ABSTRACT

BYRD, CASSIE LYN. Perceptions Toward Technology Adoption of Electronic Healthcare Record Systems Among Healthcare Professionals: A Q methodological Study. (Under the direction of Dr. Michelle Bartlett).

Healthcare professionals play a vital role in patient information and healthcare data management. The purpose of this study was to assess the viewpoints healthcare professionals have toward the technology adoption of electronic health record systems. This research can guide training and development professionals as they assist providers and their healthcare staff with the implementation and effective use of new technology into daily practice. Q methodology provided an opportunity to use both quantitative and qualitative methods to analyze the viewpoints of healthcare professionals who have used an electronic healthcare record system for clinical documentation. Literature on health information technology, technology adoption models, technology adoption in healthcare, and the eHealth workforce was used to create statements for the Q-sort. Participants electronically sorted the statements in a forced distribution according to their beliefs. A post-sort survey was administered after the sort to obtain demographic information and further understanding for the placement of the statements in the sort. Factor groups were created from the data analysis and labeled accordingly. The findings of the study inform recommendations on policy formation and new practices, as well as further the research in the field of technology adoption in healthcare.

Perceptions Toward Technology Adoption of Electronic Healthcare Record Systems Among Healthcare Professionals: A Q Methodological Study

by
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DEDICATION

This dissertation is dedicated to my family and friends.

Your love and encouragement provided me with the motivation

to see this educational journey through to completion!

BIOGRAPHY

Cassie Lyn Byrd grew up in Davidson, North Carolina. She received a Bachelor of Science in Business Administration with majors in Marketing and Management from The University of North Carolina at Charlotte in 2008. While working for a consulting firm in the healthcare industry, she graduated from Pfeiffer University with a Master of Health Administration degree. Cassie began teaching at Rowan Cabarrus Community College in 2014.

Cassie has worked in various positions within the healthcare field over the past 10 years as a patient case manager, reimbursement specialist, senior reimbursement manager, and physician site coordinator and region lead. These positions, along with her responsibilities at the community college as an instructor and member of the medical office board, led her to want to pursue her doctoral studies in Adult and Community College Education.

Cassie lives in Faith, North Carolina with her husband and four children. She enjoys spending time with her family, an active lifestyle, and any chance they get to travel.

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My cohort classmates and work friends kept me motivated and also provided encouragement along the way. I am especially thankful to those who provided guidance and support throughout the journey.

I am appreciative of this experience and my time spent with NCSU. The executive format of the program provided me with the opportunity to work with faculty, leaders at several community colleges, and leaders within their communities that I would have otherwise not been exposed to. I am thankful for the many educational experiences I was privy to while working on my doctoral studies. A special thank you to Dr. Michelle Bartlett, the members of my committee, and my editor for the guidance throughout my research.

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CHAPTER 1: INTRODUCTION

The American Recovery and Reinvestment Act passed by the U.S. government in 2009 mandated that all healthcare organizations adopt a certified electronic health record (EHR) system by 2015 (Barrett, 2018). This stimulus bill presented an unprecedented $19 billion program to promote the adoption and use of health information technology and especially EHR systems (Blumenthal, 2009). An EHR is defined as follows:

> A longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports. (HIMSS, 2018a, para. 1)

Additionally, the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009, which is part of the American Recovery and Reinvestment Act was signed into law with an unambiguous purpose of incentivizing healthcare providers to adopt EHR systems. The HITECH Act requires that providers adopt EHR systems and utilize them in a meaningful way, which includes using certain EHR functionalities associated with error reduction and cost containment (Menachemi & Collum, 2011).

The U.S. medical system has been surprisingly slow to adopt fully integrated EHR systems in practice in both primary care and hospital settings (Palabindala, Pamarthy, & Jonnalagadda, 2016). Some providers who were quick to invest, report high levels of satisfaction and confidence in the reliability of their system (Palabindala et al., 2016). The consensus of the first adopters of EHR systems is that the system helps improve patient care, promote safe practice, and enhance communication between patients and multiple providers, ultimately reducing the risk of error (Miller & Sim, 2004). It is important to note, while

electronic medical record (EMR) systems and EHR systems are referred to as the same system, they reside in different platforms under various technologies and standards. One major advantage of the EHR system is the availability of cross-provider medical information (Heart, Ben-Assuli, & Shabtai, 2017).

Problem Statement

According to Dr. Steven Stack, the immediate past president of the American Medical Association, EHR systems are the number one frustration of doctors today (Brient, 2017). Multiple studies have been conducted to analyze the benefits of implementing EHR systems, but until recently, there has not been significant research on the perceptions and attitudes of providers toward new technology adoption and how these perceptions and attitudes affect the implementation and efficiency of EHR systems in practice (Boonstra & Broekhuis, 2010; Duke, Frankel, & Reis, 2013; Hammoud et al., 2012; Ludwick & Doucette, 2009; Peled, Sagher, Morrow, & Dobbie, 2009). The Healthcare Information and Management Systems Society (HIMSS) is an important not-for-profit organization which promotes the best use of information and technology in the healthcare industry (Rouse, 2010). Don Woodlock, Vice President of HealthShare InterSystems, shared his thoughts before the HIMSS18 conference:

> Now more than ever; our collective focus should be on bringing together the information that matters to address healthcare's biggest challenges. Comprehensive, actionable information delivered at the right time and in the right format is essential for empowering constituents across the entire care ecosystem. (Woodlock, 2018, para. 1)

Woodlock (2018) suggested in his article, "Five HIMSS Themes that Will Improve Healthcare for All," that five themes are at the forefront of the EHR interoperability challenge throughout the U.S. healthcare system. These five themes are: 1) Connected health; 2) Interoperability; 3)

Analytics; 4) A shared health record; and 5) A united care ecosystem (Woodlock, 2018, para. 2). During the HIMSS18 conference, individuals such as Theo Siagian from Providence St. Joseph Health and Matt Simon from Himformatics discussed how a connected health record is foundational to successfully managing population health and risk under value-based care for Providence St. Joseph Health in California. Woodlock (2018) shared:

> This level of care coordination requires effective communication across the entire care ecosystem using … the real time application of logic within clinical workflows to enhance that collaboration … Tying together the critical information that surrounds a patients' healthcare journey—both within the EMR and outside of it—is the key to better connected health. Modern healthcare demands that we deliver the right information to providers at the right time and in the right format and for the people who matter most: the patients. (para. 9)

The lack of defined implementation and inconsistent training programs results in a healthcare workforce that is not adequately trained to use the EHR system at its most efficient level. It is critical that educators, healthcare administrators, and workforce development professionals understand how providers and healthcare staff perceive the EHR system to design education and training programs that support the adoption of EHR systems in its most efficient capacity.

Defining the misuse in practice. The literature implies when EHR systems were initially introduced, practitioners were not receptive to the idea for various reasons. One of which was the financial obligation and cost of implementation. A benefit cost analysis from Wang (2003) suggested that while EHR systems do improve the quality of patient care and decrease medical errors, physicians were hesitant to use these systems based on the financial

impact. However, the study found that the estimated net benefit from using an EHR system for five years was $86,400 per provider (Wang, 2003). Financial benefits were accrued from savings in drug expenditures, improved utilization of radiology tests, better capture of charges, and decreased billing errors. The study concluded that even though the implementation of an EHR system can result in a positive financial return on investment that this was reliant on multiple positive key factors, such as proper initial and ongoing training, and implementation and use (Wang, 2003).

In another study about physicians' adoption of EHR systems, the authors found weak evidence of the impact of meaningful use programs on EHR systems and reported these systems reduced physician productivity, data sharing capabilities, and lessened the need to incorporate other key interoperability features (Mennemeyer, Menachemi, Rahurkar & Ford, 2015). This study suggests the financial benefits recorded by Wang (2003) only occur if the EHR systems are used by providers who are well trained and use the system properly.

Reasons for misuse in practice. The research on EHR systems demonstrates there is misuse in practice that exists between the design of EHR systems and their intended use and what occurs in practice. Researchers have investigated the reasons for misuse recently to address why these gaps exist. One study addressed how an individual's attitude towards EHR systems has a direct correlation to the effectiveness of the system in practice. According to Diney, Albano, Xu, D'Atri, and Hart (2016):

> National adoption of Electronic Health Records (EHRs) is considered an essential component of the health care system overhaul sought by policymakers and health care professionals, in both U.S. and Europe, to cut costs and increase benefits. And yet, along with the technological aspects, the human factor consistently proves to be a critical

> component to diffusion of any IT system and is even more so regarding healthcare. The highly personal and sensitive nature of healthcare data and the associated concerns about privacy impede even the most efficient and technologically perfect system. (p. 19)

Electronic healthcare initiatives. As the medical field becomes more reliant on information technology, it is imperative that our healthcare providers stay abreast to the changing environment. Briefly mentioned above, the HITECH Act is a component of the American Recovery and Reinvestment Act of 2009 and was the first demonstration of the nation's commitment of federal resources to support the widespread adoption of EHR systems. According to The U.S. Department of Health and Human Services (2016), as of August 2012, more than 54% of Medicare and Medicaid eligible professionals had registered for the meaningful use incentive program. This number continues to increase each year as more practitioners integrate EHR systems into practice. Federal assistance programs (Medicare and Medicaid) have set the stage for EHR systems implementation, and there is not only a wealth of literature on implementation support, but incentive programs offered at the federal and state levels (U.S. Department of Health and Human Services, 2016).

According to HIMSS (2018b), the healthcare ecosystem "comprises individuals, systems and processes that want to share, exchange and access all forms of health information including discrete, narrative and multimedia" (para. 1). Individuals, patients, providers, health systems, researchers, payors, suppliers, and systems are all potential stakeholders within the ecosystem (HIMSS, 2018). A need has been identified in the healthcare field for the use and incorporation of technology in every aspect of the healthcare experience. The healthcare ecosystem embraces multiple levels of consideration and relationships between key stakeholders (Negash, Musa, Vogel, & Sahay, 2018).

Purpose of the Study

The purpose of this study was to assess the viewpoints healthcare professionals have toward the technology adoption of EHR systems. This research can guide training and development professionals as they assist providers and their healthcare staff with the implementation and effective use of new technology into daily practice. This type of research is being done on a national level. An example is the Lean Methodology, a Lean Six Sigma approach – specifically, to Define, Measure, Analyze, Improve and Control (DMAIC) framework (Miliard, 2018). The researchers found when Lean Methodology, and specifically the DMAIC framework, was applied to the EHR documentation template, the staff was able to reduce time spent in the EHR system and increase productivity as well as the satisfaction of the stakeholders (Miliard, 2018).

There is minimal research which includes the viewpoints of healthcare professionals towards technology adoption of EHR systems. By assessing the perceived importance of EHR systems at the practitioner level, researchers, educators, and administrators will be able to identify misuse in practice and adjust the implementation and continued training processes to reap the full benefits of EHR systems. Frameworks such as DMAIC can be used across the field to insure proper use. Most importantly, patient care can be improved while obtaining practice efficiencies and cost savings.

Theoretical Framework

The theoretical framework used to develop this research study was the unified theory of acceptance and use of technology (UTAUT) developed by Venkatesh. Research on technology adoption by groups and organizations (e.g., Sarker & Valacich, 2010; Sarker, Valacich, & Sarker, 2005; Sia, Lee, Teo, & Wei, 2001; 2004) holds the premise that one must first use a

technology before one can achieve desired outcomes, such as improvement in employee productivity and task/job performance in organizations. Researchers have proposed and tested several competing models (e.g., the technology acceptance model [TAM]) and models based on the theory of planned behavior (TPB) to explain and predict user acceptance and use of information technology (Venkatesh, Thong, & Xu, 2016). TAM and TPB were synthesized into the UTAUT by Venkatesh, Morris, Davis, and Davis (2003).

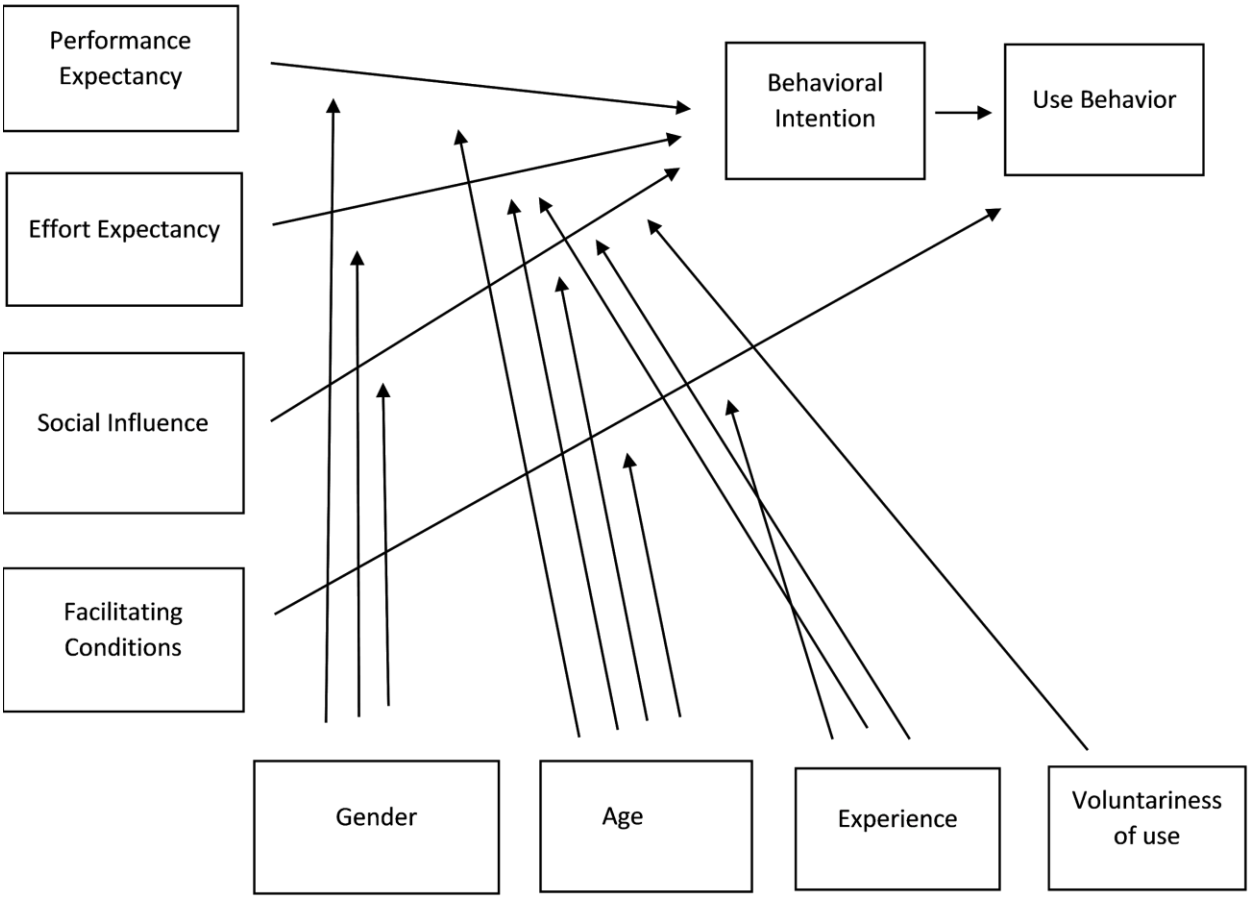

Figure 1. Unified theory of acceptance and use of technology. Adapted from "Use acceptance of information technology: Toward a unified view" by V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, 2003, *MIS Quarterly*, *27*(3), p. 425.

UTAUT identifies four key factors: 1) performance expectancy, 2) effort expectancy, 3) social influence, and 4) facilitating conditions; and four moderators: 1) age, 2) gender, 3) experience, and 4) voluntariness related to predicting behavioral intention to use technology (Venkatesh et al., 2016). According to UTAUT, performance expectancy, effort expectancy, and social influence were theorized and found to influence behavioral intention to use a technology, while behavioral intention and facilitating conditions determine technology use. Moreover, various combinations of the four moderators were theorized and found to moderate various UTAUT relationships (Venkatesh et al., 2016).

Conceptual Framework

The conceptual framework that guided this study is represented in Figure 2. The first factors to consider in new technology deployment include the type of implementation, training, expertise, and time in practice. Q methodology was the research approach deployed to understand the perspectives of healthcare professionals regarding which factors are most influential on technology adoption. Within the Q methodological approach, healthcare professionals sorted predefined statements about technology adoption based on their own perspectives. The results of the Q-sort were then evaluated using factor analysis and groups emerged that represented different viewpoints around technology adoption. The findings of the study provide implementation research and will help to create policy formation and change in practice.

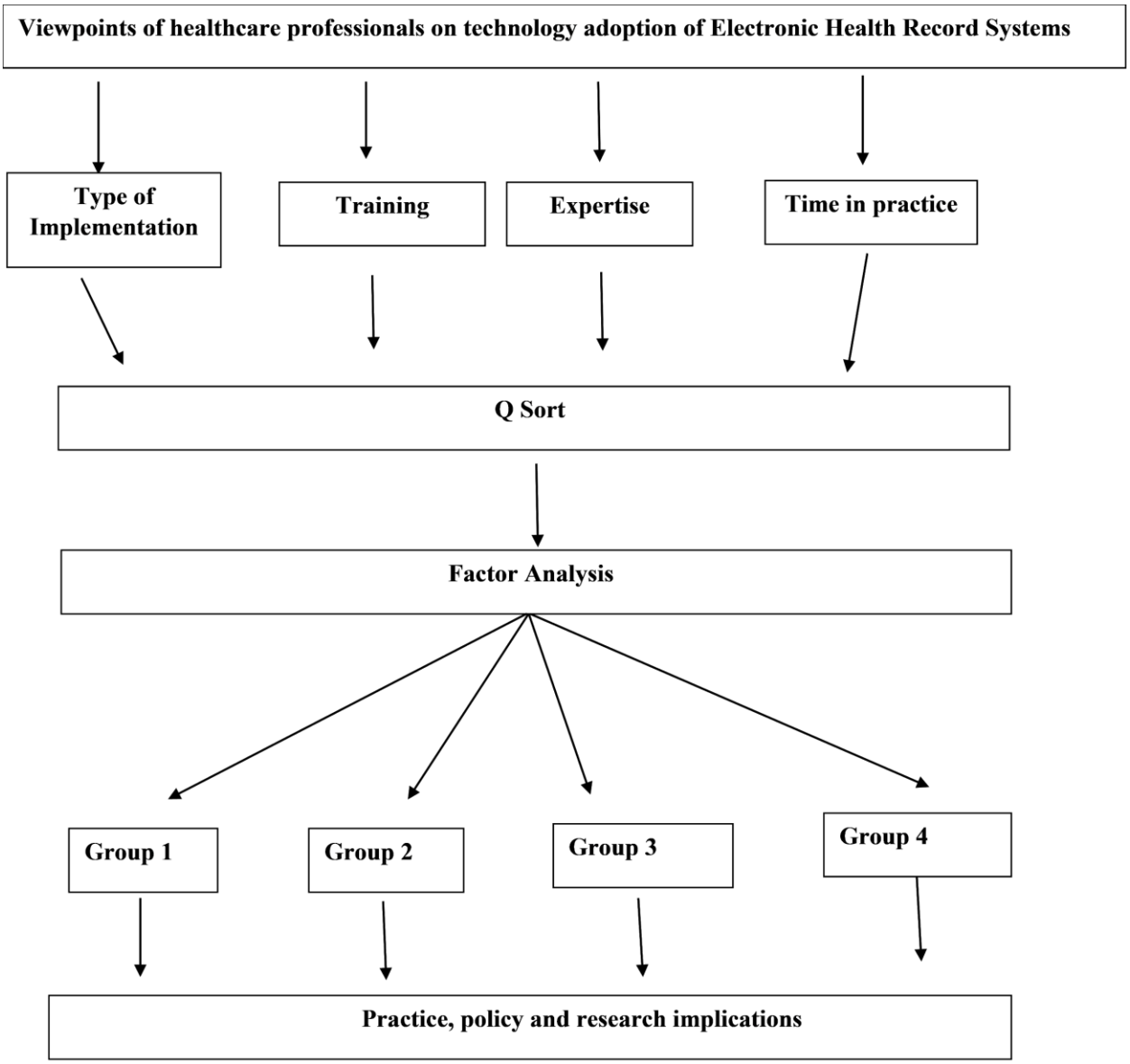

Figure 2. Graphical representation of the conceptual framework.

Research Questions

The purpose of this study was to assess the viewpoints healthcare professionals have toward the technology adoption of EHR systems. The research can guide training and development professionals as they assist providers and their healthcare staff with the

implementation of new technology into daily practice. The study answered the following research questions:

1. What are the healthcare professionals' viewpoints toward factors of technology adoption of electronic health record systems?
2. What are the distinguishing and consensus statements across viewpoints?
3. Why do healthcare professionals report reasons for selecting high and low statements?
4. Do the viewpoints of healthcare professionals toward technology adoption of electronic health record systems differ based on type of implementation, training, expertise, and time in practice.

Overview of Research Method

Q methodology was used to determine the perceptions of healthcare providers about the use of new technology. Q methodology was developed by William Stephenson in 1935 (Bartlett & DeWeese, 2015; Watts & Stenner, 2012). Brown (1993) explained Q methodology is used to determine perspectives on a topic. Q methodology systematically studies subjective matters such as thoughts, beliefs, and behaviors (van Exel & de Graaf, 2005; Yang, 2018;). Subjectivity is a "behavioral activity that constitutes a person's current point of view" (Watts & Stenner, 2012, p. 26). The Q methodological design is a non-experimental design that is ideal to ascertain the perceptions of healthcare professionals within this study. This research method is ideal for understanding perspectives on a particular topic, as it is not used to generalize to a larger population (Bartlett & DeWeese, 2015).

Performing a Q methodological study involves the following steps: 1) definition of the concourse; 2) development of the Q-sample; 3) selection of the P-set; 4) Q-sorting; and 5) analysis and interpretation (van Exel & de Graaf, 2005, p. 7). The first step, definition of the

concourse, is to develop an exhaustive list of statements about the given subject. The statements that make up the concourse should contain all possible opinions related to the topic (Bartlett & DeWeese, 2015; van Exel & de Graaf, 2005).

In the second step of the Q methodology study, the participants rank the Q-set. The Q-set is a list which usually contains between 10 and 100 items (Cross, 2004). The Q-set is created from a refinement of the concourse, where the researcher removes statements that are vague or similar to other statements (Bartlett & DeWeese, 2015). The Q-sort technique involves the rank ordering of the list of statements from agree to disagree (Brown, 1996; Cross, 2004). The statements are placed on numbered cards, and a Q-sort table is created for the participants to use as a visual for how the statements should be sorted based on the agreement level (Bartlett & Deweese, 2015).

The third step in Q methodology is the selection of the P-set (Bartlett & Deweese, 2015; van Exel & de Graaf, 2005). The P-set is the set of individuals who participate in the study to sort the Q-set and is what in a traditional quantitative study would be known as the sample (Bartlett & Deweese, 2015). A focal point to the P-set is to have at least five participants that characterize "each anticipated viewpoint" (van Exel & de Graaf, 2005, p. 6). The purpose of this study was to assess the viewpoints healthcare professionals have toward the technology adoption of EHR systems; therefore, the healthcare professionals selected made up the P-set.

The fourth step is the instrumental basis of Q methodology (Brown, 1996; Cross 2004). The Q-sort technique requires the P-set to rank order (sort) a number of items along a continuum forum with statements such as "very like me" to "very unlike me" (Cross, 2004; Kitzinger 1987) or "disagree, neutral, and agree" (van Exel & de Graaf, 2005). This study was conducted electronically using Q Method Software. When administering the Q-sort, participants were

provided a sheet with specific sorting instructions, along with an answer sheet to record their rank ordering (Bartlett & Deweese, 2015; Brown, 1993).

The last step in Q methodology is analysis and interpretation (van Exel & de Graaf, 2005). A statistical software program was utilized to conduct a factor analysis to analyze the data from the Q-sort (Bartlett & Deweese, 2015). Most factor analysis for Q studies use either the centroid or principal component analysis (PCA) method (Bartlett & Deweese, 2015). First, one calculates the correlation matrix of Q, which explains the dis(similarities) of individual points of view of the P-set (Bartlett & DeWeese, 2015; van Exel & de Graaf, 2005). Similar viewpoints are grouped into the same factor. Once factor extraction takes place, it is followed by factor rotation and the factor score calculation (Bartlett & Deweese, 2015). The factor rotation examines the data from different perspectives (Bartlett & DeWeese, 2015; van Exel & de Graaf, 2005). The factor score (or z-score) assigns value to the statements within the factor (Bartlett & DeWeese, 2015; van Exel & de Graaf, 2005).

Cross (2004) explained this fourth step as a multivariate analysis used to "identify and describe the different stories that can be told about a particular topic or issue" (p. 210) by examining the way people respond in systematically different ways to propositional samples of discourse. Once the Q factor analysis is complete, the interpretation of the results is conducted by the researcher. Statistical analysis along with post-sort explanations from the P-set are utilized to group individuals with similar viewpoints; these groups are described by the Q-set statements and demonstrate the statistical significance to the factor (Bartlett & DeWeese, 2015; van Exel & de Graaf, 2005). A detailed process of Q methodology is provided in Chapter 3.

Significance of the Study

Data on healthcare professionals' perceptions of technology will guide implementation and training. The rate of adoption over the last decade has increased dramatically, and thus the research on the topic has as well. Skinner (2003) argued that the benefits to be gained from the incorporation of information technology into the clinical decision-making process includes increased productivity for doctors and nurses, better information for decision making, better product service customization, higher quality patient outcomes, and better service.

There is a large body of research on EHR systems adoption and use. Hennington and Janz (2007) were the first to apply Venkatesh et al.'s (2003) UTAUT framework in the healthcare context. The focus of their study was to identify the most commonly discussed barriers to EHR adoption and analyze them with the UTAUT framework. The authors offered several research propositions designed to guide further research. The conceptual mapping and outlines presented by Hennington and Janz (2007) are referenced in the development of the concourse for the Q-sort in this study. Research to assist with understanding the perceptions of healthcare professionals towards EHR systems will aid in the training and development of current and future healthcare professionals and educators in the healthcare field.

Limitations and Delimitations

The research design of this study was based on several assumptions; therefore, limitations do exist. This study utilized Q methodology and was dependent upon the full participation of a group of healthcare professionals. Q methodological studies often have a limited number of participants; therefore, the perceptions in the study can be limited. This method is reliant upon the ability of the participants to sort the Q-set to reveal their viewpoints concerning technology

adoption; yet, this study only provides a snapshot of healthcare professionals' perceptions of adoption of EHR systems in practice.

There are also delimitations of this study. The participants selected for this study work in the healthcare industry and use an EHR system. As of November 23, 2019, the Centers for Medicare and Medicaid Services (CMS) published a final rule for the Medicare Physician Fee Schedule. All eligible hospitals and providers are required to use a 2015 Edition certified electronic health record technology (CMS, 2019). Examples of certified systems include: EPIC, MEDHOST, McKESSON, and NEXTGEN. The participants in this study experienced migrating to a new EHR system at some point prior to this study. Participation is voluntary and due to the time commitment required of a Q-sort the group size was smaller than requested. The study has a small P-set and the results represent only the viewpoints of those involved in the study. The results cannot be generalized to an entire population of healthcare professionals.

Researcher Positionality

I have worked in healthcare, specifically consulting for patient assistance programs, for 10 years. Throughout my time in the field I have been involved in three EHR system transitions. With each transition I had a different role but carried many responsibilities within the systems. In my most recent experience, I was considered a "change agent" and responsible for the adoption of the system for a group of team members. I received extensive training on the new system and then provided training to my team members. I was considered a mentor throughout the transition. The team members assigned to me could reach me anytime with questions or concerns while working in the systems. We also had live support during the initial use of the new system with individuals from the EHR company to assist with problems or issues that may arise.

I also teach part time at a community college in the health management technology department. I have taught courses such as Medical Terminology I and II, Insurance and Billing, Medical Office Simulation, and Introduction to Healthcare Management. I find with my teaching experience, some of the same challenges are similar to those experienced in the office setting. Technology in both of these fields is heavily relied upon and necessary. When the technology or EHR systems are not properly used or understood in a field such as healthcare, there are grave consequences. My own personal experiences led me to want to further explore why systems are not used at their most efficient capacity and what barriers may exist throughout the healthcare field that educators work to remove during implementation and use of the systems. I think understanding perceptions toward technology adoption of EHR systems among healthcare professionals will help to build the body of research on what lies ahead for the interconnection of patient care and technology.

Chapter Summary

The U.S. medical system has been tasked over the last two decades to adopt fully integrated EHR systems in practice in primary care and hospital settings. The consensus of the first adopters of EHR systems is that the system helped improve patient care, promote safe practice, and enhance communication between patients and multiple providers, ultimately reducing the risk of error (Miller & Sim, 2004). Despite these positive outcomes, there is still resistance in the field (Ngafeeson, 2019).

The problem statement illustrates the gap in practice between what is expected of healthcare professionals and what occurs in practice. This study identified some of the reasons for this gap in practice and provides recommendations on educational interventions to close the gap. There is a wealth of literature to support the adoption of EHR systems in practice, but until

recently research has not been done to address the *why* behind the resistance of healthcare professionals to adapt to these information management systems (Negash et al., 2018). The research questions that guided this study are:

1. What are the healthcare professionals' viewpoints toward factors of technology adoption of electronic health record systems?
2. What are the distinguishing and consensus statements across viewpoints?
3. Why do healthcare professionals report reasons for selecting high and low statements?
4. Do the viewpoints of healthcare professionals toward technology adoption of electronic health record systems differ based on type of implementation, training, expertise, and time in practice?

The conceptual framework and the UTAUT theoretical framework guided the study. Q methodology was used to answer this study's research questions. This methodology provided data on the perceptions of healthcare professionals on technology adoption toward EHR systems. The findings from this study inform recommendations for training and development guidance on technology adoption for current and future administrators and educators in the healthcare field.

Definition of Terms

Certified electronic health record technology (CEHRT) is an electronic health record system which meets the minimum set of required functionalities that the health information technology used by eligible clinicians must have to qualify for CMS incentive programs (CMS, 2019).

Concourse is "the list of items that are used to describe perspectives on specific topics" (Bartlett & DeWeese, 2015, p. 74).

Conditions of instruction are the instructions the researcher provides to the participants and explains how to consider the statements, interpret the research question, and complete the Q-sort procedure (van Exel & de Graaf, 2005; McKeown & Thomas, 2013).

Factor is a "cluster of respondents whose Q-sorts were statistically similar" (Brown, 2004, p. 18)

Facilitator "plays an important role in supporting primary care practices in performing quality improvement (QI), they need complete and accurate clinical performance data from practices' electronic health records (EHR) to help them set improvement priorities, guide clinical change, and monitor progress" (Hemler, Hall, Cholan, Crabtree, Damschroder, Solberg & Cohen, 2018 p. 398).

Factor loadings are "each respondent's correlation with each of the identified clusters or factors" (Brown, 2004, p. 18).

Healthcare ecosystem "comprises individuals, systems and processes that want to share, exchange and access all forms of health information including discrete, narrative and multimedia." (HIMSS, 2018, para. 1)

Electronic health record (EHR) and electronic medical record (EMR) are "a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports" (HIMISS, 2018, para. 1). EHR and EMR are often referred to as the same; however, the EHR has approved functionalities and provides real time data while the EMR only includes documentation.

Electronic health record (EHR) system is comprised of real-time, patient-centered records that make information available instantly and securely to authorized users. While an EHR does contain the medical and treatment histories of patients, an EHR system is built to go beyond standard clinical data collected in a provider's office and can be inclusive of a broader view of a patient's care (Healthit.gov, 2018).

Healthcare administrator is "an expert in managing patient health information and medical records, administering computer information systems, collecting and analyzing patient data and using classification systems and medical terminologies" (AHIMA, 2018, para. 1).

Healthcare Information and Management Systems Society (HIMSS) is a respected, not-for-profit organization which promotes the best use of information and technology in the healthcare industry (Rouse, 2010).

Health Information Technology for Economic and Clinical Health (HITECH) Act requires that providers adopt EHR systems and utilize them in a "meaningful" way, which includes using certain EHR functionalities associated with error reduction and cost containment (Menachemi & Collum, 2011)

P-set is "a structured sample of respondents who are theoretically relevant to the problem under consideration" (van Exel & de Graaf, 2005, p. 6).

Q methodology was initially developed by William Stephenson in 1935 from the statistical method of factor analysis (Watts & Stenner, 2012). The technique allows researchers to quantifiably measure subjectivity through a methodical approach using quantitative and qualitative research methods (Brown, 1994; van Exel & de Graaf, 2005).

Q-set is a "refinement of the concourse" and is the "list of items that individuals sort to describe their perspectives toward a topic" (Bartlett & DeWeese, 2015, p. 75).

Q-sort requires the P-set to rank order (sort) a number of items along a continuum forum, with statements such as, “very like me” to “very unlike me” (Cross 2004; Kitzinger 1987;)

Technology adoption model (TAM) and theory of planned behavior (TPB) are models based on TPB used to explain and predict user acceptance and use of information technology (Venkatesh et al., 2016).

Unified theory of acceptance and use of technology (UTAUT) identifies four key factors (i.e., performance expectancy, effort expectancy, social influence, and facilitating conditions) and four moderators (i.e., age, gender, experience, and voluntariness) related to predicting behavioral intention to use a technology (Venkatesh et al., 2016).

CHAPTER 2: LITERATURE REVIEW

This chapter discusses literature regarding the perceptions of healthcare professionals toward technology adoption in the healthcare field. The literature directly informed the research questions and the significance of this study. The purpose of this study was to assess the viewpoints healthcare professionals have toward the technology adoption of EHR systems. The findings can help guide educators as they design and deliver educational interventions intended to improve the adoption and application of EHR systems in daily practice. This assessment of importance provides critical information to health care administrators, employers, human resource professionals, healthcare professions educators, and continuing education professionals. Understanding perceptions can drive software design and program planning for educators, as well as selection and performance systems for human resource professionals and healthcare administrators.

Health Information Technology

This section provides an overview of the evolution of EHR systems and the role they play in the healthcare setting. The literature on EHR systems, meaningful use technology, and the healthcare ecosystem helps us to better understand the federal implications in a chronological order of how EHR systems have evolved.

Electronic Health Record

The article, “Patient case records in medical and family history: Examining the records of the Royal Free Hospital,” highlighted the importance of medical records as a historical source of patient information. The author addressed the evolution of healthcare records and the transition from the focus on founders and medical staff to that of the patient history. The article discussed

the project, “Royal Free Hospital Patient Case Records” as a working example. This marked the first time when patient information was introduced into the medical record (Cullen, 2012). The emergence of health information technology was in the 1990s. A report by the Institute of Medicine (IOM) brought international attention to the numerous problems inherent in paper-based medical records. It called for the adoption of a computer-based patient (CBP) record, which became the standard by 2001 (Wager, Lee, & Glaser, 2017).

The Health Insurance Portability and Accountability Act (HIPAA) was signed into law five years after the IOM report. HIPAA was designed to make health insurance more affordable and accessible and included important provisions to simplify administrative processes and to protect the security and confidentiality of personal health information (Wager et al., 2017).

Patient safety took the forefront with a second report from IOM (Kohn, Corrigan & Donaldson, 2000). This report brought national attention to research estimating that 44,000 to 98,000 patients die each year because of medical errors (Wager et al., 2017). The initial research focused on errors of commission, such as prescribing a medication that potentially has a fatal interaction with a current medication the patient is taking. The authors also argued that errors of omission were equally as important, such as failing to prescribe a medication that a patient would likely have benefited from (Wager et al., 2017).

Meaningful Use Technology

The criteria, objectives, and measures for demonstrating meaningful use evolved over five years from 2011 to 2016. The first stage of meaningful use criteria was implemented in 2011-2012 and focused on data capturing and sharing (Wager et al., 2017). The second stage in 2014 was intended to advance clinical processes and Stage 3 in 2016 aimed to show improved

outcomes (Wager et al., 2017). Table 1 provides a broad overview of meaningful use criteria by stage.

Table 1

Stages of meaningful use

Stage 1: Meaningful use criteria focus	Stage 2: Meaningful use criteria focus	Stage 3: Meaningful use criteria focus
Electronically capturing health information in a standardized format	More rigorous HIE	Improving quality, safety, and efficiency leading to improved health outcomes
Using that information to track key clinical conditions	Increased requirements for e-prescribing and incorporating lab results	Decision support for national high-priority conditions
Communicating that information for care coordination processes	Electronic transmission of patient summaries across multiple settings	Patient access to self - management tools
Initiating the reporting of clinical quality measures and public health information	More patient-controlled data	Access to comprehensive patient data through patient centered HIE
Using information to engage patients and their families in their care		Improving population health

Note. Adapted from *Health Care Information Systems: A Practical Approach for Health Care Management* by K. Wager, F. Lee, & J. Glaser, 2017, Hoboken, NJ: John Wiley & Sons.

Table 1 shows the progression of the stages of meaningful use criteria. It provides a useful overview of the purpose of EHRs in healthcare management. Stage 1 is focused on initial use and reporting. Stage 2 introduced patient involvement, and finally, Stage 3 is the most comprehensive with patient involvement, decision support, and efficiency.

Healthcare Ecosystem

Technology and the access to big data have paved the way for the shift from the healthcare system to the healthcare ecosystem. According to HIMSS, the health interoperability ecosystem comprises individuals, systems, and processes that want to share, exchange, and access all forms of health information (HIMSS, 2018b).

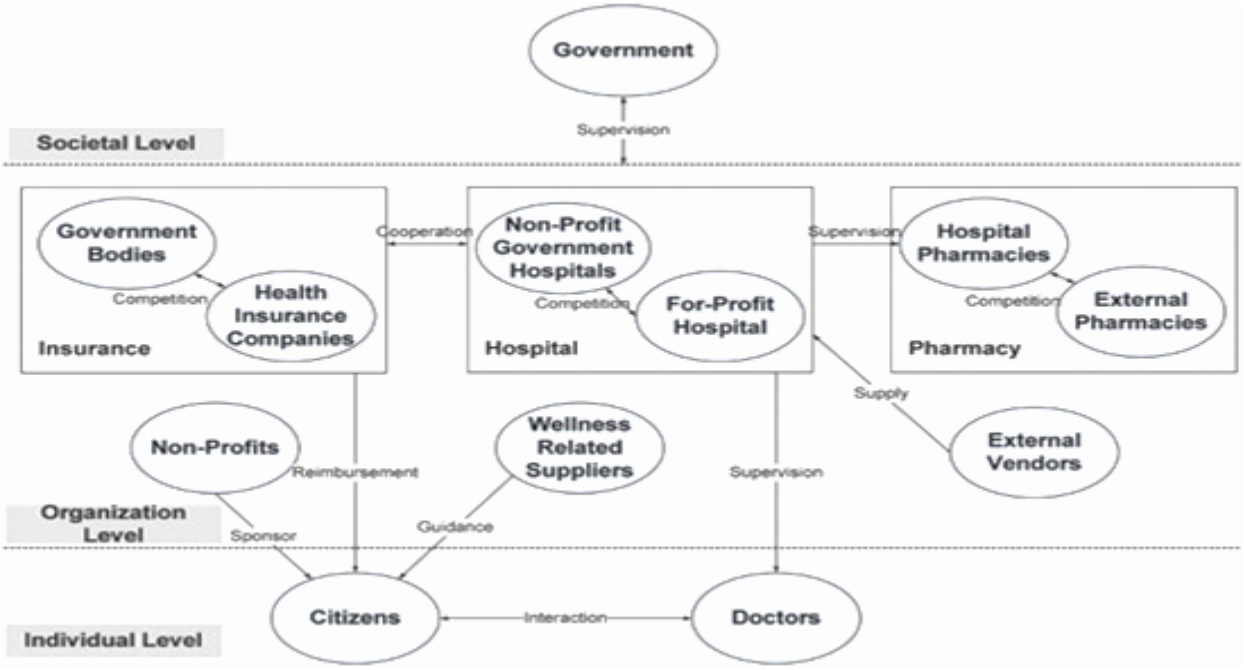

Figure 3. Healthcare ecosystem. Adapted from "Healthcare information technology for development: Improvements in people's lives through innovations in the uses of technologies" by Negash et al., 2018, *Information Technology for Development*, *24*(2), p. 189.

The U.S. federal government, as shown in Figure 3, is a major stakeholder in the healthcare ecosystem. The use of healthcare data are encouraged on a national level through the implementation of new legislation and incentive programs. Recent policy directives at the federal level include the following:

> The 2009 Open Government Directive, as well as the consequent actions of the Department of Health and Human Services (HHS) under the Health Data Initiative (HDI), are starting to liberate data from agencies like the Centers for Medicare and Medicaid Services (CMS), the food and drug administration (FDA), and the Centers for Disease Control (CDS). (U.S. Department of Health and Human Services, 2016)

The wide-ranging Affordable Care Act, enacted in March of 2010, included a provision that authorized HHS to release data that promotes transparency in the markets for healthcare and health insurance (U.S. Department of Health and Human Services, 2016).

The HITECH Act, which was part of the 2009 American Recovery and Reinvestment Act, authorized up to $40 billion in incentive payments for providers to use EMR systems, with the overall goal of driving adoption to 70 to 90% of all providers by 2019. The HITECH Act also authorized $2 billion for EMRs related to workforce training and infrastructure improvements (Groves, Kayyali, Knott, & Van Kuiken, 2013). Groves et al. (2013) pointed out that for stakeholders to take full advantage of big data in the healthcare ecosystem, "both patients and physicians must be willing and able to use insights from the data; this is a personal revolution as much as an analytical one. Behavior change will need to occur to depart from traditional practices" (p. 12).

Technology Adoption Models

For this study, technology adoption models were reviewed in reference to the healthcare field. This section describes two models from the literature. Each model discusses the relationship between user involvement and the perceived ease of use. The UTAUT model is most commonly used in the growing body of research for perceptions of technology adoption within the healthcare field.

Theory of Planned Behavior

TPB is an extension of the theory of reasoned action (Ajzen, 1991; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). The individual's intention to perform a given behavior is the central factor in both the theory of reasoned action and TPB. The structural diagram of the theory is provided in Figure 4.

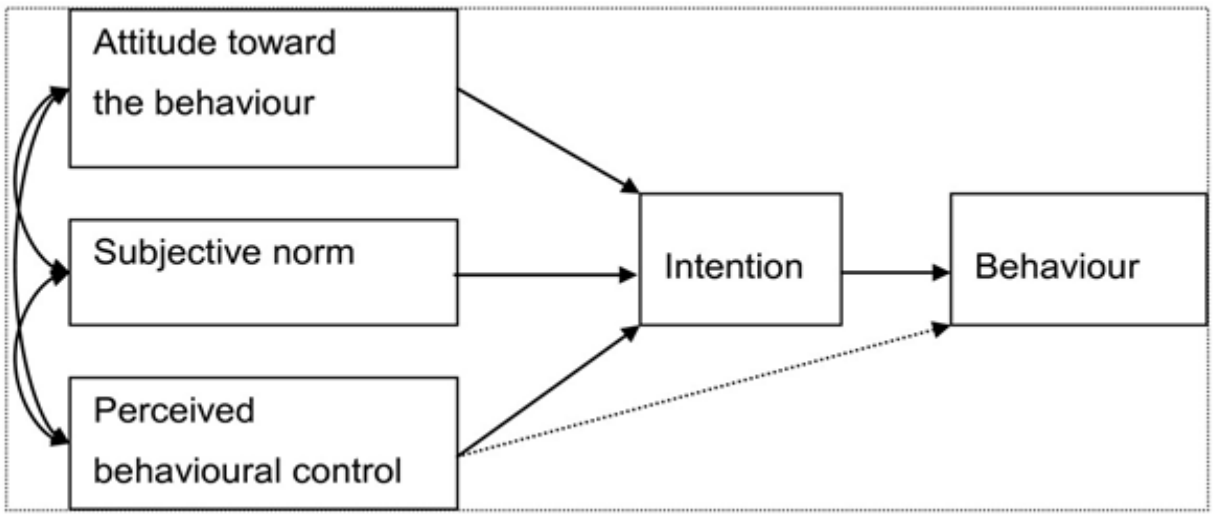

Figure 4. Theory of planned behavior. Adapted from "The theory of planned behavior" by Ajzen, I., 1991, *Organizational Behavior and Human Decision Processes, 50*(2), 179.

Ajzen and Fishbein's (1980) model explained the individual's intention to perform a given behavior. Intentions are assumed to capture the motivational factors that influence behavior; they are indications of how hard people are willing to try and of how much effort they are planning to exert to perform the behavior. Ajzen and Fishbein (1980) explained the stronger the intention to engage in a behavior, the more likely should be its performance. It is noted that the behavioral intention can find expression in behavior only if the behavior in question is under volitional control. This is if the person can decide at will to perform, or not perform, the

behavior (Ajzen, 1991). Ajzen and Fishbein (1980) advised that non-motivational factors such as time, money, skills, and cooperation should be taken into consideration. These factors represent people's actual control over the behavior. The individual should succeed in the behavior, given they have the required opportunities and resources to do so (Ajzen, 1991).

User Acceptance of Technology

Understanding user acceptance and use of information technology is one of the most researched topics concerning information technology. Venkatesh et al. (2012) defined user acceptance of technology.

> There have been several theoretical models, primarily developed from theories in psychology and sociology … employed to explain technology acceptance and use. A review and synthesis of eight theories/models of technology use resulted in the unified theory of acceptance and use of technology (UTAUT; Venkatesh et al., 2003). UTAUT has distilled the critical factors and contingencies related to the prediction of behavioral intention to use a technology and technology used primarily in organizational contexts. (Venkatesh et al., 2012, p. 157)

Handayani et al. (2016) explained the development of the user acceptance model of technology, specifically the hospital information system model (HIS). The HIS model was created to support government eHealth programs involving providers and medical and administrative staff. The model focused on human, technological, and organizational characteristics. Handayani et al.'s (2016) study found a significant influence on compatibility, self-efficacy, information quality, management support, facilitating conditions, and user involvement toward perceived ease of use of the HIS. Venkatesh and Davis (2000) said:

> The extended model was strongly supported for all four organizations in the study at all three points of measurement, accounting for 40—60% of the variance in usefulness perceptions and 34—52% of the variance in usage intentions. Both social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use) significantly influenced user acceptance. These findings advance theory and contribute to the foundation for future research aimed at improving our understanding of user adoption behavior. (p. 186)

These models depict the complexity of technology adoption and its impact on the healthcare field. Many factors contribute to an individual's willingness to adopt. It is critical for training and development professionals in the field to understand how these factors, when influenced, can best impact the individual's ease of, and willingness, to adopt.

Technology Adoption in Healthcare

This next section focuses on technology adoption in healthcare. Current literature is referenced regarding implementation using TAMs and healthcare information technology implementation and training.

Implementation Using the Technology Adoption Model

In a study examining healthcare professionals' decisions to accept telemedicine technology, a theory comparison approach was used to evaluate the extent to which a model can explain individual providers' technology acceptance behaviors. Theories compared in the study included TAM, TCP, and an integrated model. Overall findings suggested that TAM was the only model to find significant explanatory power in examining technology acceptance of individual providers (Chau & Hu, 2002). Chau and Hu (2002) stated the proliferation of

information technology in supporting highly specialized tasks and services has made it of utmost importance to understand the factors essential to technology acceptance by individuals.

In another study, 234 questionnaires were distributed to nurses and providers in cardiology, pulmonology, and internal medicine. Out of the 234 questionnaires, the researchers had a 39.7% response rate. The study concluded that the TAM was a good predictive model of healthcare professionals' intention to use telemonitoring. It was also found that the perception of the facilitator is the most important variable to consider for increasing the healthcare professionals' intention to use the new technology (Gagnon, Orruño, Asua, Abdeljelil, & Emparanza, 2012). The article pointed out variables that impact the providers' perception of telemonitoring. Telemonitoring is defined in the article as, "the use of audio, video, and other telecommunications and electronic information processing technologies to monitor patient status at a distance" (Gagnon et al., 2012, p. 54). The results of the study demonstrated that several elements should be considered when implementing telemonitoring programs. First, adequate training is suggested to ensure the healthcare system has the proper infrastructure necessary. Next, providers and nurses are considered the "gatekeepers" for telemedicine services. Finally, support from leaders in the telemedicine field is crucial in the successful implementation of telemedicine (Gagnon et al., 2012).

Healthcare Information Technology Implementation and Training

Fred Pennic with the Office of the National Coordinator for Health Information Technology created an infographic to illustrate the progress made in the nation's transition to health information technology since the passage of the HITECH Act in 2009. The progress is explained as robust participation to date. Survey data showed that the HITECH Act dramatically accelerated the nations providers' use of key health information technology capabilities

nationwide. The data explained that between 2008 and 2012, the number of hospitals using EHR systems with certain advanced functionalities that go beyond the Stage 1 Meaningful Use more than quadrupled from 9.4 to 44%. Data on the physician adoption of EHR systems with the same advanced functionalities more than doubled between 2008 and 2012, from 17 to 40% (Pennic, 2013).

To support this robust adoption in new technology, HITECH funds established 62 Health Information Technology Regional Extension Centers (RECs) to offer technical assistance and guidance that is critical to accelerating the provider adoption and meaningful use of EHR systems (Pennic, 2013). Pennic (2013) explained RECs are providing assistance and support to more than 44% (130,000) of primary care providers and 48% (20,000) of nurse practitioners nationwide. More than 80% of all federally qualified healthcare centers are enrolled with a REC. As of March 2013, 941 vendors are providing more than 1700 unique certified EHR products with the continued support of federal investment and standard setting (Pennic, 2013).

Heath (2016) explained and detailed the results of a nationwide survey of EHR system adoption trends in both hospital-owned and independent outpatient clinics. Overall, hospital-owned outpatient clinics have higher rates of EHR adoption than independently run clinics. The Office of the National Coordinator for Health Information Technology announced that hospital EHR adoption had risen to 96% in 2015 (Heath, 2016). Heath (2016) pointed out that with the impending Medicare Access and CHIP Reauthorization Act (MACRA) implementation or Stage 3 Meaningful Use, providers may need to change their systems to invest in different technologies. He described, “All of these federal policies show an opportunity for a burgeoning EHR market” (Heath, 2016, para. 10).

Perceptions of Adoption toward Electronic Health Record Systems

Literature on the topic previously focused on why or why not providers choose to adopt. Now that EHR adoption has nearly reached market saturation, the research studies have evolved to address where these systems have been most successful and why. A prominent study at the Department of Surgery at Baylor Scott & White Temple in 2016 has captured the perceptions of professionals using the systems in the field. The study at Baylor Scott & White Temple was part of a six-month education program on the use of EHR systems. A survey designed on a Likert Scale of 1 (strongly disagree) to 5 (strongly agree) was employed and included three areas of questions: 1) quality of documentation with the EHR; 2) billing questions; and 3) physician/patient satisfaction related to the EHR. The results found that the surgeons felt the EHR system was more effective as a billing tool than clinical documentation and expressed concern that the EHR system would negatively affect patient satisfaction (Frazee, Harmon, & Papaconstantinou, 2016)

Researchers have turned their attention to assessing the rate of EHR system adoption and the user's perception in order to direct future healthcare policy and system design. In one study, Lim et al. (2018) found out of 348 respondents, users had more negative perceptions of EHR productivity outcomes and effect on practice costs. The authors suggested that more attention should be placed on efficiency and the usability of the EHR systems.

Despite the acceptance and use of EHR systems in practice, the general consensus of users appears to be negative. Meigs & Solomon (2016) found in their study of 16 office-based practices, that users experienced obstacles such as system costs, workflow disruption, decreased productivity, and usability of the systems. Participants in the study expressed frustration with interoperability, increased physician workload, and negative affect on quality of care.

Certified Electronic Health Record Technology

The Quality Payment Program (QPP) is a value-based care reimbursement system for Medicare providers. For reimbursement the QPP requires practices to fully adopt CEHRT. Even with the adoption of CEHRT, in which the systems are designed to ease implementation and ease historically faced barriers, providers still find themselves facing monetary penalties and lack of resources for proper implementation (Gillen, Berzin, Vincent, & Johnston, 2018).

Evidence of the eHealth Workforce Gap

Information and communication technologies are the catalyst for new and far reaching forms of patient and consumer interactions. Healthcare improvements and clinical care outcomes require the mining of data that exist within the technology systems. Marisa Wilson and Paula Proctor, associate professors whose research focuses on health information and technology, explained current evidence exists to support the idea that the healthcare workforce does not possess the competence to maximize the technology tools available to them. The professors said, “a multi-pronged, international and interprofessional effort is needed to bridge the gap from the education pipeline to the bedside (HIMSS, 2019, para. 1).

Studies on Gap Analysis

Found (2012) made the bold assessment that nurses entering the workforce are not digitally prepared and lack the competencies required to be successful. Further, Found (2012) labeled nurse educators as the “biggest barrier” to student success in nursing informatics and suggested beginner nurses are not provided with the necessary skills, knowledge, and positive attitude required to develop student competence in nursing informatics. The diffusion of innovation theory is suggested as a foundation to move the eHealth initiative forward at the educator level.

In a study conducted by Pordeli (2018), competency deficits were found in nursing informatics at a facility in northeast Florida. The Nursing Informatics Competency Assessment (NICA) tool was used in the project and the results indicated a competencies gap intervention was needed. The author suggested the findings from this project are valuable to healthcare organizations who wish to identify, and address informatics competency gaps and leaders should provide on the job training to address gaps in knowledge and skills (Pordeli, 2018). As with the previous study, education and continuous evaluation is the key to success with the implementation of EHR systems.

In a mixed methods study, Brunner et al. (2018) discussed a three-phase study that identified the need for education and curriculum reform to reduce the gap between academia and eHealth application. The study incorporated a literature review, focus groups, and a Delphi study to examine stakeholder perceptions of eHealth capabilities and create a framework of eHealth capability statements. The final framework included statements that described the learning outcomes expected of university graduates in the healthcare field. The study concluded there is a need for educational curriculum to reinforce and adapt existing eHealth capabilities and introduce new learning opportunities for interactions for technologies within education and practice encounters (Brunner et al., 2018). It is suggested in the article that the framework from the study can be a tool for future research to explore the potential for integration of findings into workforce development programs.

The Technology Informatics Guiding Education Reform (TIGER) was established in 2006 to help develop key areas of informatics in nursing (O'Connor, Hubner, Shaw, Blake, & Ball, 2017). The reform has since evolved and in 2017, researchers conducted a gap analysis in the U.S. and Europe. There were 877 participants out of 1000 that responded to the study.

Overall, they identified a pressing need for eHealth training (O'Connor et al., 2017). Furthermore, the initiative developed a competency framework to support the integration of informatics within the healthcare field.

Chapter Summary

Chapter 2 provided a review of the literature for the study, which was designed to determine the perceptions of healthcare providers on technology adoption. The first part of the chapter provided a historical perspective of health information technology. The evolution of health information technology was broken down into three sections; EHRs, meaningful use technology, and the healthcare ecosystem. The emergence of health information technology was in the 1990s and began with the IOM report. It was followed five years later with HIPAA. Patient safety took the forefront from 2000-2010. Meaningful use was then established over five years from 2011 to 2016.

The chapter also provided a review of technology adoption models, TPB and UTAUT. These models were chosen because each model presents the relationship between user involvement and the perceived ease of use. Ajzen and Fishbein's (1980) TPB model explains the individual's intention to perform a given behavior. The UTAUT model depicts critical factors and contingencies related to the prediction of behavioral intention to use a technology and technology used primarily in organizational contexts (Venkatesh et al., 2012).

The last section of Chapter 2 discussed technology adoption in healthcare. Studies using the TAMs were reviewed and suggest it is important to understand the factors essential to technology acceptance by individuals (Chau & Hu, 2002). The major takeaways of the studies discussed are the factors that affect behaviors and professionals' intention to adopt. While

information technology is at the forefront of healthcare, and adoption is reaching market saturation, the research is now moving toward implementation and training.

The studies identified in Chapter 2 on health information technology do not address the necessary factors for technology adoption to be successful and efficient in the healthcare field. Studies have uncovered barriers to adoption, many of which explain the human factor or intention to use as the greatest obstacle. All of the studies' participants were made up of providers or nurses, and do not take into consideration other healthcare professionals who are responsible for using this same technology. These individuals might include the front office staff, benefit verification specialists, paramedics, nurses, and any other healthcare staff with administrative duties. One study mentioned that both providers and nurses are the gatekeepers of information; therefore, the participants of the current study included multiple levels of healthcare professionals.

Perceptions of the facilitator was mentioned, but how the healthcare professionals' perception affects implementation is not readily found in the literature. In this context, the facilitator is referred to as the individual responsible for the implementation of the system. This individual may be from within or outside of the organization. Data from this study can guide future changes and implementation by understanding user viewpoints that hinder successful implementation. The Q methodological approach was used to decipher the factors that users perceived as most beneficial to technology adoption.

CHAPTER 3: METHODS

This study utilized a Q methodological design to research health professionals' viewpoints of technology adoption toward EHR systems. The research questions for this study investigated healthcare professionals' perspectives on the implementation of new technology into daily practice and factors that are most beneficial. Chapter 3 includes the history of the research design and an overview of the method, including its appropriateness for this study. An outline of Q methodology will be provided and explain the development of the concourse, Q-set, and selection of the p-sample (participants). The chapter will discuss the literature on Q methodology and healthcare professionals, the creation of the instrument, data collection, and data analysis.

History of Q Methodology

Q methodology was initially developed by William Stephenson in 1935 from the statistical method of factor analysis (Watts and Stenner, 2012). The technique allows researchers to quantifiably measure subjectivity through a methodical approach (Brown, 1996; van Exel and de Graaf, 2005). Brown (1996) explained Q methodology utilizes both qualitative and quantitative research methods.

Q methodology is utilized to identify "different types of people" or "different types of viewpoints" (Watts and Stenner, 2012, p. 14). Participants in a Q methodology study will sort statements according to their viewpoint and then rank the statements from most unlike their viewpoint to most like their viewpoint (van Exel and de Graaf, 2005). According to Ramlo (2016) and Yang (2018), quantitative data for individual viewpoints is provided by the statistical method factor analysis used to evaluate the sorts. Participants with "similar views on the topic will share the same factor and each factor represents a group of individual points of view that are

highly correlated" (van Exel and de Graaf, 2005, p. 8). Bartlett and deWeese (2015) and Ramlo (2016) explained a post-sort questionnaire should be administered, as well as factor analysis, to aid in the interpretation that emerges from the study. The purpose of this study was to identify the perspectives held by healthcare professionals on new technology adoption into daily practice which made Q methodology an ideal method.

Research Design

This study used Q methodology to measure the perceptions of healthcare professionals working in various roles within the healthcare setting about incorporating new technology into daily practice. The study focuses on the following research questions:

1. What are the healthcare professionals' viewpoints toward factors of technology adoption of electronic health record systems?
2. What are the distinguishing and consensus statements across viewpoints?
3. Why do healthcare professionals report reasons for selecting high and low statements?
4. Do the viewpoints of healthcare professionals toward technology adoption of electronic health record systems differ based on type of implementation, training, expertise, and time in practice?

As identified by Brown (1993), Q methodology is highly appropriate for determining perspective on a topic and was an ideal method for this study. The research questions of this study aimed to conceptualize the perceptions of healthcare professionals on the adoption of new technology into daily practice. The study aids in developing a framework for future training and implementation strategies. Participant feedback was used to determine if perceptions can be changed and include factors with the highest positive impact.

The sample size was based on the statements selected for the Q-sort concourse. Watts and Stenner (2012) suggested a minimum ratio of Q-sample to p-sample of 2:1 with a maximum of less than the number of items in the Q-set. Performing a Q methodological study involves the following steps: 1) definition of the concourse; 2) development of the Q-sample; 3) selection of the P-set; 4) Q-sorting; and 5) analysis and interpretation (van Exel & de Graaf, 2005 p. 7).

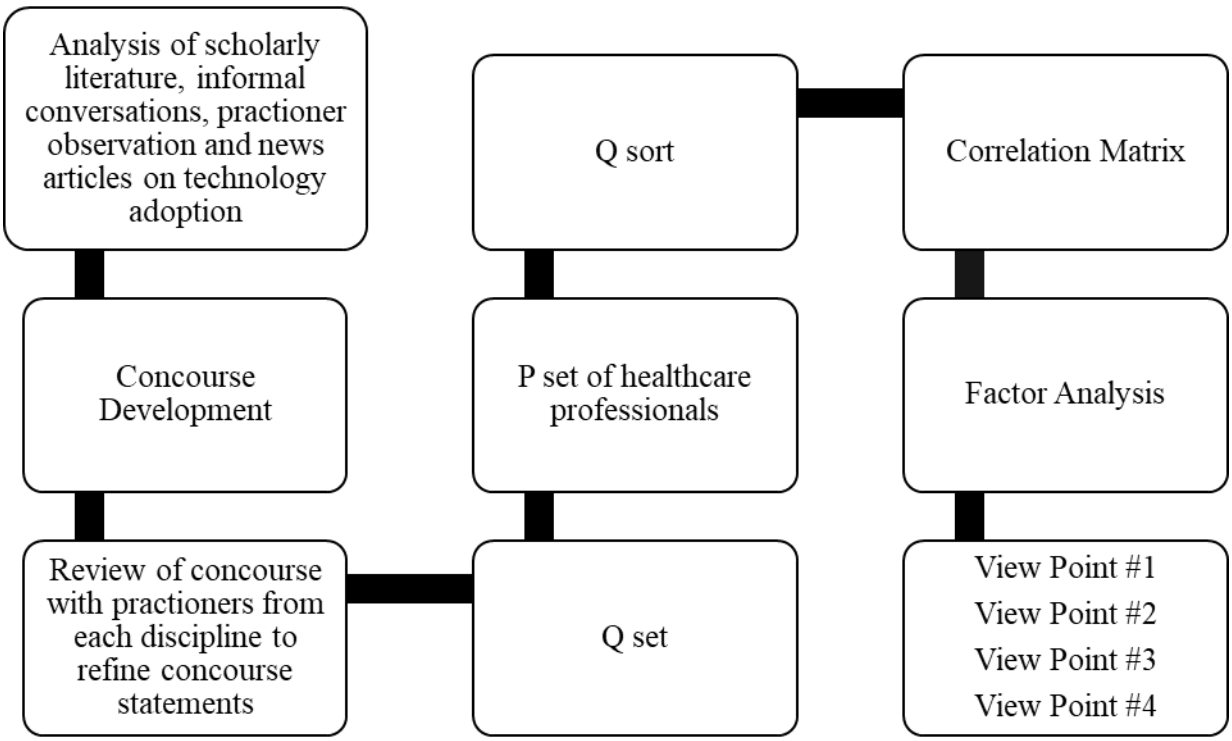

Figure 5. Visual representation of the study's research design.

Definition of the concourse. Van Exel and de Graaf (2005) explained concourse development as the process of identifying "all the possible statements" an individual can make regarding a particular subject (p. 4). The researcher should develop the concourse through reviews of existing literature (van Exel and de Graaf, 2005; Watts and Stenner, 2005),

conducting interviews and participant observation (Ramlo, 2016; van Exel and de Graaf, 2005), pilot studies (Watts and Stenner, 2005), and focus groups (Brown, 2004).

The concourse for this study was developed through the analysis of scholarly literature, informal conversation and observation, practitioner review, and news articles on technology adoption. The literature review included journal articles, published books, and official reports. Following the literature review, practitioner observation and practitioner review of the concourse, I created the concourse statements, which can be found in Appendix A.

Q-sample. The second step to perform a Q methodological study is to develop the Q-sample (van Exel & de Graaf, 2005). The Q-set should have a "comprehensive, balanced, and representative set of survey items" (Brown, 2004, p. 4) and must "not appear to be value-laden or biased" toward viewpoints (Watts and Stenner, 2012, p. 67). Brown (1994) and van Exel and de Graaf (2005) explained the standard number of a Q-set is between 40 and 50 statements on the research topic. The recommended minimum ratio of the Q-sample to P-sample is 2:1 with a maximum of less than the number of items in the Q-set (Watts and Stenner, 2012). Therefore, the P-set should aim to include a minimum of 20 to 25 healthcare professionals. One administrator per discipline was asked to review the statements for clarity and non-bias. The final Q-set was developed following the review.

P-set. Watts and Stenner (2012) defined the P-set as a purposefully selected group of participants in the Q study. A researcher should aim to have a group of participants who have a theoretical interest in the research topic and are well-educated about the topic of interest within their subjective perspectives (Brown, 2004). This is contrary to most sampling methods, which are typically randomly assigned. The number of participants in a Q study is also atypical as a

smaller group is necessary to measure the perceptions of a particular group on the research topic (Watts and Stenner, 2005).

Van Exel and de Graaf (2005) noted one goal of the P-set is to ensure there are four to five individuals who identify with "each anticipated viewpoint" (van Exel and de Graaf, 2005, p. 6). As the researcher for this study, I purposefully selected a group of individuals for the P-set. Individuals were chosen within different disciplines in the field. These disciplines in the healthcare field include providers, nurses, paramedics, pharmacists, and administrative staff.

Q-sort. The fourth step of Q methodology is Q-sorting, and this is the data collection step. The P-set is tasked with the ranking of the Q-sort statements from the participants' point of view (van Exel and de Graaf, 2005). Each card in a Q-sort will have one statement and the P-set is instructed to rank the statements based on their personal point of view. Ramlo (2016) added it is important to note to participants that there are no right or wrong rankings. Watts and Stenner (2005) emphasized the research questions must be clearly defined as the participants are asked to read the statements in relation to the condition of instruction. The ranking scale is also determined by the research questions and is given in the conditions of instruction. The ranking scale to be used will be a Q-sort matrix with a continuum from negative to positive. Figure 6 illustrates an example of the matrix where the participant will record the card numbers following their Q-sort. The participant was asked to rank statements from most disagree to most agree in relation to the condition of instruction, "When thinking about the statement and the extent they influenced your adoption of the EHR system in your workplace."

Rankings can be collected in a forced distribution curve or an open distribution that allows the P-set "to assign any number of items" under each ranking category (Watts and Stenner, 2012, p. 78). Watts and Stenner (2005) concluded there is little to no effect on the

factors based on the distribution type, but the forced distribution creates less work for both the participant and the researcher when analyzing the results. As most healthcare professionals have minimal time, the researcher used a forced distribution.

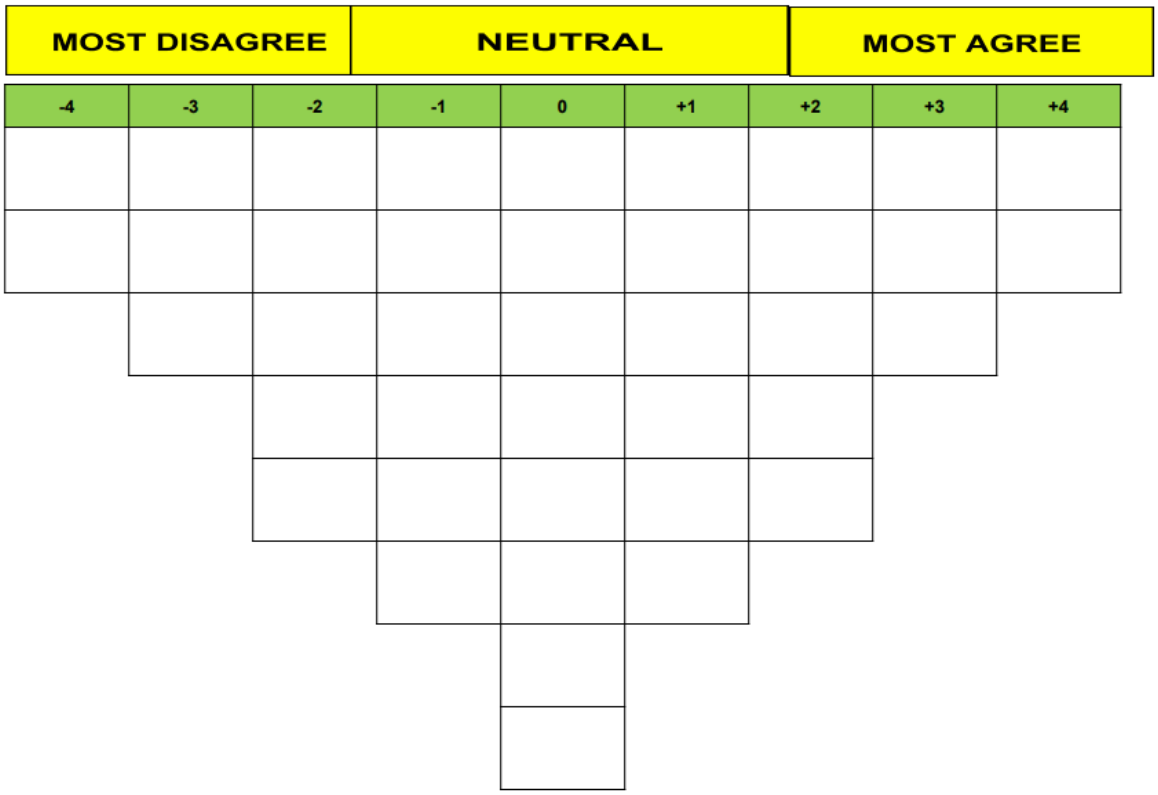

Figure 6. Q-sort matrix.

Out of respect for the time of the participants, another condition of instruction was for the Q-sort to be conducted in two sorts. The initial sort divided the cards into three piles of positive, negative, and neutral. In the second sort, the P-set sorted the cards in the provided matrix (van Exel and de Graaf, 2005). Once this ranking process was complete, follow-up interviews were conducted with the P-set to better understand the rationale behind the placements of the

statements (Bartlett and deWeese, 2015; Ramlo, 2016; van Exel and de Graaf, 2005; Watts and Stenner, 2005;).

Factor analysis and interpretation. The last step in a Q methodological study is factor analysis and interpretation. The Q-sort will produce two sets of data, qualitative and quantitative. Van Exel and de Graaf (2005) explained the correlation matrix shows the agreement or disagreement among the sorts and should be calculated first for similar viewpoints. Factor analysis takes place next and groups individuals with similar perspectives into the same factor (van Exel and de Graaf, 2005). The factor is defined as a "cluster of respondents whose Q-sorts were statistically similar" (Brown, 2004, p. 18). Brown (1993) explained this as grouping participants expressed opinion profiles by similarities and differences in which the statements are arranged.

Lastly, the factor loadings are "each respondents' correlation with each of the identified clusters or factors" (Brown, 2004, p. 18). The factor loadings will demonstrate each participants' association with the different opinion profiles. The results show "how statements rank in each of the groups" (Bartlett and deWeese, 2015, p. 79). The interpretation of data analysis is highly dependent upon the research topic. Bartlett and deWeese (2015) explained the researcher will interpret the factors by describing the groups of individuals. The quantitative data should be used along with a post-sort questionnaire and/or focus group to identify different perspectives that emerge from the study (Bartlett and deWeese, 2015).

Q Methodology and Healthcare Professionals

A healthcare administrator "is an expert in managing patient health information and medical records, administering computer information systems, collecting and analyzing patient data, and using classification systems and medical terminologies" (AHIMA, 2018, para. 1). This

is a requirement of most professionals in the healthcare setting and includes, but is not limited, to physicians, nurses, paramedics, pharmacists, and administrative staff. Participants of this study were healthcare administrators who work in the healthcare field.

As discussed in the P-set section above, Watts and Stenner (2012) provided best practices for selecting participants in a Q methodological study. The participants chosen for this study presented an interesting point of view and perspective with respect to new technology adoption (Bartlett & deWeese, 2015; Watts & Stenner, 2012). I aimed to avoid "opportunity sampling" and considered the recruitment of participants whose "viewpoints matter in relation to the subject at hand, also known as strategic sampling" (Watts & Stenner, 2012, p. 71). Practicing healthcare administrators were ideal candidates for this study as the viewpoints of practitioners are the most relevant. It is important that practitioners are not limited to one profession within the healthcare setting to address the fourth research question, "Do perceptions of technology adoption vary based on the area of expertise or time in practice?" Also, there is no current research using Q methodology that includes different areas of expertise but focuses on one discipline. For example, the studies described in the literature review in Chapter 2 were used to aid in the development of concourse statements; yet each of those studies only included participants of one discipline, nurses or providers. This study was intended to aid in the development of educational interventions to improve the adoption and application of new technology into daily practice; therefore, by including multiple disciplines in the P-set, the study aids in developing a new perspective and framework that can be applied throughout the healthcare setting.

Instrument

The chosen instrument for this Q methodological study was Q Method Software. I created the sort by adding Q-set statements and choosing the agreement level scale. This

software further allowed me to capture demographic data and the post-sort questionnaire. The P-set was provided a link to the Q Method Software where participants then completed an initial sort followed by the final Q-sort. Participants dragged and dropped the statements into the category or agreement. They were later asked to complete the post-sort questionnaire.

The research design process began with the development of the concourse outside of the instrument through the analysis of scholarly literature, interviews, practitioner observation, and news articles on technology adoption. Once complete, the set number of statements were determined. The statements were reviewed for themes and to eliminate duplicates. This led to the final concourse reflective of the attitudes and perceptions toward new technology adoption. Once the concourse was identified, I added the concourse list to the Q Method Software and set the agreement scale. I then created the demographic section and the post-sort questionnaire. The Q Method Software allowed for all three activities to be completed at once or separately. In respect to practitioners' busy schedules, they were given the option to complete all three activities at the same time. Once the Q-sorts were completed by the P-set, the software allowed the data to be downloaded for analysis.

Data Collection

This research study was submitted to the North Carolina State University Institutional Review Board (IRB). After receiving approval from IRB, I began to reach out to individuals who were representative of each discipline. When the Q-set was finalized and added to the Q Method Software, I sent a participation request via email to the desired participants. The conditions of instruction and the Q-sort link were provided to the P-set in additional email requests. The approved documentation from IRB (Participant Recruitment Letter, Informed Consent and Q-Sort Instructions) are provided in the appendix.

McKeown and Thomas (2013) explained Q-sorting can be more labor intensive than other data gathering techniques and the researcher facilitated the process, so the participant does not become less attentive. Table 2 provides an overview of the Q-sorting procedures suggested by McKeown and Thomas (2013).

Table 2

Steps of data collection in the Q-sorting process

Steps	Procedures
1) Q-sample Items	The participant becomes familiar with the Q-sample content. The participant will arrange the statements into three piles: agree, neutral, and disagree.
2) Dispersion of Items	The items are dispersed, keeping the general position of agree, neutral, and disagree (from left to right) positions. This is the initial sorting to help with contextual reading and helps in making comparisons between the items.
3) Selection of items: strong agreement	Items are examined in the conformity with the requested distribution. The number of items that are most strongly agreed with are chosen and placed in the appropriate column. (The number of items selected are dependent on the number required and the order is unimportant because those beneath are scored the same).
4) Selection of items: strong disagreement	The items (based on the number specified) as most strongly disagreed are selected and placed under the marker.
5) Continuation of item selection	The participant repeats the selection process by alternating from positive to negative ends of the continuum and working towards the middle.
6) Recording the Q-sort distribution	The item scores for the completed Q-sorts are recorded for the Q-sort distribution and participants will complete the post-sort questionnaire.

Note. Adapted from "*Q Methodology*" by McKeown, B., & Thomas, D. B., 2013, Thousand Oaks, CA: Sage Publications.

Table 2 breaks down the six steps for the data collection process of the Q-sort. McKeown and Thomas (2013) also noted that during the fifth step, to keep the sort from becoming cumbersome, the participant should begin with the poles of the continuum and work inward. This suggestion is based on the probability that the sorter is more confident when judging the extremes, unlike those in the middle, where clarity and judgement are more problematic. The alternating process helps consideration of significance of each item in position to the other items. Once complete the participant is able to make adjustments to their sort.

Data Analysis

Data were downloaded from the Q Method Software program and analyzed using statistical data analysis software to provide the quantitative data. The demographic questionnaire and post-sort questionnaire following the sort provided additional information to aid in the development of the qualitative data. The R statistical package was used to conduct the data analysis for this study. Demographic and descriptive data were summarized with means, standard deviations, frequencies, and percents. Factor analysis was conducted, and as explained by van Exel and de Graaf (2005), the resulting factors represented “a group of individual points of view that are highly correlated with each other and uncorrelated with others” (p. 9).

Chapter Summary

Q methodology uses both quantitative and qualitative methods to identify common themes and identify people's views about a target topic. For this research study, the aim was to determine the perceptions of healthcare administrators regarding the adoption of new technology into daily practice to guide better training and implementation across the disciplines in the field. This chapter included the history of the research design and an overview including the appropriateness for the study. An outline of Q methodology was provided to explain the

development of the concourse, the Q-set, and selection of the p-sample (participants). Q methodology and the healthcare administrator was then discussed followed by the creation of the instrument, collection of data, and finally, factor interpretation and data analysis.

CHAPTER 4: FINDINGS

This chapter provides the results of the data analysis of the Q-sorts that were completed to answer the research questions. A total of 22 healthcare professionals completed the Q-sort to assess the viewpoints professionals' have toward the technology adoption of EHR systems. These professionals included two nurse practitioners (9.09%), three nurses (13.64%), four medical aid/assistants (18.18%), two pharmacists (9.09%), four paramedics (18.18%), four benefits specialists (18.18%), and three medical office staff (13.64%). The amount of time participants spent using an EHR system each week ranged from 15-30+ hours with 54.55% reporting 30+ hours per week. Table 3 provides the demographic data collected in questions two through nine from the post-sort questionnaire. The participants sorted a concourse of 40 statements based on a review of literature, expert opinion, and my own personal experience within the field. The procedures followed to conduct the study were provided in Chapter 3.

The purpose of this study was to assess the viewpoints healthcare professionals have toward the technology adoption of EHR systems. This research will help guide training and development professionals as they assist providers and their healthcare staff with the implementation and effective use of new technology into daily practice. This chapter presents the data from the study to answer the following research questions:

1. What are the healthcare professional's viewpoints toward factors of technology adoption of electronic health record systems?
2. What are the distinguishing and consensus statements across viewpoints?
3. Why do healthcare professional's report reasons for selecting high and low statements?

4. Do the viewpoints of healthcare professionals toward technology adoption of electronic health record systems differ based on type of implementation, training, expertise, and time in practice.

Table 3

Overall Participant Demographics

	Overall	
	f	%
Gender		
Male	4	18.18%
Female	18	81.82%
Race/Ethnicity		
White/Caucasian	20	90.91%
Black/African American	1	4.55%
Another Race	1	4.55%
Age		
18-24	0	0.0%
25-34	8	36.36%
35-44	6	27.27%
45-54	5	22.73%
55-64	3	13.64%
65+	0	0.0%
Profession		
Nurse Practitioner	2	9.09%
Nurse	3	13.64%
Medical Aid/Assistant	4	18.18%
Pharmacist	2	9.09%
Paramedic	4	18.18%
Benefit Specialist	4	18.18%
Medical Office Staff	3	13.64%
Hours of Use per Week		
0-5	1	4.55%
5-15	4	18.18%
15-30	5	22.73%
30+	12	54.55%

To answer the research questions, healthcare professionals completed the Q-sort and answered a post-sort questionnaire that included demographic and narrative questions. In the Q-sort, the participants sorted concourse statements based on their perception of EHR systems in their work environment. The narrative questions asked each participant to provide the reasoning for why they chose the statement for "most agreed" or "most disagreed."

This chapter provides an overview of the data analysis, correlation matrix, factor analysis, eigenvalues, factor loadings, factor arrays, distinguishing statements, and consensus statements. Data are provided to show the highest and lowest ranked statements for each group along with the participant demographics.

Overview Analysis

Brown (1993) explained Q methodology is used to determine perspectives on a topic. Q methodology systematically studies subjective matters such as thoughts, beliefs, and behaviors (van Exel & de Graaf, 2005; Yang, 2018). The participant ranked statements in a forced distribution based on their own perception. Factors were extracted to represent the groups of individual viewpoints. Themes were identified based on the "high" and "low" for each group.

The Q-sort was conducted electronically through Q Method Software. The electronic sort is similar to the manual sort, as the participants were first asked to complete a pre-sort which separated the statements into three categories; agree, disagree, and neutral. The participants then completed the Q-sort by ranking the statements on a scale of -4 to +4, most disagree to most agree. Once the data were collected, the study was closed, and the data were exported to an Excel document. Participants were asked to respond to a post-sort questionnaire. The data are analyzed using R Statistical Data Analysis Software. The software was used specifically to develop the factor analysis, correlation matrix, eigenvalues, factor loadings, factor arrays, and

any consensus and distinguishing statements. The data analysis was used to identify groups of professionals of technology adoption of EHRs and the qualitative responses to the post sort questionnaire helped to identify themes within the groupings.

Factor Analysis & Eigenvalues

CRAN-R project for analysis was the R statistical software used for the data analysis of the study. Five factors were determined from the study based on the eigenvalues of the factor groups. McKeown and Thomas (2013) explained that eigenvalues that exceed 1.0 are considered significant and eigenvalues that are less than 1.0 are considered weak and should not be included. There are five factors in the analysis where the eigenvalue is above 2.0. Table 3 shows the eigenvalues for each of the factors ranging from 3.6 to 1.9. The table also shows the five factors combined to explain 58.1% of the variance amid the responses. The reliability between the factor groups ranged from 0.89 to 0.95. Watts and Stenner (2012) explained these are reliable as the score was greater than 0.70.

Table 4

Factor Characteristic Eigenvalues

Factor	Average Reliability Coefficient	Number of Loading Q Sorts	Eigenvalues	Variance Explained	Reliability	Standard Error of Factor Scores
Factor 1	0.8	5	3.6	16.5	0.95	0.22
Factor 2	0.8	3	2.6	11.7	0.92	0.28
Factor 3	0.8	5	2.5	11.6	0.95	0.22
Factor 4	0.8	3	2.1	9.6	0.92	0.28
Factor 5	0.8	2	1.9	8.7	0.89	0.33

Factor loadings enabled me to see the Q-sorts of groups of participants who loaded significantly on the same factor (Watts & Stenner, 2012). This is best illustrated using the scree plot of eigenvalues. In Figure 7, the y-axis represents the eigenvalues and the x-axis represents the factors. The curve on the scree plot demonstrates the point at which the number of factors explains the data. According to Watts and Stenner (2012) the eigenvalue is no longer adequately explained when it is below 1.0.

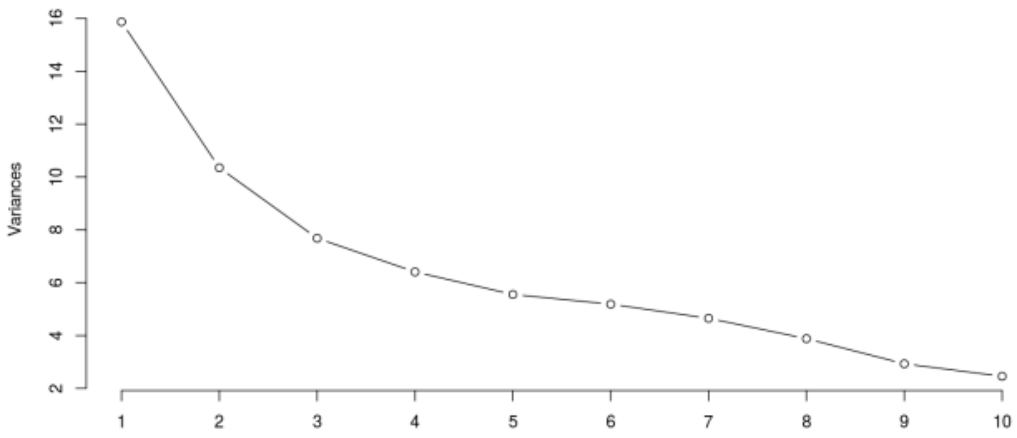

Figure 7. Scree plot of eigenvalues.

Correlation Matrix

The correlation matrix presents the values that range from -1.0 to +1.0. Groups of opposite opinion are represented by -1.0, while groups of similar opinion are represented by +1.0. Bartlett and DeWeese (2015) stated, “the values assist to determine the number of shared factors among the data” (p. 79). Table 5 displays the relation of the factor groups in the study. Factor Group One and Factor Group Five have the strongest correlation of 0.316 which indicates similar Q-sorts within these groups of participants. Factor Group One and Factor Group Two

have the weakest correlation of 0.018 which indicates these groups have the Q-sorts the least alike.

Table 5

Correlation Matrix

	F1	F2	F3	F4	F5
F1	1.00				
F2	0.018	1.00			
F3	0.20	0.195	1.00		
F4	0.251	0.275	0.171	1.00	
F5	0.316	0.164	0.078	0.29	1.00

Factor Loadings

Factor loadings measure "the extent to which each individual Q-sort" represents the factor (Watts & Stenner, 2012, p. 111). The range of factor loadings is -1.0 to +1.0. According to Mertler & Vannatta (2010) a loading of +.30 is the minimum consideration for significance and +.50 is a practically significant correlation. The loadings of each participant presented in Table 6 and Table 7 display the flagged factor loadings provided from the analytical library in R.

Table 6

Factor Loadings

	F1	F2	F3	F4	F5
P1	0.83(true)	0.03	0.14	0.03	0.14
P2	0.08	0.67(true)	0.25	0.10	-0.04
P3	-0.30	0.28	0.61(true)	0.05	0.04
P4	-0.33	0.72(true)	0.12	0.09	0.14
P5	0.59(true)	0.08	0.44	0.18	0.21
P6	0.59(true)	-0.19	0.09	-0.14	0.27
P7	0.68(true)	-0.00	-0.20	0.10	-0.03
P8	0.00	-0.46	0.69(true)	0.27	0.24
P9	0.07	0.15	0.68(true)	-0.15	0.20
P10	0.06	0.18	0.15	0.17	0.49(true)
P11	0.15	0.14	0.35(true)	0.11	-0.09
P12	0.44	0.19	0.24	0.33	-0.49
P13	-0.17	0.26	0.05	0.70(true)	0.25
P14	0.20	0.48	0.03	0.16	0.39
P15	0.48	0.02	-0.35	0.30	0.39
P16	0.49	-0.43	0.23	-0.23	0.38
P17	0.19	0.04	-0.08	0.15	0.65(true)
P18	0.58(true)	0.22	0.29	0.24	-0.09
P19	0.46	0.59(true)	0.03	-0.37	0.31
P20	0.17	0.01	0.60(true)	0.00	-0.23
P21	0.14	0.40	0.06	0.58(true)	0.06
P22	0.29	-0.25	0.03	0.72(true)	0.11

Table 7

Flagged Factor Loadings

	Factor One	Factor Two	Factor Three	Factor Four	Factor Five
P01	TRUE	FALSE	FALSE	FALSE	FALSE
P02	FALSE	TRUE	FALSE	FALSE	FALSE
P03	FALSE	FALSE	TRUE	FALSE	FALSE
P04	FALSE	TRUE	FALSE	FALSE	FALSE
P05	TRUE	FALSE	FALSE	FALSE	FALSE
P06	TRUE	FALSE	FALSE	FALSE	FALSE
P07	TRUE	FALSE	FALSE	FALSE	FALSE
P08	FALSE	FALSE	TRUE	FALSE	FALSE
P09	FALSE	FALSE	TRUE	FALSE	FALSE
P10	FALSE	FALSE	FALSE	FALSE	TRUE
P11	FALSE	FALSE	TRUE	FALSE	FALSE
P12	FALSE	FALSE	FALSE	FALSE	FALSE
P13	FALSE	FALSE	FALSE	TRUE	FALSE
P14	FALSE	FALSE	FALSE	FALSE	FALSE
P15	FALSE	FALSE	FALSE	FALSE	FALSE
P16	FALSE	FALSE	FALSE	FALSE	FALSE
P17	FALSE	FALSE	FALSE	FALSE	TRUE
P18	TRUE	FALSE	FALSE	FALSE	FALSE
P19	FALSE	TRUE	FALSE	FALSE	FALSE
P20	FALSE	FALSE	TRUE	FALSE	FALSE
P21	FALSE	FALSE	FALSE	TRUE	FALSE
P22	FALSE	FALSE	FALSE	TRUE	FALSE

Table 8 illustrates the factor loading for the participants. Factor Group One had five participants that significantly loaded with factors ranging from 0.83 to 0.58. Factor Group Two had three participants that loaded significantly with factors ranging from 0.59 to 0.72. Factor

Group Three had five participants that loaded significantly with factors ranging from 0.35 to 0.69. Factor Group Four had three participants that loaded significantly with factors ranging from 0.22 to 0.70. Factor Group Five had two participants that loaded significantly at 0.49 and 0.65.

Table 8

Factor Loadings

Participant ID	Factor One	Factor Two	Factor Three	Factor Four	Factor Five
P01	0.83				
P05	0.59				
P06	0.59				
P07	0.68				
P18	0.58				
P02		0.67			
P04		0.72			
P19		0.59			
P03			0.61		
P08			0.69		
P09			0.68		
P11			0.35		
P20			0.60		
P13				0.70	
P21				0.58	
P22				0.22	
P10					0.49
P17					0.65

Factor Arrays

Factor arrays calculate each concourse statement. All the ranking values from each statement are analyzed from every participant (Bartlett & DeWeese, 2015). The factor arrays consist of all the Q-sorts within an identified factor and presented in whole numbers (-4 to +4) to be compared and contrasted with the other factors that emerged from the Q-sorts (Bartlett & DeWeese, 2015). The study asked healthcare professionals to sort statements of technology adoption practices on a forced distribution scale from -4 (most disagree) to +4 (most agree), relating to their own perceptions of which practices would impact them during the implementation of a new EHR system. Factor arrays for each concourse statement in the study are presented in Table 9.

There are four statements with a positive score across all factor groups: 1) Statement #4 (Technical support is available 24/7), 2) Statement #7 (The system is necessary to complete essential duties of daily tasks), 3) Statement #16 (The system includes user support systems), and 4) Statement #20 (System data are used to inform, deliver and improve healthcare). There were no statements that had negative scores across all factor groups. Distinguishing and consensus statements derived from the factor arrays are discussed in the following sections.

Table 9

Factor Arrays

Number	Statement	F1	F2	F3	F4	F5
1	The system is user friendly	2	1	-1	-1	3
2	An expert provides the training	2	-1	3	1	1
3	I feel comfortable asking questions	3	0	-2	2	1
4	Technical support is available 24/7	2	0	4	0	1
5	Clear written instructions are provided	2	1	2	-2	0

Table 9 (continued).

6	A detailed explanation for why use is necessary is given	-2	-4	-2	3	1
7	The system is necessary to complete essential duties of daily tasks	4	2	3	3	2
8	The system provides output quality with result demonstrability	0	1	1	0	-1
9	Management support is available during and following initial training	2	-1	-1	-1	1
10	Dedicated time to training is provided during work hours	3	-1	-1	-1	1
11	Continuous quality communication is received from management	-1	-1	0	2	2
12	Digital skills required for the system are included in the job description	-1	-2	0	1	3
13	Systems are built with user input	-1	-2	2	0	-3
14	Systems are accessible by all parties in the healthcare setting including the patient.	-2	2	0	-2	3
15	System training includes mobile technology	-4	3	3	4	-2
16	The system includes user support systems	0	0	2	0	0
17	Legal implications of the system are well defined	-1	0	-1	-1	-2
18	Policy implications of the system are well defined	-1	-1	-2	0	-2
19	Ethical implications of the system are well defined	0	1	0	1	-1
20	System data are used to inform, deliver and improve healthcare	1	4	1	2	0

Table 9 (continued).

21	System training includes integration with billing to provide better access to resources	-3	2	-3	1	2
22	Participation is encouraged for system evaluation	0	-2	2	-2	-1
23	Systems are integrated across all healthcare professions and institutions	-2	2	1	-3	-2
24	Systems are vital to digital health and the industry	3	3	-1	3	2
25	System data provides the foundation for healthcare spending	-2	-1	-4	-1	0
26	System data provides the foundation for reimbursement platforms	0	0	-2	-1	-3
27	All stakeholders have visibility to patient notes	-3	2	0	-1	-2
28	Systems follow universal standards	0	0	-2	0	4
29	Systems have a standard method for matching patient data	-1	1	1	-1	1
30	All systems are interoperable	-3	1	2	-2	0
31	Systems are beneficial to patient self-management	-1	3	-1	1	0
32	System implementation is deployed in small groups	1	0	0	-3	-1
33	Individual system training is offered	1	-2	0	2	0
34	System training is led by individuals with a positive attitude	1	-2	1	1	2
35	Users are included in new system deployment	0	0	-1	0	0
36	System training is made fun and includes incentives	0	-4	-3	-4	0

Table 9 (continued).

37	Clear instructions are provided in the event the system is not accessible	-2	-3	1	-2	-3
38	Customized training is given based on the profession	1	-1	1	2	-1
39	System software use is formally taught prior to entering the profession	1	-3	-3	-3	-4
40	Training includes how to address concerns of patient confidentiality	1	1	0	1	-1

Consensus Statements

Consensus statements are identified as concourse statements with similar scores across the factors (Bartlett & DeWeese, 2015). Distinguishing statements are statements that are rated significantly higher or lower on one factor compared to another. Once factors are identified using quantitative data, qualitative statements from the post-sort questionnaire are used to help interpret the factors and identify themes.

In this research study, only one consensus statement was identified through R: Statement #35 (Users are included in new system deployment). A comparison of how each factor group rated this statement can be seen in Table 10. As seen in the table, the low ratings across all factor groups indicate participants do not believe they are included in new system deployment.

Table 10

Consensus Statements

Number	Statement	F1	F2	F3	F4	F5
35	Users are included in new system deployment	0	0	-1	0	0

Distinguishing Statements

Statements that are ranked higher or lower by the given factor in comparison to the other factor groups are considered distinguishing statements. According to Bartlett & DeWeese (2015) it is essential to examine the highest and lowest ranked statements for each factor. Five factors were identified for this research study on technology adoption of EHR systems among healthcare professionals.

Table 11

Distinguishing Statements by Group

	No.	Statement	F1	F2	F3	F4	F5
Group One	10	Dedicated time to training is provided during work hours	3	-1	-1	-1	1
	15	System training includes mobile technology	-4	3	3	4	-2
	32	System implementation is deployed in small groups	1	0	0	-3	-1
	39	System software use is formally taught prior to entering the profession	1	-3	-3	-3	-4

Table 11 (continued).

Group Two	6	A detailed explanation for why use is necessary is given	-2	-4	-2	3	1
	20	System data are used to inform, deliver and improve healthcare	1	4	1	2	0
	27	All stakeholders have visibility to patient notes	-3	2	0	-1	-2
	31	Systems are beneficial to patient self- management	-1	3	-1	1	0
	33	Individual system training is offered	1	-2	0	2	0
	34	System training is led by individuals with a positive attitude	1	-2	1	1	2
Group Three	4	Technical support is available 24/7	2	0	4	0	1
	13	Systems are built with user input	-1	-2	2	0	-3
	14	Systems are accessible by all parties in the healthcare setting including the patient	-2	2	0	-2	3
	22	Participation is encouraged for system evaluation	0	-2	2	-2	-1
	24	Systems are vital to digital health and the industry	3	3	-1	3	2
	25	System data provides the foundation for healthcare spending	-2	-1	-4	-1	0

Table 11 (continued).

	37	Clear instructions are provided in the event the system is not accessible	-2	-3	1	-2	-3
Group Four	6	A detailed explanation for why use is necessary is given	-2	-4	-2	3	1
	13	Systems are built with user input	-1	-2	2	0	-3
	32	System implementation is deployed in small groups	1	0	0	-3	-1
Group Five	6	A detailed explanation for why use is necessary is given	-2	-4	-2	3	1
	12	Digital skills required for the system are included in the job description	-1	-2	0	1	3
	15	System training includes mobile technology	-4	3	3	4	-2
	20	System data are used to inform, deliver and improve healthcare	1	4	1	2	0
	28	Systems follow universal standards	0	0	-2	0	4

Table 11 shows the distinguishing statements by group. No one group had the same amount of statements. Factor Group Three had the most with seven distinguishing statements, as well as the lowest overall correlation between the groups. Factor Group Four had three distinguishing statements and Factor Group One had four, indicating these groups had the

strongest correlations. There were four distinguishing statements with ("only") in which three factor groups loaded the same. These statements included: Statement #24 in Factor Group Three, Statement #34 in Factor Group Two, Statement #37 in Factor Group Three, and Statement #39 in Factor Group One.

Factor One: Training Influences System Adoption and Implementation

A total of five participants loaded significantly on Factor Group One. The five participants account for 22.7% of the P-set and 27.7% of the variance. The participants in this factor group share similar viewpoints on the adoption of EHR systems. The participants in Factor Group One include; two pharmacists, two supervisors of benefit verification specialists, and one medical aid. The highest ranked statement for adoption was Statement #7 (The system is necessary to complete essential duties of daily tasks). The narrative responses in the post-sort questionnaire indicated that necessity governs the rate of adoption. One participant stated, "they do not need fun incentives" as use of the system is required. As noted in Table 12, Factor Group One ranked high on Statement #10 (Dedicated time to training is provided during work hours) compared to all other factors that ranked relatively low on this statement. Statement #39 (System software use is formally taught prior to entering the profession) was also ranked higher by Factor Group One as compared to the other factor groups. This group of participants have the overall view that training is essential to successful adoption of the EHR systems.

Table 12

Distinguishing Statements for Factor Group One

	No.	Statement	F1	F2	F3	F4	F5
Group One	10	Dedicated time to training is provided during work hours	3	-1	-1	-1	1
	15	System training includes mobile technology	-4	3	3	4	-2
	32	System implementation is deployed in small groups	1	0	0	-3	-1
	39	System software use is formally taught prior to entering the profession	1	-3	-3	-3	-4

Table 13 provides the highest and lowest ranked statements for this factor group. The highest ranked statement for Factor Group One was Statement #7 (The system is necessary to complete essential duties of daily tasks) by two participants within the group. Statement #10 (Dedicated time for training is provided during work hours) and Statement #24 (Systems are vital to digital health and industry) are also highs within the group. Statement #10 (Dedicated time to training is provided during work hours) is a distinguishing statement. The lowest ranked statements for Factor Group One also included a distinguishing statement: Statement #15 (System training includes mobile technology). Statement #30 (All systems are interoperable) and Statement #31 (Systems are beneficial to patient self-management) were the other lowest ranked statements.

Table 13

Factor Group One: Highest and Lowest Ranked Statements

Rank	Card Number	Corresponding Statement
Highest		
	7(x2)	The system is necessary to complete essential duties of daily tasks
	10	Dedicated time for training is provided during work hours (*)
	24	Systems are vital to digital health and the industry
Lowest		
	15	System training includes mobile technology (*)
	30	All systems are interoperable
	31	Systems are beneficial to patient self- management

(*) indicates the statement is a distinguishing statement for the group

The post sort questionnaire asked participants to address why they chose to place their statements at -4 and +4. All participants in this group responded that they placed these cards according to their initial reactions to the statements and personal experiences within their profession. Each participant wrote about a positive training experience. One participant discussed a "3-week training on a new system." Another stated, "on the job training is most beneficial." Another participant mentioned, "being taken off site and given education and instruction on the system during work hours."

Figure 8 is a model sort for Factor Group One. The model sort provides a representation of the quantitative data from the sort. The model shows the highest and lowest placement of the statements for Factor Group One. The sort aids in the understanding of how the participants in the group view technology adoption of EHR systems.

MOST DISAGREE			NEUTRAL			MOST AGREE		
-4	-3	-2	-1	0	+1	+2	+3	+4
31	19	28	39	38	40	34	32	10
	16	25	37	36	26	33	29	
	14	20	23	30	22	24	7	
		15	21	27	18	9		
		11	17	12	8	5		
			13	6	4			
			35	3	2			
				1				

Figure 8. Model sort for Factor Group One

Factor Two: System Integration is Vital to Digital Health and Industry

Factor Group Two consists of three participants. The three participants account for 13.6% of the P-set and 16.6% of the variance. The participants in Factor Group Two include a supervisor of benefit verification specialists and two tenured medical aids. This factor group is focused on the outcomes of the adoption of EHR systems. The highest ranked statements for this group were Statement #21 (System training includes integration with billing to provide better access to resources) and Statement #24 (Systems are vital for digital health and industry). The participants in this group have a futuristic outlook on adoption of EHR systems and there was consensus in this group that training should be given once in the profession. One participant stated, “training is not necessary prior to entering the clinical setting and should be given by a

preceptor as it pertains to their specialty. Systems should be used to keep all parties informed with specific patient care."

Table 14 provides the distinguishing statements for this factor. The distinguishing Statement #6 (A detailed explanation for why use is necessary is given) was ranked the lowest compared to the other factors and Statement #20 (System data are used to inform, deliver and improve healthcare) was ranked the highest compared to the other factor groups. This group of participants ranked Statement #27 (All stakeholders have visibility to patient notes) and Statement #31 (Systems are beneficial to patient self-management) higher than the other factor groups. Statement #33 (Individual system training is offered) and Statement #34 (System training is led by individuals with a positive attitude) were ranked lower than the other factor groups. Unlike Factor Group One, this group of participants finds training on the system less important and feels strongly on understanding how use of the system positively affects outcomes in the field. An individual in this factor group stated, "Systems integrated across all healthcare professions and institutions would have the greatest positive impact on the industry. Training should be provided by the system administrator and be profession specific."

Table 14

Distinguishing Statements for Factor Group Two

	No.	Statement	F1	F2	F3	F4	F5
Group Two	6	A detailed explanation for why use is necessary is given	-2	-4	-2	3	1
	20	System data are used to inform, deliver and improve healthcare	1	4	1	2	0
	27	All stakeholders have visibility to patient notes	-3	2	0	-1	-2
	31	Systems are beneficial to patient self- management	-1	3	-1	1	0
	33	Individual system training is offered	1	-2	0	2	0
	34	System training is led by individuals with a positive attitude	1	-2	1	1	2

Table 15 provides the highest and lowest ranked statements for Factor Group Two. Statement #21 (System training includes integration with billing to provide better access to resources) and Statement #24 (Systems are vital to digital health and industry) were ranked the highest. The lowest ranking statements from this group were Statement #11 (Continuous quality communication is received from management), Statement #40 (Training includes how to address concerns of patient confidentiality), and Statement #14 (Systems are accessible by all parties in the healthcare setting including the patient). Two of the three participants in this group discussed

in the post-sort questionnaire that systems are not currently accessible by all parties in the healthcare setting and this is a key component that should be added to the EHR systems.

Table 15

Factor Group Two: Highest and Lowest Ranked Statements

Rank	Card Number	Corresponding Statement
Highest		
	21	System training includes integration with billing to provide better access to resources
	24(x2)	Systems are vital to digital health and industry
Lowest		
	11	Continuous quality communication is received from management
	40	Training includes how to address concerns of patient confidentiality
	14	Systems are accessible by all parties in the healthcare setting including the patient

Figure 9 is a model sort for Factor Group Two. The model sort provides a representation of the quantitative data from the sort. The model shows the highest and lowest placement of the statements for Factor Group Two. The sort aids in the understanding of how the participants in the group view technology adoption of EHR systems.

MOST DISAGREE			NEUTRAL			MOST AGREE		
-4	-3	-2	-1	0	+1	+2	+3	+4
39	36	34	38	28	40	31	24	23
	22	33	37	27	29	30	15	
	6	12	32	25	26	21	14	
		10	9	19	18	20		
		2	3	16	8	7		
			4	13	11			
			17	5	1			
				35				

Figure 9. Model sort for Factor Group Two.

Factor Three: System Support and User Input for System Development

A total of five participants loaded significantly on Factor Group Three. The five participants account for 22.7% of the P-set and 27.7% of the variance. The participants in Factor Group Three include; a nurse practitioner, three nurses and a paramedic. The highest ranked statement for this factor group was Statement #24 (Systems are vital to digital health and the industry) and was also a distinguishing statement. This group had similar viewpoints to that of Factor Group Two regarding digital health and integration. One participant explained, similarly to the participant in Factor Group Two, that they would have liked to have seen a statement that acknowledged the commerce side of EHR systems. This participant felt the systems are of utmost importance to digital health and the evolution of healthcare but stated, “there should be

EHR intercommunication. While the reality of the systems "talking" to each other is certainly available, it seems the difficulty relates back to the potential loss of income related to proprietary software."

Table 16 identifies the distinguishing statements for Factor Group Three. This group ranked highest compared to the other factor groups on Statement #4 (Technical support is available 24/7), Statement #13 (Systems are built with user input), Statement #14 (Systems are accessible by all parties in the healthcare setting including the patient), and Statement #22 (Participation is encouraged for system evaluation). Compared to the other factor groups, lower rankings were given to Statement #25 (System data provides the foundation for healthcare spending) and Statement #37 (Clear instructions are provided in the event the system is not accessible). Three of the five participants in this group are nurse practitioners with extensive training and responsibility within the systems. These individuals are considered the "preceptors" referred to in the statements from Factor Group Two.

Table 16

Distinguishing Statements for Factor Group Three

	No.	Statement	F1	F2	F3	F4	F5
Group Three	4	Technical support is available 24/7	2	0	4	0	1
	13	Systems are built with user input	-1	-2	2	0	-3
	14	Systems are accessible by all parties in the healthcare setting including the patient	-2	2	0	-2	3
	22	Participation is encouraged for system evaluation	0	-2	2	-2	-1
	24	Systems are vital to digital health and the industry	3	3	-1	3	2
	25	System data provides the foundation for healthcare spending	-2	-1	-4	-1	0
	37	Clear instructions are provided in the event the system is not accessible	-2	-3	1	-2	-3

Table 17 provides the highest and lowest ranked statements for Factor Group Three. The highest ranked statements for this group are Statement #24 (Systems are vital to digital health and the industry), Statement #5 (Clear written instructions are provided), and Statement #2 (An expert provides the training). The lowest ranked statements from Factor Group Three are Statement #37 (Clear instructions are provided in the event the system is not accessible), Statement #26 (System data provides the foundation for reimbursement platforms), and Statement #1 (The system is user friendly). Statement #24 (Systems are vital to digital health

and the industry) and Statement #37 (Clear instructions are provided in the event the system is not accessible) were also distinguishing statements. One participant from this group explained:

> The system is vital to the industry. Ideally, the information is found easily and transferred through different departments. Best care is given when all history is known about the patient. It takes days sometimes to get records faxed over in an emergency-and this is not what saves a life.

Another participant from this group said, "It is important to learn the system from an expert, have resources when things go wrong and the visibility of each different health disciplinary and the notes about the patient so that the patient receives the best care."

Table 17

Factor Group Three: Highest and Lowest Ranked Statements

Rank	Card Number	Corresponding Statement
Highest		
	24(x2)	Systems are vital to digital health and the industry (*)
	5	Clear written instructions are provided
	2	An expert provides the training
Lowest		
	37	Clear instructions are provided in the event the system is not accessible (*)
	26(x2)	System data provides the foundation for reimbursement platforms
	1	The system is user friendly

(*) indicates the statement is a distinguishing statement for the group

Figure 10 is a model sort for Factor Group Three. The model sort provides a representation of the quantitative data from the sort. The model shows the highest and lowest placement of the statements for Factor Group Three. The sort aids in the understanding of how the participants in the group view technology adoption of EHR systems.

MOST DISAGREE			NEUTRAL				MOST AGREE	
-4	-3	-2	-1	0	+1	+2	+3	+4
25	26	40	36	33	37	30	38	23
	21	39	35	32	34	29	13	
	6	31	18	22	24	27	7	
		28	17	19	20	15		
		12	14	11	16	4		
			9	5	10			
			8	3	1			
				2				

Figure 10. Model sort for Factor Group Three.

Factor Four: Mobile Technology for System Development

Factor Group Four consists of three participants. The three participants account for 13.6% of the P-set and 16.6% of the variance. The participants in Factor Group Four include; a traveling therapist (medical office staff) and two paramedics. The highest ranked statement in Factor Group Four is statement #15 (System training includes mobile technology). The

participants that make up Factor Group Four include two paramedics and one traveling medical aid. The post-sort questionnaire indicated that the three participants in this factor group agreed that systems are vital to digital health and industry (Statement #24). One participant stated, "based on the digital world that exists now within healthcare, the job is impossible without the software." The greatest impact to their sort related to their "experience within the system and that there is no integration between systems at all."

Table 18 presents the distinguishing statements for Factor Group Four. The group ranked Statement #6 (A detailed explanation for why use is necessary is given) significantly higher than the other factor groups. All factor groups ranked Statement #13 (Systems are built with user input) low and Factor Group Four ranked Statement #32 (System implementation is deployed in small groups) lower than the other factor groups. The qualitative data from the post-sort questionnaire gave insight into the ranking of these statements. Participants described explanation for use of an EHR system as, "non-existent" and "not necessary." The participants of the study had an overall consensus that systems are not built with user input. Factor Group Four also felt Statement #32 (System implementation is deployed in small groups) was not relevant and discussed "individual on the job training."

Table 18

Distinguishing Statements for Factor Group Four

	No.	Statement	F1	F2	F3	F4	F5
Group Four	6	A detailed explanation for why use is necessary is given	-2	-4	-2	3	1
	13	Systems are built with user input	-1	-2	2	0	-3
	32	System implementation is deployed in small groups	1	0	0	-3	-1

Table 19 provides the highest and lowest ranked statements for Factor Group Four. The highest ranked statements for this group include Statement #15 (system training includes mobile technology), Statement #31 (Systems are beneficial to patient self-management), and Statement #24 (Systems are vital to digital health and industry). The lowest ranked statements for Factor Group Four were Statement #23 (Systems are integrated across all healthcare professions and institutions) and Statement #36 (System training is made fun and includes incentives). According to this group, similar to Factor Groups Two and Three, EHR systems need to be integrated across professions and institutions. Factor Group Four finds the systems and training necessary in the field and focus for adoption should be placed on new technologies such as mobile technology and integration.

Table 19

Factor Group Four: Highest and Lowest Ranked Statements

Rank	Card Number	Corresponding Statement
Highest		
	15	System training includes mobile technology
	31	Systems are beneficial to patient self-management
	24	Systems are vital to digital health and industry
Lowest		
	23(x2)	Systems are integrated across all healthcare professions and institutions
	36	System training is made fun and includes incentives

Figure 11 is a model sort for Factor Group Four. The model sort provides a representation of the quantitative data from the sort. The model shows the highest and lowest placement of the statements for Factor Group Four. The sort aids in the understanding of how the participants in the group view technology adoption of EHR systems.

MOST DISAGREE			NEUTRAL				MOST AGREE	
-4	-3	-2	-1	0	+1	+2	+3	+4
23	39	36	37	38	35	34	15	24
	29	32	28	26	33	17	7	
	14	31	25	22	19	11	3	
		30	21	20	18	6		
		27	13	16	12	2		
			5	8	10			
			1	40	9			
				4				

Figure 11. Model sort for Factor Group Four.

Factor Five: System Navigation and Perceived Ease of Use Influences System Adoption and Implementation

Factor Group Five consists of two participants. The two participants account for 9.0% of the P-set and 11.1% of the variance. The participants in Factor Group Five include a billing specialist (medical office staff) and a medical assistant. The highest ranked statement in Group Five is Statement #1 (The system is user friendly). The two participants in Factor Group Five strongly agreed that systems should be user friendly. One participant stated, “users are not included in creating the software and having one software system across the board would greatly benefit users.” The other participant also stated ease of use is of utmost importance to adoption of the system and included in the post-sort questionnaire, “ I am unsure how the billing in the

clinic is done as we are required to use two separate systems and patient notes are not readily available in the billing software."

Table 20 presents the distinguishing statements for Factor Group Five. The participants in this group ranked Statement # 28 (Systems follow universal standards) and Statement #12 (Digital skills required for the system are included in the job description) significantly higher than the other factor groups. The remaining three distinguishing statements for this group include Statement #6 (A detailed explanation for why use is necessary is given), Statement #15 (System training includes mobile technology), and Statement #20 (System data are used to inform, deliver and improve healthcare). Statement #20 (System data are used to inform, deliver and improve healthcare) and Statement #15 (System training includes mobile technology) were ranked lower than the other factor groups.

Table 20

Distinguishing Statements for Factor Group Five

	No.	Statement	F1	F2	F3	F4	F5
Group Five	6	A detailed explanation for why use is necessary is given	-2	-4	-2	3	1
	12	Digital skills required for the system are included in the job description	-1	-2	0	1	3
	15	System training includes mobile technology	-4	3	3	4	-2
	20	System data are used to inform, deliver and improve healthcare	1	4	1	2	0
	28	Systems follow universal standards	0	0	-2	0	4

Table 21 presents the highest and lowest ranked statements for Factor Group Five. The highest ranked statements for this group include Statement #1 (The system is user friendly) and Statement #28 (Systems follow universal standards). Statement #28 was also a distinguishing statement. The lowest ranked statements for Factor Group Five are Statement #39 (System software use is formally taught prior to entering the profession) and Statement #13 (Systems are built with user input). The two participants in this group both felt that systems are not formally taught prior to entering the profession and that training is not necessary as systems do not currently “talk” to one another; rather, users must be trained in the specific system they will work with once they are in the clinical setting.

Table 21

Factor Group Five: Highest and Lowest Ranked Statements

Rank	Card Number	Corresponding Statement
Highest		
	1	The system is user friendly
	28	Systems follow universal standards (*)
Lowest		
	39	System software use is formally taught prior to entering the profession
	13	Systems are built with user input

(*) indicates the statement is a distinguishing statement for the group

Figure 12 is a model sort for Factor Group Five. The model sort provides a representation of the quantitative data from the sort. The model shows the highest and lowest placement of the statements for Factor Group Five. The sort aids in the understanding of how the participants in the group view technology adoption of EHR systems.

MOST DISAGREE			NEUTRAL				MOST AGREE	
-4	-3	-2	-1	0	+1	+2	+3	+4
13	39	40	35	36	38	34	24	28
	37	26	33	32	9	21	12	
	27	19	31	30	7	16	11	
		18	23	29	6	14		
		17	22	25	5	3		
			20	10	4			
			15	8	1			
				2				

Figure 12. Model sort for Factor Group Five.

Participant Demographics

This study was designed to determine the perceptions of healthcare professionals of technology adoption of EHR systems. Twenty-two healthcare professionals completed the Q-sort and post-sort questionnaire. Eighteen individuals were placed into one of the five factors. Bartlett & DeWeese (2015) suggested using a post-sort questionnaire to provide the qualitative aspect of Q methodology. The post-sort questionnaire is provided in Table 22 below.

Table 22

Post-Sort Questionnaire

Question Number	Demographic and Narrative Questions
1	What is your participant code?
2	What is your gender?
3	What is your race/ethnicity?
4	What is your age?
5	Do you use an electronic health record system?
6	What is your profession?
7	Have you used more than one electronic health record system?
8	Were you trained on the system prior to entering the clinical setting?
9	How many hours do you work in the system per week?
10	Briefly describe your training experience for the training on the electronic health record system.
11	What is the name of the electronic health record system you use?
12	Why did you place your “very strongly agree” card under +4? Card #
13	Why did you place your “very strongly disagree” card under -4? Card #
14	Were there specific statements that you had difficulty placing? Choose one and please list the number of the statement and describe the difficulty. Card #
15	What has had the greatest impact on how you sorted your cards the way you did?
16	Is there at statement that you would have liked to see in the sort? If so, what would the card have said and where would you have placed it?
17	Do you feel there are any components that were missing?
18	Do you have any additional comments?

Most of the respondents were female (n=18) representing 81.82%; 90.91% of the P-set was White/Caucasian as illustrated in Table 23. The ages for participants ranged from 25 to 64. The P-set was made up of 22 healthcare professionals. These professionals included two nurse

practitioners (9.09%), three nurses (13.64%), four medical aid/assistants (18.18%), two pharmacists (9.09%), four paramedics (18.18%), four benefits specialists (18.18%), and three medical office staff (13.64%). The amount of time participants spent using an EHR system each week ranged from 15-30+ hours with 54.55% reporting 30+ hours per week. Table 23 provides the demographic data collected in questions two through nine from the post-sort questionnaire.

Table 23

Participant Demographics

	Overall		*Factor One*		Factor Two		Factor Three		Factor Four		Factor Five	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Gender												
Male	4	18.18%	1	20.0%	0	0.0%	0	0.0%	2	66.6%	0	0.0%
Female	18	81.82%	4	80.0%	3	100.0%	5	100.0%	1	33.3%	2	100.0%
Race/Ethnicity												
White/Caucasian	20	90.91%	4	80.0%	3	100.0%	5	100.0%	3	100.0%	2	100.0%
Black/African American	1	4.55%	1	20.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Another Race	1	4.55%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Age												
18-24	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
25-34	8	36.36%	2	40.0%	1	33.3%	2	40.0%	1	33.3%	0	0.0%
35-44	6	27.27%	2	40.0%	1	33.3%	0	0.0%	2	66.6%	1	50.0%
45-54	5	22.73%	1	20.0%	1	33.3%	0	0.0%	0	0.0%	1	50.0%
55-64	3	13.64%	0	0.0%	0	0.0%	3	60.0%	0	0.0%	0	0.0%

Table 23 (continued).

65+	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Profession												
Nurse Practitioner	2	9.09%	0	0.0%	0	0.0%	2	40.0%	0	0.0%	0	0.0%
Nurse	3	13.64%	0	0.0%	0	0.0%	2	40.0%	0	0.0%	0	0.0%
Medical Aid/Assistant	4	18.18%	1	20.0%	2	66.6%	0	0.0%	0	0.0%	1	50.0%
Pharmacist	2	9.09%	1	20.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Paramedic	4	18.18%	0	0.0%	0	0.0%	1	20.0%	2	66.6%	0	0.0%
Benefit Specialist	4	18.18%	2	40.0%	1	33.3%	0	0.0%	0	0.0%	0	0.0%
Medical Office Staff	3	13.64%	1	20.0%	0	0.0%	0	0.0%	1	33.3%	1	50.0%
Hours of Use per Week												
0-5	1	4.55%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
5-15	4	18.18%	1	20.0%	1	33.3%	2	40.0%	0	0.0%	0	0.0%
15-30	5	22.73%	1	20.0%	1	33.3%	1	20.0%	1	33.3%	0	0.0%
30+	12	54.55%	3	60.0%	1	33.3%	2	40.0%	2	66.6%	2	100.0%

Chapter Summary

In Chapter 4, the data collected from 22 healthcare professionals representing seven different professional areas within the field was presented. These professions included nurse practitioner, nurse, medical aid/assistant, pharmacist, paramedic, benefits specialist, and medical office staff. Eighteen participants were included in the final analysis. Both quantitative and qualitative data were used to complete the analysis. Q-sorts were completed by the healthcare professionals and factor analysis was used to obtain the statistical data. The perceptions of technology adoption of EHR systems were further defined with the use of a post-sort questionnaire. Five factors emerged, which are summarized below.

Factor One: Training influences system adoption and implementation. Factor Group One emphasizes training as the key to successful adoption of an EHR system. Through analysis of the narrative responses, it can be inferred that the participants all agree the system is necessary to complete essential duties of daily tasks. The participants feel training should be provided at multiple levels, including formal education prior to entering the profession, and both formally and informally once in the clinical setting. The more training an individual has on the systems, the more successful they will be at using them properly.

Factor Two: System integration is vital to digital health and industry. The participants in Factor Group Two are best described as having a futuristic outlook regarding the EHR systems. This group was very positive about how the systems can better patient care. This group understands the systems are necessary and believe systems should be integrated for better processes and patient outcomes. These participants felt confident in using the systems and focused primarily on what these systems can do for patient care in the future.

Factor Three: System support and user input for system development. Participants in Factor Group Three, like Factor Group Two, would like to see integration and collaboration across professions within the system. It was clear this group did not feel supported within the systems they used. This group illustrates a need for user support systems, such as 24/7 customer support and clear guidelines for daily use and extraordinary situations. Along with clear guidelines and instructions, this group felt an expert should provide the training and be readily available should a technical issue arise.

Factor Four: Mobile technology for system development. Participants in Factor Group Four had a perspective that was not addressed in any other factor: the need for mobile technology. These individuals felt the systems are vital and necessary, like all other factor groups, but did not feel that users were included in design or deployment. It is clear this group feels systems should be designed with user input and integration across all professions. All participants in the group felt strongly that the capability to access patient notes anywhere and from any patient encounter (across professions) is not available and would greatly improve patient outcomes.

Factor Five: System navigation and perceived ease of use influences system adoption and implementation. Factor Group Five felt the most important aspect of adoption of EHR is the user perceive the system to be user friendly. The participants suggested that one system across the board that was user friendly would greatly improve the rate of adoption. These participants, like the participants in Factor Group Four, did not perceive the systems are designed with user input and felt this would greatly improve adoption within the field.

Based on the data analysis, the healthcare professionals within this study have different perceptions on adoption of EHR systems with a few major similarities. The differences are

explained through the distinguishing statements, analysis, and narrative responses from the post-sort questionnaire. The implications of this research study along with recommendations for future studies will be discussed in Chapter 5.

CHAPTER 5: DISCUSSION AND IMPLICATIONS

This study sought to determine the perceptions toward technology adoption of EHR systems among healthcare professionals. Healthcare professionals were asked to rank a Q-set of 40 statements on an agreement scale of -4 to +4 based on the extent to which they felt "most disagreeable" to "most agreeable" to the professional's viewpoint of the EHR system. Studies have been conducted on the perceptions of healthcare professionals toward EHR systems, but these studies did not include more than one professional area. This identified gap in the literature enables this study to build the body of research on EHR systems across multiple professions.

The study examined opinions of healthcare professionals toward technology adoption of EHR systems and sought to answer the following questions:

1. What are the healthcare professional's viewpoints toward factors of technology adoption of electronic health record systems?
2. What are the distinguishing and consensus statements across viewpoints?
3. Why do healthcare professional's report reasons for selecting high and low statements?
4. Do the viewpoints of healthcare professionals toward technology adoption of electronic health record systems differ based on type of implementation, training, expertise, and time in practice.

The results of the research can be used to assist EHR system administrators with design, policy, and best practices.

The study began with an in-depth literature review relevant to the adoption of EHR systems. Specifically, I examined the perception of these systems amongst healthcare professionals. This literature, along with professional expertise, was used to develop the study

concourse, which resulted in the development of a final set of 40 statements regarding influences on adoption of EHR systems in practice.

Q methodology was used in the design of this study to measure the perceptions, attitudes, and viewpoints of healthcare providers. Chapter 3 discussed the use of Q methodology, justification of the method, research design, data collection process, and analysis of the data. The software packages used for the study were Q Method Software and R-CRAN.

Chapter 4 detailed an analysis of the results. Correlation data, factor scores, consensus and distinguishing statements were discussed. The comments from the post-sort questionnaire were examined for each participant and used to develop a deeper understanding of viewpoints for each factor group. Five factors were identified based on similarity of the Q-sorts. The five factor groups were labeled based on the common influencer of adoption of the EHR systems: 1) Training influences system adoption and implementation; 2) System integration is vital to digital health and industry; 3) System support and user input for system deployment; 4) Mobile technology for system deployment and system navigation; and 5) Perceived ease of use influences system adoption and implementation.

Chapter 5 explores the implications for adoption of EHR systems based on factor themes and narrative statements. Furthermore, suggestions for future research are presented in relation to the study and the methodology.

Limitations

The current study was designed to explore healthcare professionals' perceptions toward technology adoption of EHR systems. The study was designed to include more than one professional area. The sample size was small with less than five participants per profession; therefore, the results cannot be generalized to all healthcare professionals. Recruitment of a

wider participant base with at least eight or more participants per profession may have resulted in larger factor loadings or different emergent themes.

Healthcare professionals are often burdened with extreme workloads and time constraints. This may have hindered response rates, as the survey instrument could have potentially taken time away from an already busy schedule. Participants were recruited through professional contacts. Due to the unfamiliarity with the study and method, this may have further reduced participant response given the confidential nature of the healthcare field.

The instrument used to collect the data may have also been a limitation. Some narrative responses from participants indicated they disliked the forced distribution or were unable to access the instrument using a tablet or mobile device. Some participants shared that because the software did not include a survey option, participants had to navigate to a different site for narrative responses, at which point they were unable to go back and see the sort. Furthermore, some narrative responses were limited as the researcher was unable to ask additional clarifying questions based on the responses.

Implications for Practice, Policy, and Research

While the findings of this study cannot be generalized across the healthcare field the study adds to the literature on technology adoption in healthcare. The results of the study have implications for system developers, administrators, and educators. The five viewpoints that emerged from the study can be used to develop an understanding of healthcare professionals.

In this study, the results were unanimous that adoption of EHR systems is necessary, and the systems are vital to healthcare. The themes that emerged and narrative responses identified influencers on proper system use within the field. These were not generalized to one specific profession within the study, but agreement was found in all professional areas.

The results of the study only included one consensus statement, “users are included in new system deployment.” All participants felt they were not included in the development of EHR systems and they should be, as user input should be considered valuable. There were also four statements with a positive score across all factor groups; Statement #4 (Technical support is available 24/7), Statement #7 (The system is necessary to complete essential duties of daily tasks), Statement #16 (The system includes user support systems), and Statement #20 (System data are used to inform, deliver and improve healthcare). From the narrative responses, the surveyed healthcare professionals would like to see system integration across all areas in the healthcare field. Professionals would like to be able to access all documentation, for a holistic view of the patient history.

Implication for practice #1: Educational interventions. Valenta and Wigger (1997) concluded in their Q methodological study of healthcare professionals that, “an organization’s system implementers could employ Q Methodology to individualize and customize their approach to understanding the personality complexities of physicians in their organization and their willingness to adapt and utilize information technologies within the workplace” (p. 501). The study completed by Valenta and Wigger (1997) was like most literature in existence on the topic of technology adoption which includes only one professional area and focuses on why a healthcare professional is willing or not willing to adopt.

EHR system administrators should use the rankings within the five viewpoints developed through this study and target specific practice gaps within the profession as educational interventions. Educators can then use the 40 statements from this study within their own participant groups to assess if the viewpoints align with their target participants. The viewpoints

that emerge should be considered at the participant level and educational interventions should be designed accordingly.

The narrative responses from this study such as, “Training should be deployed in small groups” and “systems should be developed with user input” are important to address at the administrator level. As Valenta and Wigger (1997) suggested, “an organization’s system implementers could employ Q Methodology to individualize and customize their approach to understanding the personality complexities” (p. 501) of the healthcare professionals in the organization. The design of this study can be used for future studies at the organizational level and then professionals grouped by emerging themes for EHR system development and training.

Implication for practice #2: New system development. The participants from all surveyed professions in this study communicated through their narrative responses and the consensus statements that they believe their opinions do not matter in the development of the systems. All factor groups agree the systems are necessary and have a positive disposition towards use and were eager to give suggestions on how to integrate and use the systems at their most beneficial capacities for better patient outcomes. This is a gap in practice that is not being addressed. Duplicated studies with focus groups would allow administrators to incorporate the findings into new system development and deployment.

Implications for policy #1: Regulations for new system deployment. The perspectives on EHR system adoption that emerged from this study have implications for policymakers. Policymakers include administrators of the systems, training and development professionals, and those individuals regulating use, such as those regulating the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009, which is part of the American Recovery

and Reinvestment Act. It is important for policy makers to understand the perspectives of the system users so that adjustments can be made during design and implementation of the systems.

Implications for policy #2: Inclusion of participants for system design. Statement #35 (Users are included in new system deployment) was the only consensus statement. This statement, along with the narrative comments, indicate that policymakers should be aware that users do not feel included and taken into consideration when systems are deployed or upgraded. Participants also felt strongly about the integration of systems. Policymakers can use this information to address future concerns of confidentiality as the systems evolve to support this shift to a healthcare ecosystem in which all users have access to information and are included in system design.

Implications for research #1: New system design. This research guides training and development professionals as they assist providers and their healthcare staff with the implementation of new technology into daily practice. There should be further investigation of the perceived influencers on adoption of EHR systems. The findings of this study implied there are few negative perceptions of using the systems, but rather a feeling that systems are not being used to their full capability. The viewpoints that emerged from this study should be used specifically for the development of new system design to support user preference. There is little current research regarding influencers of adoption across multiple professions. Influencers should be well understood prior to new system design.

Implications for research #2: Influencers of system adoption: The participants in the study identified the influencers in Figure 13 as the factors most needed for system adoption. As mentioned in Chapter 1, assessing the perceived importance of EHR systems at the practitioner level, researchers, educators, and administrators are able to identify misuse in practice and adjust

the implementation and continued training processes to reap the full benefits of EHR systems. This study demonstrates that influencers, training, integration of systems, system support and user input, mobile technology, and ease of use are important to professionals who work within the systems. Further research is needed to build and administer new systems using identified influencers of adoption.

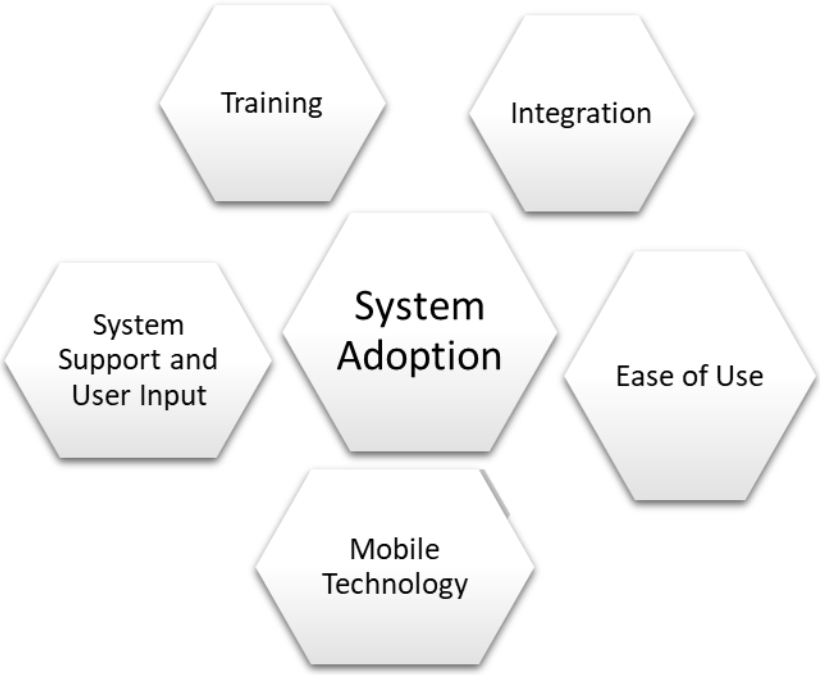

Figure 13. Influencers of system adoption.

Recommendations for Future Research

The purpose of this study was to identify the perceptions of healthcare professionals on technology adoption of EHR systems. The study successfully identified five viewpoints/perceptions regarding influencers to adoption of these systems. The study had limited participation due to the confidential nature of the healthcare field and time constraints for professionals.

Recommendation #1: Replicate with larger sample sizes. To replicate and refine the results of this study it is recommended future researchers utilize Q methodology with larger samples, as further viewpoints will be discovered, and profession-specific themes may emerge. With a larger sample size representing multiple areas of expertise, a more accurate representation of the user's perceptions will surface from the data. This will allow for generalization across the field and explain the perceptions of system users beyond this particular study.

Recommendation #2: Research integration of all EHR systems. As explained in Chapter 2, Meigs & Solomon (2016) found in their study of 16 office-based practices, that users experienced obstacles such as system costs, workflow disruption, decreased productivity, and usability of the systems. Participants in the study expressed frustration with interoperability, increased physician workload, and negative affect on quality of care. This research study had similar findings that identified the importance of user input and integration of systems. Further research is needed to answer how to obtain full integration of systems. Research should be completed that focuses on how integration of EHR systems is possible, so that healthcare professionals from any profession can access the patient information. HIMSS (2019) released an article on the evolution of digital health companies and what is next in health technology. In the article "Is the Digital Health Bubble Bursting," it is explained that not only is digital health not bursting, but rather, it is growing. Based on current research, HIMSS explains:

> Organizations should innovate and partner together and think collaboratively about how healthcare occurs outside the walls of their own organization. A lot of models at Health 2.0 show how that's possible: models for integration, new technology models for developing new technology and other ways to deploy innovation so you can reach the people you need to reach. (HIMSS, 2019)

Recommendation #3: Research to include patients. Current research shows that health information technology is evolving to a community-based platform. The "healthcare ecosystem" as discussed in Chapter 2 is what this field should expect to see over the next several years. Groves et al. (2013) pointed out that for stakeholders to take full advantage of big data in the healthcare ecosystem, "both patients and physicians must be willing and able to use insights from the data; this is a personal revolution as much as an analytical one. Behavior change will need to occur to depart from traditional practices" (p. 12). It is important to note that studies which include a patients' use of EHR systems are not readily found within the literature. There are studies regarding the use of patient portals, but these are not directly aligned with the EHR systems. This is an important gap in the literature to address with integration and the design of a new system. As explained below in Recommendation #4, legal implications of all users of the EHR systems, including the patient, should be identified.

Recommendation #4: Research policy adherence and legal implications. Studies to determine legal implications of accessibility and information sharing should also take place. As mentioned in Chapter 1, healthcare is constantly evolving, and confidentiality and policy adherence is of utmost importance. When conducting future studies, legal implications must be considered for best practices. The perceptions of EHR systems are very different since the passing of the American Recovery and Reinvestment Act in 2009 mandated that all healthcare organizations adopt a certified EHR system by 2015 (Barrett, 2018).

As mentioned in Chapter 2, The HITECH Act, which was part of the 2009 American Recovery and Reinvestment Act, authorized up to $40 billion in incentive payments for providers to use EMR systems, with the overall goal of driving adoption to 70 to 90% of all providers by 2019. The HITECH Act also authorized $2 billion for EMRs related to workforce

training and infrastructure improvements (Groves, Kayyali, Knott, & Van Kuiken, 2013). The American Recovery and Reinvestment Act is just one example of existing policy.

Recommendations for Future Q Studies

This research methodology is unique in its assessment of the importance of adoption of EHR systems by healthcare professionals. The utilization of Q methodology in this study provides the quantitative and qualitative means to assess professionals regarding the importance of the influencers of adoption of the EHR systems. The viewpoints that emerged from the study provide a comprehensive view of the perceptions of the participants; this is a strength of Q methodology that is not found with traditional ranking surveys. Q methodology has been applied in other fields such as business and education, but opportunities exist to merge studies between two fields such as nursing or health management technology at the college level.

This study did have challenges that should be considered before using Q methodology. Data collection was completed online via Q Method Software which offered convenience and increased the geographical area for respondents. The researcher felt this was important to offer based to time constraints of healthcare professionals. Some participants reported technical and user error issues such as accessing the survey instrument, having to start over during the sorting of the statements, and disliking the forced distribution aspect of the sort. Only two participants reached out with technical questions and six individuals started the survey and did not complete it. The researcher did not receive a response when assistance was offered. For future studies, screen shots should be included with the step by step instructions or an option for a manual sort should be provided.

Additionally, if time restraints were removed and identical sorts were administered with the separate professions and then analyzed as a whole, it may be found that there are more consensus statements within each profession.

Summary

Q methodology was used for this study to explore the perceptions of healthcare professionals on technology adoption of EHR systems. Twenty-two participants volunteered to take the study and 18 of those responses were used in the data analysis. Participants were asked to sort 40 statements in regard to their views on adoption of EHR systems and then complete 18 narrative questions. The narrative questions collected information on demographic characteristics and allowed them to provide further insight on their views. Analysis of the sorted statements indicated that five factor groups were present. The five factor groups were themed as 1) Training influences system adoption and implementation, 2) System integration is vital to digital health and industry, 3) System support and user input for system deployment, 4) Mobile technology for system deployment and system navigation, and 5) Perceived ease of use influences system adoption and implementation. The differences in the way the statements were sorted created the factor groups; several statements, however, were sorted similarly between the groups.

As discussed in Chapters 1 and 2, healthcare professionals are the most prominent users of EHR systems. The research should guide training and development professionals as they assist providers and their healthcare staff with the implementation and effective use of new technology into daily practice. The participants of this study revealed viewpoints consistent with Woodlock's (2018) findings in his article, "Five HIMSS Themes that Will Improve Healthcare for All." The most important of these themes from current research being integration of system

or interoperability, also known as a shared health record. The use of analytics and user input to build a more user-friendly system, and overall a healthcare ecosystem in which users have access to the newest options, such as mobile technology for healthcare outside of the traditional office.

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APPENDICES

Appendix A: Concourse Statements

Concourse Statements

1. The System is user friendly
2. An expert provides the training
3. I feel comfortable asking questions
4. Technical support is available 24/7
5. Clear written instructions are provided
6. A detailed explanation for why use is necessary is given
7. The system is necessary to complete essential duties of daily tasks
8. The system provides output quality with result demonstrability
9. Management support is available during and following initial training
10. Dedicated time to training is provided during work hours
11. Continuous quality communication is received from management
12. Digital skills required for the system are included in the job description
13. Systems are built with user input
14. Systems are accessible by all parties in the healthcare setting including the patient
15. System training includes mobile technology
16. The system includes user support systems
17. Legal implications of the system are well defined
18. Policy implications of the system are well defined
19. Ethical implications of the system are well defined
20. System data are used to inform, deliver and improve healthcare
21. System training includes integration with billing to provide better access to resources

22. Participation is encouraged for system evaluation

23. Systems are integrated across all healthcare professions and institutions

24. Systems are vital to digital health and the industry

25. System data provides the foundation for healthcare spending

26. System data provides the foundation for reimbursement platforms

27. All stakeholders have visibility to patient notes

28. Systems follow universal standards

29. Systems have a standard method for matching patient data

30. All systems are interoperable

31. Systems are beneficial to patient self-management

32. System implementation is deployed in small groups

33. Individual system training is offered

34. System training is led by individuals with a positive attitude

35. Users are included in new system deployment

36. System training is made fun and includes incentives

37. Clear instructions are provided in the event the system is not accessible

38. Customized training is given based on the profession

39. System software use is formally taught prior to entering the profession

40. Training includes how to address concerns of patient confidentiality

Appendix B: Participant Recruitment Letter

Hello,

I am a doctoral candidate at North Carolina State University in the Adult and Community College Education program working with my Chair, Dr. Michelle Bartlett on my dissertation, "Perceptions Towards Technology Adoption of Electronic Healthcare Record Systems among Healthcare Professionals: A Q Methodological Study."

For this research project, I am seeking to recruit a sample of 20-25 participants who have used an electronic health record system in practice. This research study is a Q methodological study, a research method that will allow me to investigate into participants' subjective point of view, where the individuals who take part in this study will share their concerns through the viewpoints' they have that are most significantly impacting the successful adoption of electronic health record systems.

Through an extensive list of literature reviewed, research of different websites, conversations with field professionals, and my thoughts, 40 items that professionals may encounter through the electronic health record system adoption process have been identified for professionals who choose to partake in this study. Individuals will be asked to sort or rank these items. The purpose of this study is to assess the viewpoints healthcare professionals have toward the technology adoption of electronic health record systems and determine what factors are most significant to efficient use in daily practice.

If you are interested in participating in this study, click this link https://app.qmethodsoftware.com/study/3120 to access a consent form, the Q-Sort and the Post Sort Questionnaire. The entire process will take approximately 30-45 minutes to complete.

**You will need to take a screenshot of the Q-Sort diagram prior to hitting submit and moving on to the questionnaire. This can be done by clicking the "prt sc" button on the keyboard.

If you have questions, please feel free to e-mail me at clbyrd2@ncsu.edu.

Thank you!

Regards,

Cassie Byrd

Appendix C: Informed Consent

RESEARCHER. Cassie Byrd | North Carolina State University, Doctorate of Education: Adult and Community College Education | clbyrd2@ncsu.edu | 704-785-7210 and **CHAIR**. Dr. Michelle Bartlett | North Carolina State University, Educational Leadership, Policy, and Human Development (ELPHD) | mebarlett@ncsu.edu | 919-208-1700.

PURPOSE OF STUDY. The purpose of this study is to assess the viewpoints healthcare professionals have toward the technology adoption of electronic health record systems. The research will guide training and development professionals as they assist providers and their healthcare staff with the implementation and effective use of new technology into daily practice. The study will utilize Q methodology, a method which will ask individuals to rank and sort statements based on the extent to which they feel are "most agreeable" to "most disagreeable" to the professional's viewpoint of the electronic health record system.

RISKS. Minimal, if any, risk is involved in the participation of this study. All information provided by participants will be confidential, and to ensure individuals' privacy, all data collected will be stored in a locked file cabinet. All information stored electronically will be stored on a personal computer, which is password protected. The researcher will be sensitive and careful in the reporting of the data. At no point will individuals' names and their information be shared with other individuals or in the write-up of the results. Participation in this study is voluntary, and you may decline to participate or terminate your involvement at any time if you choose.

BENEFITS. There will be no direct benefit for those participating in this study. However, it is my hope that the findings from this study can be used as a means to begin conversations of what factors are required for optimal use of systems in practice.

CONFIDENTIALITY. Individual responses to this research study will be confidential. While I will collect demographic information from you, this information will be used to analyze trends; no identifying information will be reported in the findings of this research. Every effort will be made by the researcher to preserve your confidentiality. All data kept electronically will be stored on the researcher's password-protected computer. Only the researcher will have access to these files.

CONTACT INFORMATION. If you have questions at any time about this study, experience adverse effects as the result of participating in this study or wish to withdraw or rescind your participation in this study, you may contact the researcher via phone or email. If you have questions regarding your rights as a research participant or if problems arise which you do not feel you can discuss with the researcher, you may contact the North Carolina State University Institutional Review Board at (919) 515-8754 or irb-coordinator@ncsu.edu.

VOLUNTARY PARTICIPATION. Your participation in this study is voluntary. If you decide to take part in this study, you will be asked to sign a consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason. If you

withdraw from the study before data collection is completed, your data will be returned to you or destroyed.

CONSENT. I have read and I understand the provided information. By clicking “next” I agree to participate in the study. I have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason, and without cost. I voluntarily agree to take part in this study.

Appendix D: Q Sort Instructions

Q Sort Instructions:

Read through all 40 cards to become familiar with the statements.

As you read through the statements for a second time, choose disagree, neutral, or agree on the card to organize them into three piles based on what are the most important factors for efficient use of the electronic healthcare record system?

1. On the right, you will see the cards that you feel you "**most agree".**
2. On the left, you will see the cards that you feel you "**most disagree"**.
3. In the middle, you will see the cards that you feel less certain about or have no strong opinions.

Beginning with the pile on the right, place the one card that you **agree** with the most under the **+4** marker. Next, place the cards that follow in importance under the **+3** marker, then cards under the **+2** marker, and so on.

On your left side, place the **one** card that you **disagree** with the most under the **-4** marker. Next, place the cards that follow in least importance under the **-3** marker, then cards under the **-2** marker, and so on.

Continue this process until all the boxes are filled. You are free to change your mind during the sorting process and switch items around.

When completed, you should have the following number of cards under each row:

+4/-4: 1 card; +3/-3: 3 cards, +2/-2: 5 cards; +1/-1: 7 cards; 0: 8 cards

- **1** card under markers **+4 (most agree)** and **-4 (most disagree)**
- **3** cards under markers **+3 (agree**) and **-3** (d**isagree**).
- **5** cards under markers **+2** (**somewhat agree**) and **-2** (**somewhat disagree**).
- **7** cards under markers **+1** (**slightly agree**) and **-1** (**slightly disagree**).
- **8** cards under marker **0** (**neutral**).

Q Sort Instructions continued:

Demographic and Post Q Sort Questions:

- Now, confirm all cards have been added to the diagram and click submit.
- After you submit the diagram, answer the remaining questions.

When all the questions have been answered, please submit.