated that TAM was not an effective theoretical model to use by itself. In conclusion, this study contributes to ongoing research based on the statistical significance of the regression model in predicting user acceptance.

Applications to Professional Practice

The intent of this study was to predict user acceptance. This study contributed to the ongoing discussion of physician resistance toward EMR adoption, low adoption rates, and barriers to adoption. Several publications continue to provide ongoing research and literature reviews toward this discussion. This study contributed to the discussion through a validated survey instrument and applying the results from this study (Seeman & Gibson, 2009).

Despite the mandates within the ARRA, physicians have continued to exhibit difficulties adopting EMR to meet the criteria set forth in the legislation. The potential consequence of decreased reimbursement rates or revenue streams because of certification rates are less than 100% by 2015 appeared to accelerate rates of adoption. The results of a survey that I conducted in early 2014 revealed 38.1% of respondents indicated that they were likely not to have certification by the 2015 deadline. Even

though two thirds of the respondents noted that they were likely to have certification prior to the deadline, the small sample size did not reflect the results of larger survey samples completed by other researchers (Audet et al., 2014; Decker et al., 2012; Nguyen, Bellucci, & Nguyen, 2014).

The statistical significance of the regression model used in this study helped predict user acceptance toward EMR adoption. The survey statements provided the scoring necessary to perform the multiple regression analysis for the independent variables perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, and perceived attitude toward EMRs. Despite the regression model being statistically significant, none of the individual independent variables had statistical significance in predicting user acceptance. Determining what independent variables are statistically significant predictors of user acceptance is important for ongoing studies by other researchers.

Implications for Social Change

Barriers to EMR adoption by end users continue to exist. Medical errors, redundancy, and inefficiencies in health care delivery systems persist despite advances in IT. Therefore, examining the barriers toward EMR adoption benefits health care industry stakeholders, including physicians, patients, hospitals, and ancillary providers.

The health care industry is the largest employer in the United States and has a significant effect on the U.S. economy. Approximately 17% of the U.S. GDP derives from the health care industry (Martin et al., 2012). Despite the financial incentives associated with EMR adoption, a number of physicians and providers have yet to

complete the adoption process. The physicians and providers who have not completed EMR certification may encounter reduction in Medicare and Medicaid reimbursement rates, which could negatively affect quality of care and present the likelihood of continued medical errors in documentation, prescriptions, and order entry. This study contributes to the ongoing research conducted toward EMR adoption and its effect on the health care industry (Audet et al., 2014; McCullough, Christianson, & Leerapan, 2013; Seeman & Gibson, 2009).

Recommendations for Action

This study involved an attempt to reach a diverse group of physicians based on their gender, age, type of practice, size of practice, length of practice, and geographical location. Physicians could benefit from recognizing their peers' efforts and perceptions toward EMR adoption. Additional studies on EMR adoption could result in a deeper understanding of why adoption rates are not likely to reach 100% compliance. Policy makers involved in the 2009 ARRA mandate could benefit from this study by revising their deadlines or creating additional incentives toward comprehensive adoption. Despite the mandated deadline, EMR adoption concerns will still exist with lower than anticipated adoption rates. Ongoing research is necessary on decreasing medical errors, the effectiveness of EMRs, and understanding physician work processes.

Recommendations for Further Study

The survey used for this study was a validated survey instrument that included a 5-point Likert-type scale. Based on the scores received and the general nature of the questions, a 7-point Likert-type scale may provide different results. I recommend

additional questions or modified questions for this survey. As technology and adoption rates are likely to increase past 2015, the scope of the questions may be obsolete. I recommend additional research toward one practice rather than the diverse scope of specialties prevalent in the health care industry. I further recommend expanding the number of statements for each independent variable to ensure higher scoring for each variable. Because of the violation of the assumption of linearity, and an interdependence between the independent and the dependent variables, I recommend performing a dominance analysis or a relative weight analysis. If the combined scores for each survey response increases, a possibility to anticipate different levels of correlations between variables are present. If time permits, a mixed-methods study could include questions more applicable to the timing of the adoption process. Finally, a larger sample size would provide a response more reflective of the population.

Reflections

The research performed in this doctoral study involved examining barriers faced by end users toward EMR adoption was rewarding and challenging for three reasons. I conducted the study with the knowledge that a federally mandated deadline was pending. I anticipated a younger demographic to respond to the survey based on my personal bias that technology use among younger individuals is more frequent. Physicians have a heavy workload, and the amount of time and effort the participants spent responding to the survey remains unknown. Discussing the participants' concerns and receiving verbal feedback from the participants would have helped to understand how the physicians truly perceived EMR adoption. A final reflection of this study concerned the adoption rates

discovered during this survey. Although the analysis performed was on a smaller sample than most surveys performed by larger organizations and researcher groups, it appeared that the financial consequences for failing to adopt EMR increased the adoption rate. Thus, the theories may help explain some of the behaviors associated with EMR adoption. Despite the explanation of behavior relating to adoption, a deeper context to adoption barriers that financial consequences may not provide.

Summary and Study Conclusions

The United States has the highest amount of health care spending in the world (Goozner, 2013). Despite health care spending nearing a quarter of the nation's GDP, use of IT is low relative to other industrialized nations (Zhang et al., 2013). In 2009, the Obama administration addressed lagging adoption rates by passing the ARRA legislation. Prior to ARRA passing, adoption rates were low and resistance was high. This study contributed to numerous studies on the barriers to technology adoption through a simple multiple regression analysis conducted to determine what independent variables (perceived ease of use, perceived usefulness, perceived behavioral control, perceived social influence, attitudes toward EMRs) predicted the dependent variable for this study (user acceptance). The results of the study confirmed that the regression model predicted user acceptance; however, none of the independent variables had a statistical significance in predicting user acceptance.

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Zemore, S. E., & Ajzen, I. (2014). Predicting substance abuse treatment completion using a new scale based on the theory of planned behavior. *Journal of Substance Abuse Treatment, 46,* 174-182. doi:10.1016/j.jsat.2013.06.011

Zhang, N., Seblega, B., Wan, T., Unruh, L., Agiro, A., & Miao, L. (2013). Health information technology adoption in U.S. acute care hospitals. *Journal of Medical Systems*, *37*(2), 1-9. doi:10.1007/s10916-012-9907-2

Appendix A: Survey Questions Associated with Independent Variables

Perceived Ease of Use
I find EMR flexible to interact with.
I find EMR to be easy to use.
I find it easy to get EMR to do what I need it to do in my patient care and management.
It is easy for me to become skillful in use the EMR technology.
Learning to operate EMR is easy for me.
My interaction with EMR are clear and understandable.

Perceived Usefulness
The primary benefit of EMR is patient safety.
EMR is related to physician's ethical responsibility to "do no harm."
I find EMR useful for my patient care and management.
Using EMR enhances my service effectiveness.
Using EMR improves my patient care and management.
Using EMR enables me to complete patient care more quickly.
Using EMR increases my productivity in patient care.

Perceived Behavioral Control
I know why EMR was/is being implemented in my organization.
Individual physicians have the ability to influence the decisions regarding EMR.
Individual physicians will influence the decisions regarding EMR.
I have the knowledge necessary to use EMR.
I have the resources necessary to use EMR.

Perceived Social Influence
Medical leadership believes that I/we should use EMR.
My feelings of responsibility toward my patients influence me to use EMR.
My peers think I/we should use EMR.
The culture here embraces EMR technology.

Attitudes Towards EMR
EMR will be successfully implemented at other organizational locations.
EMR is an appropriate tool for physicians to use.
I like the idea of using EMR.
I find technology useful for my patient care and management.
Using EMR is a good idea.
Using EMR is pleasant.
Using the EMR system is a wise idea.
I have embraced the EMR technology in my workplace.

Appendix B: Acceptance of EMR Technology Survey

Doctoral Study Invitation

My name is Terrence Duncan. I am a 5th year doctoral student pursuing my Doctorate of Business Administration through Walden University. My research study examines the central question of what barriers do end-users face regarding electronic medical records (EMR) adoption. This survey's intended research will attempt to add to the ongoing studies in understanding what barriers exist towards EMR adoption. Thus, I hope you will participate in my survey entitled "Acceptance of EMR Technology Survey."

If you choose to participate, you will be asked to complete an online questionnaire that will provide a series of statements that you will select what is your perception under each statement. You will have 60 minutes to complete this survey; however, it is possible to complete in less than 30 minutes. I hope that you do consider this opportunity in participating and contributing to the ongoing efforts of this study.

If you wish to participate, please continue and review the consent page, prior to participating in this study. Thank you in advance for taking the opportunity to review this invitation.

Please respond to the statements below by selecting the appropriate number. The selections provided range from "5 - strongly agree" to "1 - strongly disagree."

I find EMR flexible to interact with.
5 4 3 2 1

I find EMR to be easy to use.
5 4 3 2 1

I find it easy to get EMR to do what I need it to do in my patient care and management.
5 4 3 2 1

It is easy for me to become skillful in use the EMR technology.
5 4 3 2 1

Learning to operate EMR is easy for me.
5 4 3 2 1

My interactions with EMR are clear and understandable.
5 4 3 2 1

The primary benefit of EMR is patient safety.
5 4 3 2 1

EMR is related to physician's ethical responsibility to "do no harm."
5 4 3 2 1

I find EMR useful for my patient care and management.
5 4 3 2 1

Using EMR enhances my service effectiveness.
5 4 3 2 1

Using EMR improves my patient care and management.
5 4 3 2 1

Using EMR enables me to complete patient care more quickly.
5 4 3 2 1

Using EMR increases my productivity in patient care.
5 4 3 2 1

I know why EMR was/is being implemented in my organization.
5 4 3 2 1

Individual physicians have the ability to influence the decisions regarding EMR.
5 4 3 2 1

Individual physicians will influence the decisions regarding EMR.
5 4 3 2 1

I have the knowledge necessary to use EMR.
5 4 3 2 1

I have the resources necessary to use EMR.
5 4 3 2 1

Medical leadership believes that I/we should use EMR.
5 4 3 2 1

My feelings of responsibility toward my patients influence me to use EMR.
5 4 3 2 1

My peers think I/we should use EMR.
5 4 3 2 1
The culture here embraces EMR technology.
5 4 3 2 1

EMR will be successfully implemented at other organizational locations.
5 4 3 2 1

EMR is an appropriate tool for physicians to use.
5 4 3 2 1

I like the idea of using EMR.
5 4 3 2 1

I find technology useful for my patient care and management.
5 4 3 2 1

Using EMR is a good idea.
5 4 3 2 1

Using EMR is pleasant.
5 4 3 2 1

Using the EMR system is a wise idea.
5 4 3 2 1

I have embraced the EMR technology in my workplace.
5 4 3 2 1

Survey Reminder Email – via SurveyMonkey® ®

Message Preview
No recipients have been defined, so we can't generate a full preview of your message. Edit

To:

From: "terrence_duncan2006@yahoo.com via SurveyMonkey® .com" <member@SurveyMonkey® .com>

Subject: Acceptance of EMR Technology Survey Follow Up

Body: Hello. Recently, a survey was sent to you seeking participation for a doctoral study. Your response would be appreciated.

Here is a link to the survey:
https://www.SurveyMonkey® .com/s.aspx

This link is uniquely tied to this survey and your email address. Please do not forward this message.

Thanks for your participation!

Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
https://www.SurveyMonkey® .com/optout.aspx

Appendix C: Literature Review Search Matrix

Review Search Method	*Number*
Peer-reviewed (PR) journal articles	106 (95%)
Books, Publications, Other Sources	6
References within last five years	95 (85%)
Total References	112

Appendix D: Individual Informed Consent Form

CONSENT FORM

You are invited to take part in a research study examining the factors affecting electronic medical records adoption. The researcher is inviting physicians in the United States whose operations would be impacted by the American Reinvestment and Recovery Act of 2009 to be in the study. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

This study is being conducted by a researcher named Terrence Duncan, who is a doctoral student at Walden University.

Background Information:
The purpose of this study is to conduct a quantitative, correlational assessment to examine how physician perceptions impact electronic medical records adoption.

Procedures:
If you agree to be in this study, you will be asked to:

- Complete a series of questions and statements concerning electronic medical records and how it impacts your operations and personal perceptions.
- Respond to the series of questions and statements by indicating "strongly agree" to "strongly disagree."
- Complete the survey within 30 minutes.

Here are some sample questions:

Sample questions for this survey includes: "I like EMRs" and "My interactions to EMR are clear and understandable."

Voluntary Nature of the Study:
This study is voluntary. Everyone will respect your decision of whether or not you choose to be in the study. If you decide to join the study now, you can still change your mind later. You may stop at any time during the study.

Risks and Benefits of Being in the Study:
Participation in this research study does not present any foreseeable risk or benefit to the participants. The outcome of this study could develop an intricate understanding into why barriers exist towards electronic medical records adoption, barriers to adopting new technology in physician settings, and assist those involved in policy review and decisions impacting physicians in different compositions (solo practices, urban/rural practices, university/academic hospital settings).

Payment:
Participants in this study will not receive compensation.

Privacy:
Any information provided for this study will be kept confidential. The researcher will ensure that all appropriate steps of confidentiality are maintained. The information provided will not be used for any purposes outside of this research study. The researcher will not include your name or any other identifying methods that could any way indicate your identity. The researcher will not use your personal information for any purposes outside of this research project. Also, the researcher will not include your name or anything else that could identify you in the study reports. Data will be kept secure by a password encrypted data file that will only be accessible by the researcher. Data will be kept for a period of at least 5 years, as required by the university.

Contacts and Questions:
You may ask any questions you have now. Or if you have questions later, you may contact the researcher via Terrence Duncan, 618-580-5411, or terrence.duncan@waldenu.edu. If you want to talk privately about your rights as a participant, you can call Dr. Leilani Endicott. She is the Walden University representative who can discuss this with you. Her phone number is 612-312-1210. Walden University's approval number for this study is 02-12-13-0156081 and it expires on February 11, 2015.

Please print or save this consent form for your records.

Statement of Consent:

I have read the above information and I feel I understand the study well enough to make a decision about my involvement. By clicking the link below, I understand that I am agreeing to the terms described above.

Appendix E: SurveyMonkey Survey Protocols

Hi Terrence,

Thank you for contacting SurveyMonkey Audience!

Academics frequently use SurveyMonkey Audience to reach their desired audiences. Please review this FAQ that provides the information we have found to be helpful for those running academic projects using this tool. Check out this article for more information on how SurveyMonkey adheres to IRB guidelines.

Please remember, we have a survey question maximum of 50 questions (including each line of a matrix or rating question).

Read our FAQ for more information on the types of demographics and attributes we target. When your survey is ready, you can buy respondents ages 18 and above on your own with your SurveyMonkey account. Simply create your survey in SurveyMonkey, choose the "Buy a Targeted Audience" collector option, and select your targeting options and checkout. You'll get your results in 5 days or less!

Best,
The SurveyMonkey Audience Team

How does SurveyMonkey adhere to IRB guidelines?

This help article outlines the potential guidelines for using SurveyMonkey as a tool to survey research participants. These are criteria that most university IRB's recommend when using an online survey tool to collect data. It is important to engage your Institutional Review Board to approve.

Secure Transmission

- It is important to enable the SSL encryption feature. Sensitive data must be protected as it moves along communication pathways between the respondent's computer and SurveyMonkey servers. Helpful link: SSL encryption
- IP addresses should be masked from the survey author. Here is a helpful tutorial demonstrating how to turn off the collection of IP addresses: Turn off IPs

Informed Consent

- Be sure to include a consent form for your online survey. This should be on the first page of your survey. Here is a good example of a survey consent form: https://www.SurveyMonkey® .com/consent
- Please be sure to include a data confidentiality statement in your consent form. Don't make guarantees to confidentiality or anonymity.
- SurveyMonkey records the respondent time stamp. This is important especially for respondents that consented to taking your survey.
- The survey should allow for "no response "or "prefer not to respond" as an option for every survey question. A survey where a respondent cannot proceed without answering the question is in violation of the respondent's right to withhold information.
- At the end of the survey, the respondent should be given an option to withdraw from survey.

Database and Server Security

SurveyMonkey has physical and environmental controls in place to protect data. Here is a helpful link describing our security details: Security

- SurveyMonkey will not use the information collected from your surveys in any way, shape or form. In addition, any other material provided to SurveyMonkey (including images, email addresses, etc.) will be held in the strictest confidence. Click here to view our policy: SurveyMonkey Privacy Policy
- Data is backed up daily on SurveyMonkey servers.

Appendix F: Survey Demographic Questions

1. Please indicate your gender.

   ____ Male

   ____ Female

2. What age group are you in?

   ____ 30 years of age or younger

   ____ 31 to 40

   ____ 41 to 55

   ____ 56 or more

3. Please indicate the appropriate type of practice you are associated with.

   ____ General Practice

   ____ Emergency/Operating Room

   ____ Orthopedic/Occupational Medicine

   ____ Dental Surgery/Medicine

   ____ Physician Assistants

   ____ Other (specify)_____

4. Please indicate the size of your practice

   ____ Solo

   ____ Two or three physicians/Small practice physician group

   ____ Academic/University hospital group

   ____ Large provider group (Health systems/large hospital facility)

5. Please indicate the length of time you have been practicing medicine.

   ____ 0 to 5 years of practice

   ____ 6 to 10 years of practice

   ____ 11 to 15 years of practice

   ____ 15 to 20 years of practice

   ____ 21 years of practice or more

6. Please indicate the type of population environment that best fit your location

   ____ Urban/metropolitan

   ____ Rural

7. Are you EMR certified as mandated under the 2009 American Reinvestment and Recovery Act?

   ____ Yes (100% certified/operable)

   ____ Will be certified before 2015

   _____ May be certified relatively soon after 2015

   _____ Have not started/significant delay after 2015

Appendix G: Request for Permission to Use Instrument

Original E-mail
>From : "Seeman, Elaine" [SEEMANE@ecu.edu]
Date : 07/01/2013 09:18 PM
To : Terrence Duncan [terrence.duncan@waldenu.edu]
Subject : RE: Request for Permission to Use Survey Instrument

Terrance:
We give your permission to use our survey. Best of luck to you.
Elaine Seeman

From: Terrence Duncan [mailto:terrence.duncan@waldenu.edu]
Sent: Saturday, June 29, 2013 10:16 PM
To: Gibson, Shanan; Seeman, Elaine
Subject: Request for Permission to Use Survey Instrument

June 29, 2013

Dear Dr. Elaine Seeman and Dr. Sanan Gibson:

My name is Terrence Duncan. Currently, I am a doctoral student for Walden University. I am currently working on my doctoral study proposal focused on EMR adoption and physician resistance. Upon review of the literature, I had noted your survey instrument that you had used for your own research project "Predicting Acceptance of Electronic Medical Records: Is Technology Acceptance Model Enough?"

It is with great respect and courtesy, that I am asking for your consent to use your survey instrument for the purpose of my own study. I do understand that with your consent, the appropriate credit and citation will be given in my study. If there is any additional information that you may require, please feel free to contact me. Thank you in advance for your response.

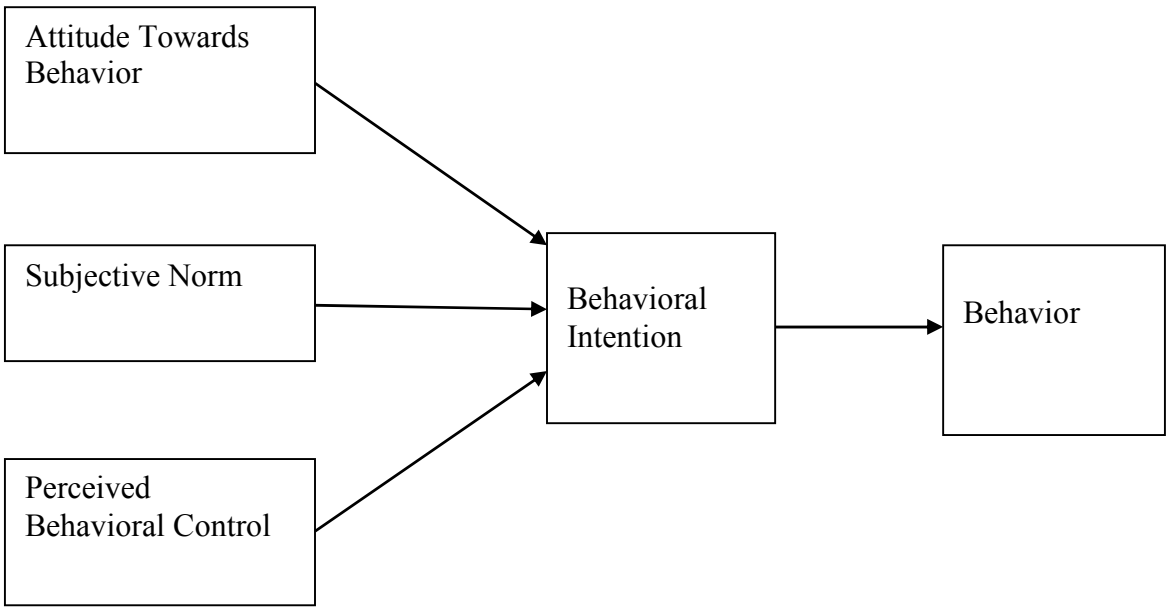
Sincerely,

Terrence Duncan
Doctoral Student - Walden University

Appendix H: Predictive Model

Theory of Planned Behavior

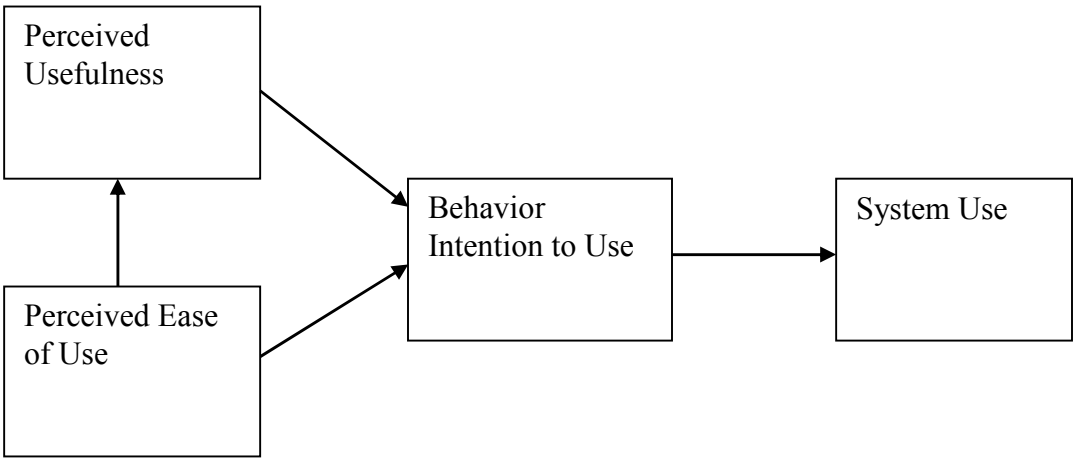
Ajzen (1988)



Appendix I: Information Systems Theory

Technology Acceptance Model

Davis et al. (1989)



Appendix J: SPSS Output

Table J1: Descriptive Statistics

		Statistic	Bootstrap[a]			
			Bias	Std. Error	95% Confidence Interval	
					Lower	Upper
UserAccept	Mean	2.934	-.0001	.1504	2.645	3.237
	Std. Deviation	1.330	-.0084	.0532	1.197	1.410
	N	76	0	0	76	76
EaseofUse	Mean	19.658	.0235	.7421	18.250	21.079
	Std. Deviation	6.736	-.0714	.4477	5.754	7.521
	N	76	0	0	76	76
Usefulness	Mean	21.803	-.005	.8749	20.132	23.579
	Std. Deviation	7.896	-.0549	.4407	6.939	8.679
	N	76	0	0	76	76
BehControl	Mean	17.079	.0152	.5206	15.987	18.052
	Std. Deviation	4.771	-.0511	.3703	4.029	5.434
	N	76	0	0	76	76
SocInfluence	Mean	13.974	-.0058	.4910	12.961	14.934
	Std. Deviation	4.3389	-.0466	.30017	3.697	4.851
	N	76	0	0	76	76
Attitude	Mean	27.6316	.0159	.9868	25.672	29.552
	Std. Deviation	8.9306	-.0923	.5378	7.785	9.879
	N	76	0	0	76	76

a. Unless otherwise noted, bootstrap results are based on 1,000 bootstrap samples

Table J2: Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.498[a]	.248	.194	1.195

a. Predictors: (Constant), Attitude, EaseofUse, BehControl, SocInfluence

b. Dependent Variable: UserAccept

Table J3: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	32.861	5	6.572	4.609	.001[b]
	Residual	99.810	70	1.426		
	Total	132.671	75			

a. Dependent Variable: UserAccept

b. Predictors: (Constant), Attitude, EaseofUse, BehControl, SocInfluence

Table J4: Coefficients[a]

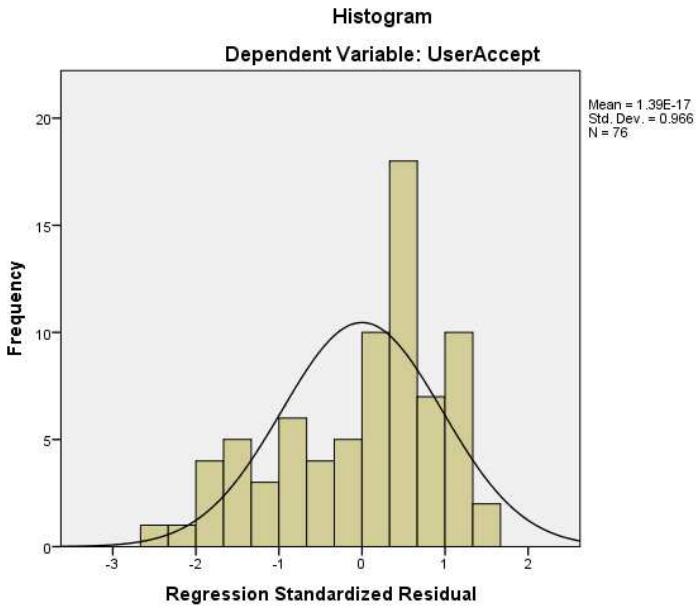
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
	B	Std. Error	Beta			Zero-order	Partial	Part
(Constant)	.919	.532		1.727	.089			
EaseofUse	-.030	.038	-.154	-.805	.423	.167	-.096	-.084
Usefulness	-.040	.038	-.240	-1.063	.291	.202	-.126	-.110
BehControl	.072	.049	.260	1.464	.148	.417	.172	.152
SocInfluence	.061	.060	.200	1.022	.310	.406	.121	.106
Atittude	.051	.031	.341	1.617	.110	.389	.190	.168

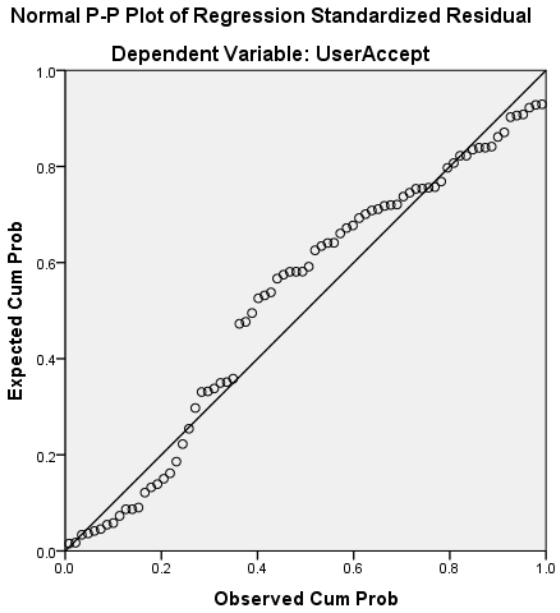
a. Dependent Variable: UserAccept

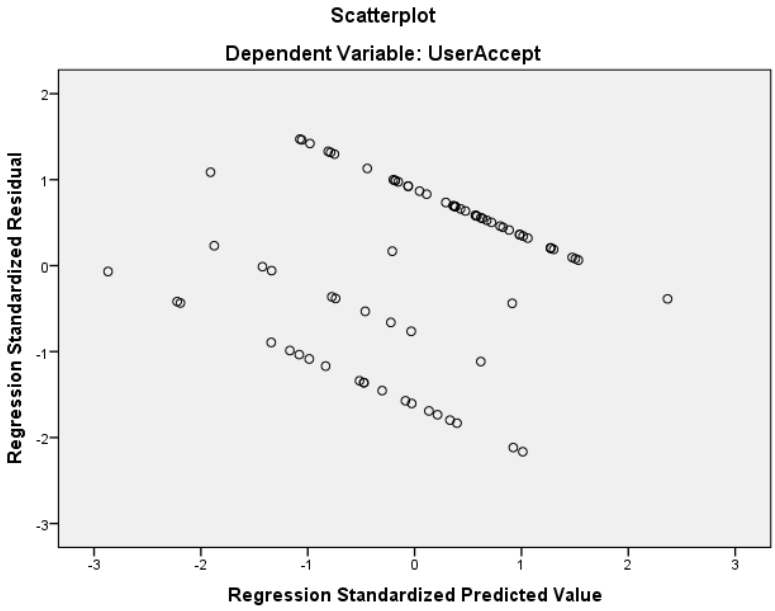
Table J5: Bootstrap for Coefficients

Model		B	Bootstrap[a]				
			Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval	
						Lower	Upper
1	(Constant)	.919	-.052	.476	.050	-.064	1.816
	EaseofUse	-.030	.005	.043	.419	-.104	.070
	Usefulness	-.040	-.003	.045	.333	-.145	.036
	BehControl	.072	.000	.054	.166	-.029	.178
	SocInfluence	.061	-.009	.068	.369	-.081	.188
	Attitude	.051	.004	.032	.111	-.007	.121

a. Unless otherwise noted, bootstrap results are based on 1,000 bootstrap samples




Normal P-P Plot of Regression Standardized Residual
Dependent Variable: UserAccept
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0


Scatterplot
Dependent Variable: UserAccept
Regression Standardized Residual
Regression Standardized Predicted Value
-3
-2
-1
0
1
2
3