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The impact of information quality awareness on users' behaviors toward information quality practices

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THE IMPACT OF INFORMATION QUALITY AWARENESS ON USERS' BEHAVIORS

TOWARD INFORMATION QUALITY PRACTICES

A Dissertation

by

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ABSTRACT

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Healthcare organization rely more on electronic information to optimize most of their processes. Additional information sources and more diverse information increase the relevance and importance of information quality (IQ). The quality of information needs to be improved to support a more efficient and reliable utilization of information systems (IS). This improvement can only be achieved through the implementation of initiatives followed by most users across the organization. The purpose of this study is to develop a model related to how awareness of IS users about IQ issues would affect their actual practices toward IQ initiatives. It is posited that users' motivation is influenced by their awareness on beneficial and problematic situations generated by IQ. The motivation that users may have regarding IQ impact, will influence their behavior regarding IQ practices. Social influences and facilitating conditions are considered as moderators of the interaction between intention and actual users' behavior.

DEDICATION

The continued support of my wife and my sons have provided me with the patient and

strength I needed to complete many of my challenges. This dissertation is one achievement that I

want to dedicate to them. Thank you for your love, support, and understanding.

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One of the most important things I gained along my doctoral studies have been the support of many people. Some of these people were already important to me, and some other have become important to me. My whole family has been really supportive, and my dissertation committee showed a real interest on my success providing me with knowledge, encouragement, and a lot of patience. Many other persons also helped me in many different ways, listening to me, and providing me a kind advice. I want to thank all and every person who cared about me during this time, to whom I am truly grateful.

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CHAPTER I

INTRODUCTION

1.1 Overview

Electronic Information Systems are essential to improve health care in the United States where the Congress looks to health information technology (HIT) as a way to improve health care quality (Blumenthal, 2009). A crucial component for these benefits to materialize is data and information quality (Freitas, Silva-Costa, Marques, & Costa-Pereira, 2010). In the same way as HIT, and more specifically electronic health records (EHRs) applications, have great potential to improve care quality and reduce cost in healthcare, they can also impair care quality if not used appropriately (Agarwal, Gao, DesRoches, & Jha, 2010). Due to a generalized used of electronic data, the attention on its quality has increased up to become essential in the performance of operating processes (Batini, Cappiello, Francalanci, & Maurino, 2009). The increased use of medical data from EHRs is finding a higher number of information quality (IQ) problems (Botsis, Hartvigsen, Chen, & Weng, 2010). Hogan & Wagner (1997) report IQ studies since 1978, highlighting a tremendous gap between their relevance and the knowledge gathered at the time.

Organizations in general are facing huge growth in operating data derived from more information systems, which have increased the number of their capabilities and their complexities (Klassen, Borek, Parlikad, & Kern, 2012). Healthcare industry is under great pressure to contain an increasing cost, improve efficiencies, effectiveness, and most importantly

increase quality of care services. HIT, particularly EHR applications can improve quality of care, and provide support to reduce the number of errors enhancing patients' safety and obtaining better patient outcomes (Linder, Ma, Bates, Middleton, & Stafford, 2007). This brings as a consequence a higher data quality (DQ) importance linked to higher data diversity, additional sources, and new technologies, among others (Sadiq, Yeganeh, & Indulska, 2011). Moreover, DQ is highly relevant for chronic disease management and self-management programs in general, due to its reliance on data towards its optimization (Sunyaev, & Chornyi, 2012). As EHR's data become prevalent, its secondary use will also become standard for research, practice improvements, and ultimately for a higher care quality (Botsis, Hartvigsen, Chen, & Weng, 2010). For example, Chaudhry, Wang, Maglione, and associates (2006) found evidence among previous research, about three major benefits from quality in the use of EHR/HIT, which include a closer follow to guideline-based care, better surveillance and monitoring, and a decreased number of medication errors.

Important issues around clinical decision making are linked to IQ impacting patient safety, quality care, and health care cost (McCormack & Ash, 2012). Kattimani (2010) posits that quality awareness is essential for users of information systems to obtain full value from information. Additional research in information systems argue that increased awareness positively impacts for example security control (Spears & Barki, 2010).

The spending of the United States' healthcare system is the highest worldwide, although it does not provide the expected benefits of building a "healthy" nation (Berndt, Hevner, & Studnicki, 2003). In 2002, the Data Warehouse Institute estimated that IQ problems would cost U.S. businesses as much as $600 billion. Even more, in 2005 there were tragic events in the U.S. related to health care, such as the needless deaths of 75,000 patients, which could have been

avoided if all states have had the same level of performance as the best rated state (Smith, M. D., & Institute of Medicine, 2012). Baron and associates (2005) suggest that EHRs can save up to 5% of total health care expenses, which adds to other EHR benefits. Healthcare organizations are incentivized with financial advantages and with the possibility to improve the safety and quality in patients' services (Blumenthal & Tavenner, 2010; Menachemi, Yeager, Bilello, Harle, Sullivan, & Siler-Marsiglio, 2011). In contrast, in July of 2006 a report of the Institute of Medicine mentioned that about 800,000 preventable adverse drug events occurred annually in healthcare facilities at a cost of $3.5 billion to hospitals (Puspitasari and Soegijoko, 2009; Brewin, 2007).

An important issue in business performance improvements is users' deficiency to comply with required initiatives involving motivation and knowledge on associated consequences when initiatives are avoided (Herath & Rao, 2009). For example, IQ management demands commitment from information systems' users to support associated activities to improve IQ (Caballero, Gomez, & Piattini, 2004). Regarding information security, end users can perceive related practices interfering with their regular activities impacting their willingness to perform those (Herath & Rao, 2009). Initiatives such as quality awareness usually require a collaborative strategy to become effective. For example, the improvement of IQ requires the participation of most, if not all, stakeholders (CIHI, 2009). As organizations rely more on information systems, information quality and data security become major problems. Users' low awareness on data security increases the threat (Goodhue & Straub, 1991). Johnson (2006) posits that it is essential that all IT users be aware of and follow appropriate security guidelines.

More specifically to healthcare environments, users responsible to record data should be aware of the role data plays in the system operation (Mikkelsen & Aasly, 2005). All these,

provide us with a sense of an incomplete knowledge or partial consciousness of the full issue. Endsley (2000) describes awareness consisting of three levels, where the first is the perception of important information, secondly is the comprehension which relates to the integration of multiple components of information and their relevance to the person's objectives, and finally, the projection which allows the person to see in advance future events and their implications helping the decision making. Awareness needs to go beyond informing users of their responsibilities by motivating them (Hinson, 2009).

The U.S. federal government has been promoting the adoption of EHR (Ford, Menachemi, Peterson, & Huerta, 2009). During former president George W. Bush's term, in his 2004 state of the union speech, he set a goal so every American would have an electronic health record by 2014 (Simborg, 2008). Under the administration of president Obama the American Recovery and Reinvestment Act (ARRA) of 2009 established $19 billion to promote the adoption and use of HIT (Blumenthal, 2009; DesRoches, Campbell, Vogeli, Zheng, Rao, Shields, Rosenbaum, Bristol, & Jha, 2010). Hospitals and physicians in the U.S. are adopting EHRs systems to improve patient care, increase efficiencies, drop costs, reduce medication errors, and provide better access to patient information (Kukafka, Ancker, Chan, Chelico, Khan, Mortori, Natarajan, Presley, & Stephens, 2007).

The health information technology for economic and clinical health act (HITECH) authorizes incentives linked to the adoption of EHR, accompanied with significant improvements in care, and labeled as "meaningful use" (Blumenthal & Tavenner, 2010; Classen & Bates, 2011), functioning as complying policies. The U.S. Department of Health and Human Services (HHS) through its agencies, the Centers for Medicare and Medicare Services (CMS) and the Office of the National Coordinator for Health Information Technology (ONC), have divided

meaningful use in three stages, each specifying a set of requirements. Stage 1 planned to start in 2011 focuses on electronic capture of health information; stage 2 planned to start in 2013 expands stage 1 objectives by encouraging the use of HIT for continuous quality improvement at the point of care, and the exchange of information. Stage 3 planned to start in 2015 focuses on decision support by promoting improvements in quality, safety and efficiency (HHS, 2010).

Previous research works as used the term "information" to refer to data and information in Information Quality research (Strong, Lee, and Wang, 1997b; Pipino, Lee, & Wang, 2002; and Madnick, Wang, Lee, & Zhu, 2009). This study also make indistinctive use of the term "information" for raw data and processed data. Moreover, Kahn, Pierce, & Melkas (2004) and Bovee (2004) found no significant difference using the term data quality or information quality among diverse research articles.

Data quality (DQ) research has a history of more than forty years on varied areas with an increased number of publications during the last twenty years (Sadiq, Yeganeh, & Indulska, 2011). DQ research has its foundations on total quality management research performed by personalities such as W. Edwards Deming, Joseph M. Juran, and Armand V. Feigenbaum. Researchers such as Richard Y. Wang, Thomas C. Redman, and Larry P. English have studied data/information quality relating it to business information and its corresponding processes.

The relationship between the behaviors of information systems' users toward the intention to follow IQ practices have been studied using psychological theories linked to motivation. In particular, human motivation has a long history going back to early 20th century, with theories based on needs including works such as Maslow's hierarchy of needs, Alderfer's ERG (existence, relatedness, and growth) model, McClelland's theory of needs, Self-Determination theory by Deci and Ryan, and Herzberg's motivator-hygiene model.

Given all these different models and theories, logic suggests that behavioral dispositions towards IQ practices would be better supported with a set of specific theories. Considering, for example, that IQ practices in a healthcare environment imply the coordination of multiple stakeholders requiring additional efforts (Anderson, Marsh, Flemming, Isenstein, & Reynolds, 2012), it would lead to motivation theories that can relate to factors that incentivize behaviors in favor of IQ practices, and that can also relate to factors that would also explain situations with disincentives.

In a similar research area such as information security, the concept of awareness has been studied and linked to improvements in users' behaviors. Moreover, awareness has also been studied by researchers such as Endsley (2000), highlighting the importance that awareness has in decision making processes and actions taken by systems' users, particularly, when these systems have become more and more complex and demanding. In a different field of research, although also related to cognition, Schmidt (1994) studied the implication of awareness in learning a second language, determining its relevance as a requirement for adults and young learners towards their learning process.

1.2 Statement of the Problem

Healthcare industry is the aggregation of a large number of organizations from diverse sectors with different associated needs. These organizations have multidisciplinary personnel, usually with high level of specializations. All this, makes the delivery of high-quality health care to become more complex (Garman & Scribner, 2011). In addition to this complexity within the healthcare sector, there are new demands from the market and regulatory agencies, and the interoperability between systems and institutions. These demands, which promote an increasing use of a larger number of IS, and the utilization of more of their functionalities.

The healthcare sector reliance on IT has been growing with the adoption and larger use of EHR. Its use extends from administrative and financial departments to areas with closer patients interaction (Freitas, Silva-Costa, Marques, & Costa-Pereira, 2010). Additionally, a great variety of decisions from administrative to decisions including patients' treatments and medications, are all underpinned on data from information systems. A rapid increase in transactions volume calls for more attention on data processes to keep information's value, and the possibility to contribute to additional organizational knowledge.

Considering these environments in the healthcare industry, information quality (IQ) becomes a key feature that oftentimes is assumed to exist by default within the system. Without IQ, information systems cannot provide adequate customer satisfaction, supporting strategies for revenue and profit improvements, and it might even lead to a loss of strategic competitive advantage (Lee, Pipino, Funk, & Wang, 2006). Moreover, IS in healthcare environments require internal mechanisms to monitor performance goals generating and managing knowledge toward continuous improvement (Aqil, Lippeveld, & Hozumi, 2009). IQ cannot be improved if processes put in place are not followed. Information stakeholders need to fully understand and become aware of IQ issues, and be able to perceive the impact on their working environment, and support IQ processes.

In spite of the fact that IQ research has evolved for many years covering diverse fields, there are not enough studies within HIT regarding EHR applications, the IQ achieved, and corresponding benefits delivered (Kahn, Raebel, Glanz, Riedlinger, & Steiner, 2012). There is a disparity between the volume of current research and the number of problems associated to IQ awareness. A possible reason for this gap is the fact that awareness takes place at an individual level, and IS issues happen at an organizational level (Hu & Dinev, 2005).

Issues in the healthcare industry, such as low efficiencies, increasing costs, and variable quality in healthcare services create a compelling demand for improvements (Chaudhry, Wang, Maglione, et al., 2006). One way to help with this task is to better comprehend the impact of IQ awareness on users' motivation within a healthcare IS, and users' intention to follow organizational IQ practices.

Organizations in healthcare industry need to improve the quality of EHRs' information in order to receive all the benefits linked to EHRs. This positive change can provide a required relief and possible improvement processes. Consequently, it is vital to understand how to reinforce the intention of EHRs' stakeholders to comply with IQ practices within the organization.

1.3 Purpose of the Study

The purpose of this research is to develop a model involving IQ awareness and its influence over the intention to comply with IQ practices. At the same time, we defined the construct IQ awareness to measure the levels of IS users' awareness in a healthcare environment, together with the influence in users' intention to follow organizational IQ practices. In addition to this field study, we designed an experiment study considering students enrolled in programs within the medical field to test the impact of training on their IQ awareness, and by consequence, on their intention to follow IQ activities.

For the field study involving experienced professionals working with EHRs, the goal was to test the research model through an empirical study, so as to answer the research questions. The study looked into the relationships among IQ awareness and stakeholders' motivation, their disposition toward IQ practices grouped under the label of behavioral-antecedents, and their final intention to endorse IQ following the corresponding organizational practices.

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This research work aimed to assess four important questions regarding personnel in medical institutions with experience using EHRs, and an additional research question regarding training impact using the experiment study. The questions have foundations linked to cognitive social psychology, self-determination theory, theory of planned behavior, and social learning theory. We based the awareness that IS stakeholders in a healthcare environment have upon the cognitive social psychology in combination with the self-determination theory, which also supports the motivation of IS users. Moreover, motivation and behavioral antecedents linked to IS users are studied within the self-determination theory and theory of planned behavior where the latter analyze the behavioral antecedents.

In addition, social-influences and facilitating-conditions are two moderating variables considered to influence organizational IQ practices intention (Deutsch & Gerard, 1955; Thompson, Higgins, & Howell, 1991; Taylor & Todd, 1995). Social-influences represent a person's beliefs on how the organization, represented by executives, administrators, staff and colleagues expect him to behave. Facilitating-conditions involve the organizational beliefs a person has about his own abilities to control organizational environment to achieve desired outcomes.

Particularly, this study intends to answer the following questions:

1. How will awareness of information quality impact IS users' intention to follow practices of information quality assurance?

2. How will IQ awareness influence IS users' motivation to follow practices towards the assurance of information quality?

3. How will IS users' motivation/amotivation influence their inclinations to endorse information quality?

4. How will IS users' inclination toward IQ practices influence their intention to endorse IQ practices?

5. How will training on IQ influence IS users' awareness?

Findings during this research brought light on the importance of IQ awareness influencing the motivation IS users develop, which in turn, impact their behavioral disposition towards the intentions about IQ practices. This can determine how successful an information system can be, specifically an EHR within a healthcare setting; where individuals should consider the worthiness of decisions made based on the information obtained from the system based on their quality.

1.4 Contribution of the Study

This study provides a model that can be used to test the influence of IQ benefits awareness and IQ policy awareness on stakeholders' intention towards IQ practices within the use of EHRs. The relevancy of this study is linked to benefits an organization can reach from information systems, when the information obtained has high quality. Along this, training on IQ can improve quality of care (Arts, Bosman, de Jonge, Joore, & Keizer, 2003). In particular, EHRs have not provided the anticipated number of benefits, and the achieved benefits have not always been at the expected level (Agarwal, Gao, DesRoches, & Jha, 2010; Chaudhry, Wang, Maglione, et al., 2006). Even though there are some studies regarding the impact that decision systems can have on organizational improvements, additional studies are required to better comprehend the influence that IQ has on patients' outcomes (Garg, Adhikari, McDonald, et al., 2005). Moreover, this study contributes with results that can be used to answer some of these pending issues. At the same time, it can help with low IQ problems and their effect on healthcare

research when IS were not initially designed and planned to support additional research activities (Kahn, Raebel, Glanz, et al., 2012).

Other contributions include the possibility for researchers to test the research model in different industries and environments in order to advance the understanding of precursors for IQ practices. In addition, practitioners would benefit from implications of IQ awareness by increasing the attention of IS stakeholders towards consequences, positives and negatives, on the successful practice of IQ within their organization. Awareness as a component of personnel education on IQ would provide a deeper knowledge on how to implement and operate effectively information systems with a broader perspective including quality of information. Training of these same personnel will allow them to gain skills and knowledge on specific modules to reach and maintain IQ for its use and for its interaction with other systems through Health Information Exchange (HIE). Healthcare organizations would benefit out from these practices by improving IQ and corresponding enhancement of IS outputs. This improvement, achieved through individual behaviors, occur within an organizational environment where people's interactions impact expected benefits.

1.5 Organization of the Remainder of the Study

This study includes 6 chapters. This first chapter introduces the research theme emphasizing on the relevance of the relationship between IQ awareness and IQ practice compliance. This link is done through motivations and behavioral factors that shape the behavior that EHRs' users will follow when they get involved with IQ. Chapter 2 provides review of relevant literature to each of the topics included in the study along literature related to supporting theories and the interaction of constructs. Chapter 3 details the research model explaining the different components and the corresponding hypotheses. Chapter 4 presents the methodology

utilized in the study. Chapter 5 explains the analysis of the data with a descriptive and statistical

analysis discussing possible explanations for the results obtained. Chapter 6 summarize and

discuss the findings in the analysis, along with associated conclusions and limitations.

CHAPTER II

LITERATURE REVIEW

In this chapter, information quality (IQ) research is presented along with research around awareness, linking this relationship later with motivation and behavioral research, looking to better understand human behavior toward IQ in healthcare. This comprehension can be more effectively explained with theories studying human behavior, such as theory of planned behavior and social cognitive theory. Thus, research involving each of these areas of study is presented covering historical and contemporary work.

Information quality practices are increasingly perceived as essential within healthcare organizations and are perceived as a key product of business process within what is known as total data quality management (TDQM) (Kerr, Norris, & Stockdale, 2008). Data or information quality should be conceptualized as contextual, since corresponding users will determine what quality represent for their needs in a particular context, leading to the concept of fitness for use which has been adopted broadly within the quality literature (Wang & Strong, 1996).

As Endsley (2000) clarifies, awareness can be simply explained as knowing what is happening in your environment. This study relates her study of situational awareness to the mindfulness required in medical settings to achieve better quality care. Awareness entails different levels or stages as Flach (1995) explains, suggesting that awareness allows us to have a new look of human performance by analyzing humans within the environment, and corresponding processing stages, including perception, decision, and action. Thus, awareness

involves processes at an individual level linked to a specific person who is ultimately influenced. The impact that awareness may have on people will be reflected in their behavior. This behavior will generate a subsequent interaction with other users in organizational environments. An example of this interaction can be seen in quality practices required in information usage. Following with this idea, IQ is a requisite for efficiency and effectiveness of interactive IS, demanding the coordination of multiple stakeholders throughout working communities.

Hence, consciousness represented by awareness, impacts people individually and is amplified at a social level. This relationship can be seen in figure 1, where consciousness is the initial layer of a three level pyramid. Individual processes are supported by consciousness, and they work as a base for social processes which at the end can represent the interaction among healthcare players related to EHRs. We refer to this as a view of the cognitive psychology paradigm.

Figure 1. A View of Cognitive Psychology Paradigm.
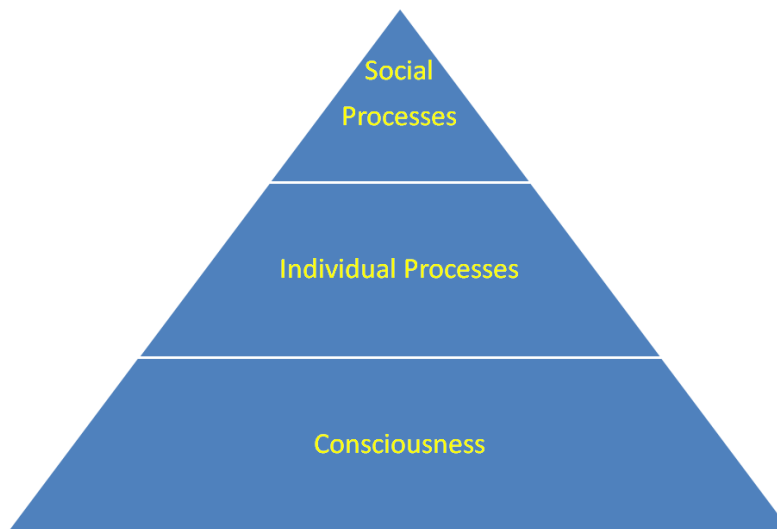
As can be observed below in Figure 2, consciousness, in particular awareness has an impact on motivation through the relationship of our feelings and experiences. This relationship

is created by individuals' consciousness on issues relevant to them, forming mental models that influence people's motivation. Moreover, people's motivations have an impact on their behavioral antecedents which interact in an environment represented by the organization. Where, the organizational behavior is composed by its members' responses and the organizational environment such as resources and peer influences.

As research work is presented, indications on relevant gaps will be highlighted, clarifying the impact it can have on behavior toward information quality practices. Studying all these relationships can provide a contribution to the body of knowledge, giving a fresh perspective and linking these areas of study.

Figure 2. Overview of Theoretical Background.
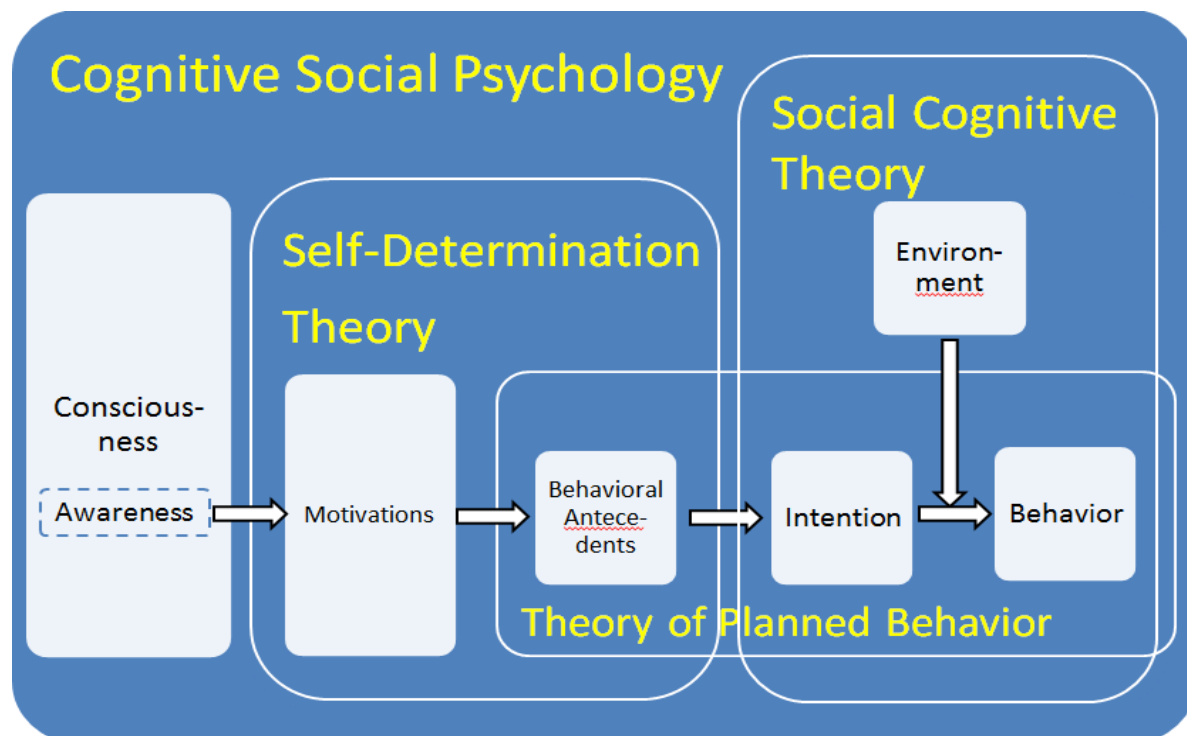
2.1 Information Quality

2.1.1 Research Areas

Information quality (IQ) research can be initially supported on the theoretical frameworks of information and quality. In the former discipline, information theory evolves from Shannon's (1948) work in his historical publication "A mathematical theory of communications" where the problem of analyzing information over a noisy channel is studied. Subsequent research, such as books by Ash (1990) and Reza (1994), elaborate on Shannon's proposals including the study of information as tool against uncertainty. Regarding research on quality, history shows diverse conceptions of quality with particular objectives and proposals. Among the initial researchers we found W. Edward Deming, Joseph M. Juran, Philip B. Crosby, Armand V. Feigenbaum, and Kaoru Ishikawa. In all these research works, the idea of higher quality is linked to productivity improvements, cost reduction, and higher efficiencies where some authors included the customer as a fundamental component in quality achievement.

There are two main research streams in IQ, one that comes from a database community, and a second stream from a management approach. The research work on IQ related to databases has a more technical perspective and is based on values from instances of data models. In contrast, research linked to management has a total quality management view (Ge, Helfert, & Jannach, 2011).

The concentration of this study gravitates in the management arena, where organizations in competing environments can find information quality as a matter of survival and competitive advantage. This situation is accentuated with the addition of new technologies, which bring new options for business models. So, new tools aimed to measure are crucial, since every management

information system needs to be part of a management control system (Ackoff, 1967) and measurement is an initial and essential step in any control process.

This point of view is supported by researchers that assert that IQ depends on the design and processes that generate it, and that its enhancement requires users' understanding and the possibility to measure the quality of its components (Wand & Wang, 1996). The definition of IQ dimensions has helped to increase its comprehension and measurability, where several researchers have studied IQ dimensions looking for their assessment and later improvement (Batini et al., 2009).

2.1.2 Study of Information Quality

Studies to assess information quality within the area of information systems were performed as first steps towards the understanding of data representing the reality (Agmon and Ahituv, 1987). Definitions linked to IQ have been studied for more than twenty years (Pipino, Lee, & Wang, 2002; Redman, 1995), with efforts toward establishing the IQ dimensions (Wand & Wang, 1996) and IQ context, taking into consideration information consumers (Strong, Lee & Wang, 1997a).

This advancement considering information users is captured within the concept of fitness for use. This concept is well established in the IQ literature (Wang & Strong, 1996). In the same vein, Strong et al (1997a) posit that IQ should be measured considering users, since quality of information can be classified as high when users find the information fitting their needs. For example, Arts, De Keizer, & Scheffer (2002) use data quality definitions that emphasize on the requirements from the intended use of the data.

Wang & Strong (1996) empirically found 20 dimensions related to IQ, which later were reduced to 15 and grouped into 4 categories. They considered information users to define and categorize information qualities avoiding the sole point of view of researchers or IS professionals. Researchers have found different degrees of relevance on IQ dimensions depending on the industry, and even depending on particular characteristics of the organization and its environments. For example, Botsis, Hartvigsen, Chen, & Weng (2010) found that EHR's suffer more IQ issues on incompleteness, inaccuracy, and inconsistency. Specifically, Weiskopf & Weng (2012) and Thiru, Hassey, & Sullivan (2003) posit that there is an absence of standards for IQ comparison, affecting any possible plan for improvement within organizations.

IQ has been presented as a multidimensional concept, stating that a one-size-fit-all model does not always work, particularly in complicated platforms such as the healthcare sector (Gendron & D'Onofrio, 2000). Researchers like Gendron & D'Onofrio (2001) studied Wang & Strong's dimensions of IQ, finding that the 15 dimensions listed by Wang & Strong in 1996 can define completely IQ within the healthcare industry.

2.1.3 Importance of Information Quality

The relevance that IQ has for a person or department is based on the degree of dependence that the person or department has on the data to make decisions, take actions, and complete their work. Most personnel in the healthcare sector are highly trained and specialized, and have a high dependence on IQ to perform efficiently. Petter, DeLone, and McLean (2012) list IQ together with system quality, use and outcomes, as key elements in the measurement of IS success, which can be linked to EHR use and decision making. Moreover, IQ becomes more relevant, but more elusive in complex environments since polluted data promote poor decision

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making, where paradoxically, there is usually a higher expectation for more and better decision making (Kerr et al., 2007). Logic suggests that larger and more complex systems would require additional efforts to maintain or improve data quality by an increased information volume, involving a larger number of interactions and processes.

Levitin & Redman (1998) considered data as a resource for organizations, idea supported by Madnick, Wang, Lee & Zhu (2009) who saw data as a product or by-product produced by almost every organization if not all. Both situations considered that lack of IQ can lead to economic and business problems, even bringing possible legal implications. Strategies for IQ improvements have been proposed, establishing an analogy between product manufacturing and data manufacturing (Wang, Storey, & Firth, 1995). In this same vein, Ballou, Wang, Pazer, & Tayi, (1998) suggest that total quality management (TQM) could be applied to improve information results when associated processes are considered as information manufacturing systems.

Several research works deal with the idea that a 100% of IQ is practically impossible to find in any information system (e.g. Kerr, Norris, & Stockdale, 2007). Healthcare environments typically involve a large number of data-driven decisions increasing the impact of IQ problems. IQ is required to keep the value of EHR (Arts et al., 2002). Poor IQ hinders the effectiveness and even cripples the tactics and strategies of any organization (Redman, 1998). Researchers have studied diverse data/information quality aspect and developed models to measure information quality (Kahn, Strong, & Wang, 2002), although for a quality initiative to succeed it is required that all stakeholders become aware of the issue and of its importance.

Since different stakeholders in the same institutions can have different requirements on the same information, the relevance they assign to IQ characteristics or dimensions would vary. Their responsibilities and interests in IQ change accordingly to their positions and roles. For

example, there could be personnel with a specific position who could be considered as a producer, custodian, consumer, or data manager of IQ (Xu, Nord, Brown, & Nord, 2002).

Mitnick & Simon (2011) posit that users can represent the weakest link in IS toward security, although at the same time they can take a key role in its success. Thus, users can have the same role for IQ, where information users can benefit from assessments, feedback, and trainings. This view is confirmed by Wells (1997) who suggests that additional to the implementation of IS, and the establishment of procedures, people need to be trained and educated to make effective use of these resources. Training and education also help to reduce uncertainty generated by change, supporting the communication required to develop new skills and the understanding of a common objective (Wells, 1997).

IQ research has evolved for many years having a watershed in Wang and Strong's article in 1996 where they established a hierarchical and multi-dimensional construct of IQ. English (2009) list a series of best practices for information quality management, and information quality principles of shared information, among others. In this same path, Lee et al. (2006) posit the need for IQ policies in any organization that looks to maintain a viable data quality effort. Nevertheless, the intention to follow IQ practices by users of IS will be influenced by their behavioral disposition. In turn, stakeholders' behavioral dispositions are affected by the motivation/amotivation they present based on their intrinsic and extrinsic motivations. Finally, people's motivation/amotivation is triggered by their awareness on IQ benefits and by their awareness on IQ policies.

2.1.4 Information Quality in Healthcare

The number of IQ research work within healthcare domain has been growing for more than two decades. An initial study emphasized the lack of knowledge on IQ regardless of its relevance, and the need to include data accuracy as a searchable concept in MEDLINE (Hogan & Wagner, 1997). Another work highlighted the importance of new information sources and services along with new challenges regarding accessibility, technology regulations and incentives for IS users to utilize such systems (Kaplan & Brennan, 2001). Multiple studies analyze the impact of IQ on computerized clinical decision support systems with three studies listing a compilation of such articles (Garg, Adhikari, McDonald, et al., 2005; Chaudhry, Wang, Maglione, et al., 2006; Nies, Colombet, Degoulet, & Durieux, 2006). Additionally, research work related to IQ has studied data attributes linked to quality measurement, and evidence of IQ impacting healthcare quality improvements (Chan, Fowles, & Weiner, 2010; Lau, Kuziemsky, & Gardner, 2010).

High IQ becomes fundamental when incremental research is required utilizing information from EHRs (Kahn, Raebel, Glnaz, et al., 2012). Regardless the relevance of IQ in additional research with EHRs' information, there is an inconsistency among IQ terminology, methodology assessment, and IQ useful dimensions (Weiskopf & Weng, 2013). IQ research in healthcare environments provides outcomes that are difficult to compare by the absence of standardized methods of IQ assessment in EHR (Thiru, Hassey, & Sullivan, 2003).

A table with a list of research works including mostly review of IQ in healthcare is displayed. This table shows research work back from 1997 and going up to 2013 involving studies from more than twenty years.

Table 1. Research on IQ within Healthcare.

Title	Authors & Year	Objective	Findings/Discussion
A pragmatic framework for single-site and multisite data quality assessment in EHR-based clinical research	Kahn, Raebel, Glanz, Riedlinger, & Steiner (2012)	Proposal of fit-for-use conceptual model for DQ assessment considering clinical research needs.	In order to achieve all benefits from research using electronic data in health care, it is required high quality data by systematic and conceptual based approach.
Accuracy of data in computer-based patient records	Hogan & Wagner (1997)	Review of previous research work looking for data accuracy in Computer-based Patient Records (CPR's)	26 studies in 20 articles analyzed, finding great variability in methods, characteristics, and results of accuracy. Regardless of the importance of data accuracy in CPR the accumulated knowledge is insufficient. They propose MeSH term for data accuracy in MEDLINE
Systematic review of scope and quality of electronic patient record data in primary care	Thiru, Hassey, & Sullivan (2003)	Review measures of DQ in electronic patient records in primary care	52 studies met search criteria. There is big difficulty in results comparison by the absence of standardized methods of DQ assessment in EHR.
Electronic health records and the reliability and validity of quality measures: A review of the literature	Chan, Fowles, & Weiner (2010)	Review empirical studies on EHR data quality which searched for data attributes relevant to quality measurement.	Found 35 articles that met search criteria. One of the main findings was the difficulty to compare EHR data for quality measurement. Authors believe that EHR data will be considered more reliable as systems capacity grow, users become familiar with their usage, and continuous quality

			improvements are implemented.
A review on systematic reviews of health information systems studies	Lau, Kuziemsky, & Gardner (2010)	A consolidation of previous reviews on health information systems (HIS).	Fifty studies selected for meta-level synthesis covering 5 areas including data quality. Some evidence found that supports a better quality of care due to the adoption of HIS.
Methods and dimensions of EHR data quality assessment: enabling reuse for clinical research	Weiskopf & Weng (2013)	Review methods and dimensions of DQ for EHR data reuse for clinical research.	95 articles met search criteria. Five DQ dimensions found (completeness, correctness, concordance, plausibility, & currency). Seven assessment methodologies were identified. Authors concluded DQ is not a simple problem that requires the development of validated and systematic methods of EHR data quality tests. There is inconsistent terminology for DQ work.
Effects of computerized clinical decision support systems (CDSS) on practitioner performance and patient outcomes – A systematic review	Garg, Adhikari, McDonald, Rosas-Arellano, Devereaux, Beyene, Sam, & Haynes (2005)	Review controlled trials of computerized CDSS looking for study traits that predicted associated benefits.	Authors included 100 studies finding that in general, computerized CDSS improved users' performance. They posit that additional studies are needed to find effects on patients' outcomes.
Systematic review: Impact of health information technology on quality, efficiency, and costs of medical care.	Chaudry, Wang, Wu, Maglione, Mojica, Roth, Morton, & Shekelle (2006)	Search for evidence of HIT impact on quality, efficiency, and costs of healthcare.	257 studies were selected where most of them focused on decision support systems or EHR. The improvement of quality and efficiency by the usage of HIT was found,

			although it still unclear how other organizations can obtain similar benefits.
Determinants of success for computerized clinical decision support systems integrated into CPOE systems: a systematic review	Nies, Colombet, Degoulet, & Durieux (2006)	Following Garg et al. (2005) study, authors reviewed computerized CDSS searching for characteristics of the studies that could lead to associated benefits.	Six studies were added to the 100 studies used by Garg et al. CCDSS were more frequently successful when they were interventions initiated by the system (rather than user-initiated), systems where data were automatically retrieved from EHR, and actions were automatically triggered in the CPOE.
A survey of SNOMED CT direct users, 2010: impressions and preferences regarding content and quality	Elhanan, Perl, & Geller (2011)	Data gathered through a questionnaire looking for impressions and preferences from direct users working with SNOMED CT (systematized nomenclature of medicine – clinical terms).	Direct users show a strong preference for improvements on consistency, quality, and completeness of concept details, regardless of their overall satisfaction.
Consumer informatics supporting patients as co-producers of quality	Kaplan & Brennan (2001)	Compile new ideas and initiatives from AMIA 2000 congress where the emphasis is on the new field of consumer health informatics.	New information sources and services bring new challenges for accessibility, technology regulations, and incentives for clinician promoting the usage of new IS. In this new environment, new roles might be created within the training and education services toward information quality, or new curricula for health informatics.

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2.2 Cognitive Social Psychology

Cognitive Psychology deals with the relationship of human knowledge and human behavior, and is associated in close connection and support with advanced technologies (Best, 1986). Additionally, the relevance of cognitive psychology to this study relies on the relationship with research performed by Broadbent (1958) and Shannon (1948), including the foundations for concepts such as information and the representation of objects that could be used by a general-purpose computer, preparing the development of the IT industry (Bermúdez, 2010).

Consciousness has been considered as one of the most interesting areas in psychology where cognitive psychology helps to better understand its functions. Usually, consciousness is associated with certain cognitive processes, having a link with awareness of stimuli in the environment or in memory (Andrade, 2005). Even though consciousness is thought as our ability to control our behavior or to know what is happening around us, it is also related to our feelings and experiences. In specific, cognitive psychology focuses studying the side of consciousness where we become aware of something, defined as access consciousness, and not on the perspective regarding what is generated as a consequence of this consciousness (Block, as cited in Andrade, 2005).

Cognitive psychology focuses on the scientific study of the mind (Braisby & Gellatly, 2005), and encompasses the concept of consciousness as part of the study of human cognition. Andrade (2005) explains that consciousness involves being awake, being aware of our surroundings, and of our mental experiences. In this same vein, Schmidt (1994) lists awareness as one of the most common use of consciousness, highlighting that there are different types or levels of awareness. In the same area of research as Schmidt of second language learning, Al-

Hejin (2005) lists attention and awareness together with their roles in the learning process, as part of the cognitive psychology research.

2.2.1 Awareness Concept

Choi, Kim, Goo, & Whitmore (2008) posit that awareness, a commonly used concept within social sciences, is usually linked to the individual's passive involvement and increased interest on specific issues, being a key factor toward augmented consciousness and action. A larger information volume nowadays, in a data-driven and knowledge-based economy, requires a more profound attention and understanding to IQ issues (Madnick et al. 2009). As a consequence, the awareness or consciousness level that information users should have is higher, and is accentuated based on the importance that information has on their work. Within research with a more institutional perspective, Ge and associates (2011) emphasizes on the relevance that IQ awareness has for organizations avoiding wrong decision making and competitiveness loss.

Biglan and Taylor (2000) provide an example where a successful work toward reduction of tobacco use can be compared to a work toward violence reduction, helping us to understand how an awareness increase through additional and specific information on problems, facilitate to find more effective solutions. Authors highlight the efficacy of social organizations networks that reviewed concepts such as the origin of tobacco use, associated harm lists, programs and policies toward tobacco use reduction. In contrast, due to the lack of all these supporting activities, violence reduction show no improvement.

In a distinct arena, a study involving physicians with different degree of awareness on cardiovascular disease prevention guidelines, researchers found that female patients had a significant higher chances to be assigned to a lower-risk category compared to male patients with

identical risk profiles (Mosca, et al. 2005). These examples give us the opportunity to see the importance of awareness, or in other words, knowing what is happening in the environment.

2.2.2 Study of Awareness

Awareness, considered a component of consciousness, has been studied in varied fields such as social sciences and medical behavioral sciences. Rogers (1962), within his earliest research on diffusion of innovations (DOI), lists awareness as the first stage in the decision making of the adoption process. In later editions, Rogers (2003) refers to the concept of awareness-knowledge, listing all five steps of the adoption process as knowledge, persuasion, decision, implementation, and confirmation. In this framework, awareness is considered as a level of consciousness that people have regarding the innovation and the associated benefits and efforts. Goodhue & Straub (1991) suggested that users' concern regarding security is linked to three different constructs, including industry risk, company actions, and individuals' awareness.

Awareness in general has been used in a variety of fields, for example, in commercial air transportation as an essential element for a good airmanship (Endsley, Farley, Jones, Midkiff, & Hansman, 1998). Within the area of studies of higher education, social awareness has been related to problem identification, communicating it and increasing the level of consciousness, which would increase individuals' interest and involvement (Greene & Kamimura, 2003). Tsui (2000) also found in this same area of study of higher education, that strong awareness of pressing social and political problems lead to an increased student activism and a lack of awareness can lead to people's rejection of higher demanding activities by not perceiving their benefits. These research efforts have as complement, the work performed in the counseling field

by Pedersen (1988) who proposed awareness as the first stage in a developmental progression, followed by knowledge, and later by skills.

2.2.3 Awareness within Information Security Research

One of the most important issues within information security is users' deficiency in motivation and knowledge on the topic (Herath & Rao, 2009). People can be incentivized to participate in information security programs improving their awareness and knowledge (Albrechtsen & Hovden, 2010). Siponen (2000, 2001) worked around information security awareness (ISA) referring to it as the state at which users are mindful of their security mission. This research was later supported by Furnell, Gennatou, & Dowland (2002) who posited that security awareness is essential to promote a complete understanding of the security issue and corresponding actions and procedures to follow.

Information security research has studied awareness presenting it as the best protection against threats from spyware applications (Stafford & Urbaczewski, 2004), and against general security threats (Choi, Kim, Goo, & Whitmore, 2008), or the most significant antecedent of user actions against spyware (Hu & Dinev, 2005). Dinev and Hu (2007) associated awareness to an increased consciousness of and interest in knowing about technology problems, and the corresponding solutions, considering needs and processes.

This research on ISA was reinforced by Choi, et al. (2008) who defined ISA as the extent to which employees in an organization regard the sig nificance of information security and as a state in which they are aware of information security objectives. Moreover, D'Arcy, Hovav, & Galletta (2009) proposed three security countermeasures including awareness of security policies, security education, training, and awareness (SETA) programs, and computer

monitoring. In this same path, ISA is proposed to be better achieved through appropriate training for all employees (Furnell, Gennatou, & Dowland, 2002; Thomson & Von Solms, 1998).

Bulgurcu, Cavusoglu, & Benbasat (2010) defined ISA as "an employee's general knowledge about information security and his cognizance of the information security policy (ISP) of his organization". For example, this same study found that ISA has a significant influence on employees' attitude toward the intention to comply with ISP.

Nevertheless, Hu & Dinev (2005) posit that, regarding information security research there is a limited work linked to awareness. These researchers pointed out that this situation can be attributed to the fact that awareness happens at individual level, and most of the work focuses at an organizational level.

2.2.4 Information Quality Awareness

Many times, problems related to IQ remain unsolved, or even become more problematic as people do not perceive IQ problems, or do not have the knowledge about them, lacking of awareness on these issues. This absence of consciousness on IQ occurs at different levels of stakeholders, adding concerns to the control and improvement of quality on data.

Information quality awareness (IQA) is emphasized as an essential concept for organizations working toward the avoidance of wrong decision making and competitiveness loss within organizations (Ge, et al., 2011). Nevertheless, awareness is initiated at an individual level, according to Endsley (2000) who posit three levels of awareness including perception, comprehension, and projection. Within the first level, individuals perceive relevant elements in the environment, while in the second level individuals would integrate all the elements perceived, gaining comprehension of the significance of all elements together forming a holistic

perspective. Finally, within the third level, individuals are able to project and create a vision of the near future with all previous elements and the comprehension of the situation (Endsley, 1995).

Moreover, regarding the objective of IQA, there is distinction between the type of awareness utilized by Rogers in his DOI theory, and the awareness utilized in IS security or in our study related to IQ. In the former, Rogers considered awareness more related to communicating an innovation with a perceived benefit, contrasting with our study where awareness is more about identifying a problem, communicating it, raising consciousness, and looking for solutions. IQA is vital to information's improvement since information users need to fully support IQ initiatives to obtain the best outcomes, by following procedures and making use of IQ processes accordingly.

2.3 Motivation Research

2.3.1 Needs-based Models of Motivation: Earliest Research

Our focus was on needs-based models out of the many research streams for motivation due to their relevance to our model. For example, the study of human motivation within the business field involves Maslow's hierarchy of needs theory (1943). This theory posits that individuals have desires influencing behaviors when they are not satisfied. These desires or needs have a hierarchical arrangement going from basic ones such as physiological needs, to more elaborated desires such as self-esteem, recognition, or self-actualization. Thus, a person moves up the hierarchy of needs as she satisfies the basics, continuing toward the most advanced.

Alderfer (1972) presented his ERG model, which elaborates on Maslow's theory, grouping human needs into existence, relatedness, and growth (ERG). This classification allows individuals to meet simultaneous needs, contrasting with the hierarchical model from Maslow.

Later, Herzberg (1968) presented his two-factor theory, also known as intrinsic/extrinsic motivation. In his theory he presents intrinsic motivators related to a positive satisfaction, and which can include concepts such as recognition, challenging work, responsibility, and similar concepts. On the other hand, extrinsic motivators can be related to the absence of satisfaction, making a distinction with dissatisfaction. These extrinsic factors were labeled hygiene factors (following an analogy), which include concepts such as job security, salary, or fringe benefits, where their presence does not provide a direct motivation (healthiness) to employees, but their absence can lead, in this case, to demotivation (illness).

From a different platform, McClelland and Burham (1976) proposed motivation based on needs for achievement, affiliation, and power. They studied the need for achievement by successful managers, showing their motivation by assuming responsibilities to solve problems and taking calculated risks.

2.3.2 Self Determination Theory

Intrinsic and extrinsic motivations were studied under the research of Self-Determination Theory (Deci & Ryan, 1985) proposing human behavior as self-motivated and self-determined response. With decades of empirical research, SDT posit three basic and universal psychological needs for all and every person to reach an optimal human functioning. These are the need for autonomy, competence and relatedness which when satisfied provide higher vitality, self-motivation, and well-being (Ryan, 2009). In addition, considering that reflective awareness

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promotes autonomy, SDT emphasizes the importance of mindfulness on self-regulations and wellness (Ryan, 2009).

Behavior led by intrinsic motivation is defined as the one performed by individuals just for the pleasure or satisfaction involved in doing it (Deci, 1971; Vallerand & Bissonnette, 1992). However, behavior led by extrinsic motivation refers to actions incentivized by rewards, punishment avoidance, and other external goals (Deci & Ryan, 1987). Moreover, individuals can be amotivated , where individuals have a perception of a disconnection between their behavior and the outcomes achieved, and a sensation of incompetence and lack of self-determination (Vallerand & Bissonnette, 1992). Thus, behavior led by amotivation is not intentional contrasting with behavior intrinsically or extrinsically motivated.

Cognitive evaluation theory (CET) was presented by Deci and Ryan (1985) as a sub-theory of SDT to analyze factors in social environments that explain variability in intrinsic motivation. For example, things such as communications or feedbacks that praise feelings of competence will enhance intrinsic motivation, since it satisfies the basic psychological need for competence. Moreover, CET also argues that feelings of competence need to be accompanied by a sense of autonomy to actually enhance intrinsic motivation. Thus, it can be said that intrinsic motivation is catalyzed, rather than caused; when individual find themselves in conditions that facilitate satisfaction and promote intrinsic motivation.

In contrast, extrinsic motivation is related to a separable result than the executed activity, even though SDT posits that its relative autonomy can vary considerably. When a person is required to perform activities that are not intrinsically rewarding, they can reach different levels of motivation going from amotivation or unwillingness, to a passive disposition, to an energetic individual resolution (Ryan & Deci, 2000b). They explain how a second sub-theory to SDT

named organismic integration theory (OIT) investigates different forms of extrinsic motivation. OIT studies how the different degrees of individuals' motivation are associated with corresponding levels of internalization and integration. A person needing to perform an activity not interesting or challenging to her, can carry out the action just to satisfy an external demand, or she can execute the action to overcome a feeling of pressure in order to avoid guilt or rejection. In addition, people can work on activities non-interesting when they identify themselves with the personal importance of the activity, possibly assimilating later these values as personal goals from there on.

Figure 3. The Self-Determination Continuum (adapted from Gagne & Deci, 2005)
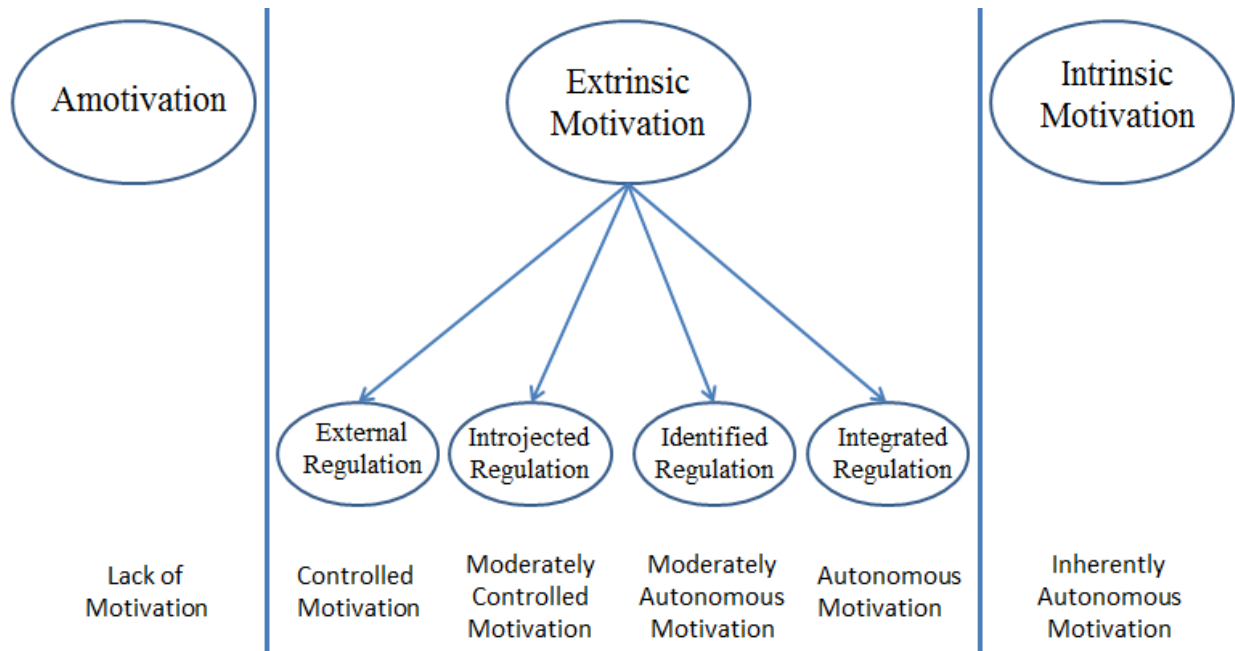
Researchers such as Gagne & Deci (2005) studied the relation of intrinsic and extrinsic motivation to performance, satisfaction, trust, and well-being in a working environment. In this same path, Davis, Bagozzi & Warshaw (1992) analyzed the impact of extrinsic motivation, represented by perceived usefulness, and intrinsic motivation represented by enjoyment, in a

study about computer usage. This was confirmed in research linked to computer technology training in the workplace by Venkatesh & Speier (1999) who proposed that extrinsic and intrinsic motivation play essential roles explaining intention to perform a particular behavior.

2.4 Attitudes and Beliefs

2.4.1 Earliest Research

Fundamental research related to attitudes was performed by McGuire, Lindzey, & Aronson (1985), which presents attitudes as the evaluation of associated beliefs and behaviors toward a particular object. Moreover, Gordon Allport (1935) lists attitudes as one of the most essential concepts in social psychology, at the time, having a long research history that prolongs into contemporary work.

Around 1920, empirical research was developed to study attitudes, and researchers such as Thurstone and Likert developed their instruments to measure attitudes, with the Equal Appearing Interval and Likert scales, respectively. Seminal research by LaPiere (1934) explored the influence of attitudes on behavior. This work was followed by research during World War II which looked to better understand how to change public opinion, when war propaganda was used by Nazis. The U.S. government, through the War Department, wanted to better understand how to influence the public, promoting the sustainability of public morale. Later, this interest in persuasion remained growing since mass communication became available being reinforced particularly through television as Cold War started.

During this same time, researcher Festinger (1957) developed the Cognitive Dissonance theory which could be applied to a wider number of attitudinal events. This theory of cognitive

dissonance relates to imbalances by inconsistent individuals' beliefs, such as attitudes, and that individuals tend to regain equilibrium by modifying one of their beliefs.

Moreover, around this same period of time, researchers such as Smith, Bruner & White (1956) and Katz (1960) suggested that attitudes served varied purposes for different individuals. Attitudes mainly can provide an assessment of an object value, helping the people to ease their evaluations and corresponding behaviors.

Work on attitudes has presented some attitudes as highly stable and difficult to change, contrasting with some attitudes being flexible and without much influence (Krosnick, & Petty, 1995). From this comparison, researchers have found that they can work out the definition of attitude strength which involves the concepts of durability and impactfulness. Where, impactfulness is related to the impact on information processing and judgments, and directing behavior.

Additional theories have been produced such as self-perception theory proposed by Dem (1967). This theory posits that individuals without previous experience and attitude, would develop their attitudes by observing their own behaviors and deciding on the origin for their actions. An additional theory was social judgment theory developed by Sherif & Hovland (1961) looking to explain attitude changes. According to this theory, people are persuaded by new ideas after they are evaluated and compared against their current point of view.

Important models of persuasion were also developed looking to explain the formation and change of attitudes proposing dual processes. Such models are Elaboration Likelihood Model (ELM, Petty & Cacciopo, 1986) and Heuristic-Systematic Model (HSM, Chaiken, 1980). Both consider two different routes by which individuals' attitudes will be influenced, and their result will have different degree of persuasion.

2.4.2 Theory of Reasoned Action

Initial research works about attitude and beliefs led to a change within social psychology around 1960's toward social cognition which focuses on how people process information and react to it. Where, researchers such as Ajzen & Fishbein (1973) developed the theory of reasoned action (TRA) looking into how individuals change their behavior influenced by attitudes. Subsequent work studied when and how attitudes can predict behavior, having a resurgence in the 1970s.

Theory of Reasoned Action (TRA) proposes behavioral intention as the most influential construct of behavior, and which is impacted by individuals' attitudes. These attitudes are depicted by favorable or unfavorable feelings towards the behavior. Moreover, an additional construct labeled subjective norm, describes the perception of other people's expectations about their behavior influencing also behavioral intention, which would determine the final action (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980).

2.4.3 Theory of Planned Behavior

Later, it was suggested that the accuracy of TRA to predict behavior did not take into consideration volitional control, representing individuals' possibilities to control the behavior. Ajzen (1991) included perceived behavioral control so TRA could consider factors outside the control of individuals, becoming the predecessor of Theory of Planned Behavior (TPB). That is, even when individual's intentions favor the action having captured all motivational factors, some behaviors depend on the availability of opportunities and resources such as time, skills, or coworkers' collaboration (Ajzen, 1985).

Figure 4. Theory of Planned Behavior (adapted from Ajzen, 1991)
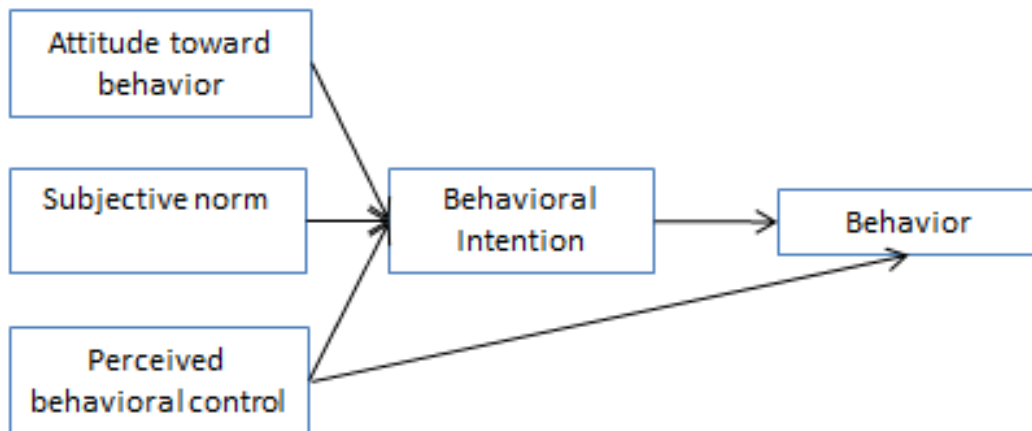
As presented in Figure 4, adapted from Ajzen (1991), the three antecedents of behavioral intention, all have a positive relationship where an increase of these constructs will generate an increase in behavioral intention. In this scenario, attitude toward behavior is defined as the level of positive or negative evaluation of associated outcomes to the behavior, that when applied to this study refers to positive feelings that generated intrinsic motivations regarding IQ. Perceived behavioral control refers to the difficulty or easiness to perform the behavior considering available resources, which in this study is more linked to perception of required capabilities and other resources such as time required to complete assigned tasks. Finally, subjective norm represents the social pressure to perform or not perform the action, depicting in our case organizational policies appealing to conform to specific rules and processes.

Therefore, behavioral intention is formed and becomes stronger by the influence of these three antecedents. Actual behavior will be determined by behavioral intentions and behavioral control which portrays the opportunities and resources in a particular context. Nonetheless, true behavioral control is difficult to measure; therefore, perceived behavioral control is utilized.

2.5 Social Interaction

2.5.1 Earliest Research

Concepts such as socialization, peer pressure, and leadership are terms related to social interaction where people's behaviors are influenced by others. Initial work around attitude change performed by Kelman (1958) analyzed the relationship of behavior and beliefs. He lists three main relationships, including firstly compliance, which represents people's acceptance of the influence by other person when they expect certain reward or approval, rather than believing in the content of the behavior. Secondly, identification, portraying the situation when an individual accepts the influence by someone important to the individual, although without much consideration to the content of the behavior. And thirdly, internalization, describing when people approve certain behavior or beliefs giving high relevance to the ideas and actions of the behavior, which provides an intrinsic reward.

Another highly important work during a similar period of time is related to normative social influences and informational social influences (Deutsch & Gerard, 1955), where normative social influence represents our need to be appreciated and leads to conform to the positive expectations of others, and informational social influence relates to our need to be right and leads to accepts evidence provided by others as representation of reality. Research related to improvement of information technology training through e-learning, Santhanam, Sasidharan, & Webster (2008) lists components of social cognitive theory view. These researchers include people's motivation, their outcomes expectancies, and corresponding beliefs about their perceived self-efficacy. This kind of theoretical platform, related to social influences allows us to analyze the interaction of healthcare information stakeholders with the organizational

environment, where, social cognitive theory posits that human behavior is determined by the interaction of personal, behavioral, and environmental influences.

2.5.2 Social Cognitive Theory

Social cognitive theory (SCT), as the evolution of social learning theory (SLT), studies the interaction of individuals, environment, and human abilities to learn and adapt. It makes emphasis on people's capacity to work collectively toward environmental improvements and organizational advantages (McAlister, Perry, & Parcel, 2008). Thus, SCT helps us as an additional theoretical platform to better understand human behavior regarding technology within organizations.

Moreover, SLT suggests that individuals' behaviors will be positively influenced to use technology by their perception on positive outcomes (Compeau & Higgins, 1995b). Marakas, Yi, & Johnson (1998) use SLT, listing cognitive, environmental, and behavioral concepts, and placing computer self-efficacy as a highly influential construct in the study of human behavior. Within this research stream, computer self-efficacy is defined as people's belief about their own abilities to work with computers (Compeau & Higgins, 1995a).

SLT proposes a bidirectional interaction between individuals, the environment, and the behavior itself (Davis & Luthans, 1980), shown in Figure 5. In an organization the interaction is given among organizational participants depicting cognitive processes, the organizational environment portraying social influences inside and outside the organization, and organizational behavior representing for example IQ practices in the organization.

Figure 5. Model of Social Learning Theory of Organizational Behavior (Adapted from Davis & Luthans, 1980).
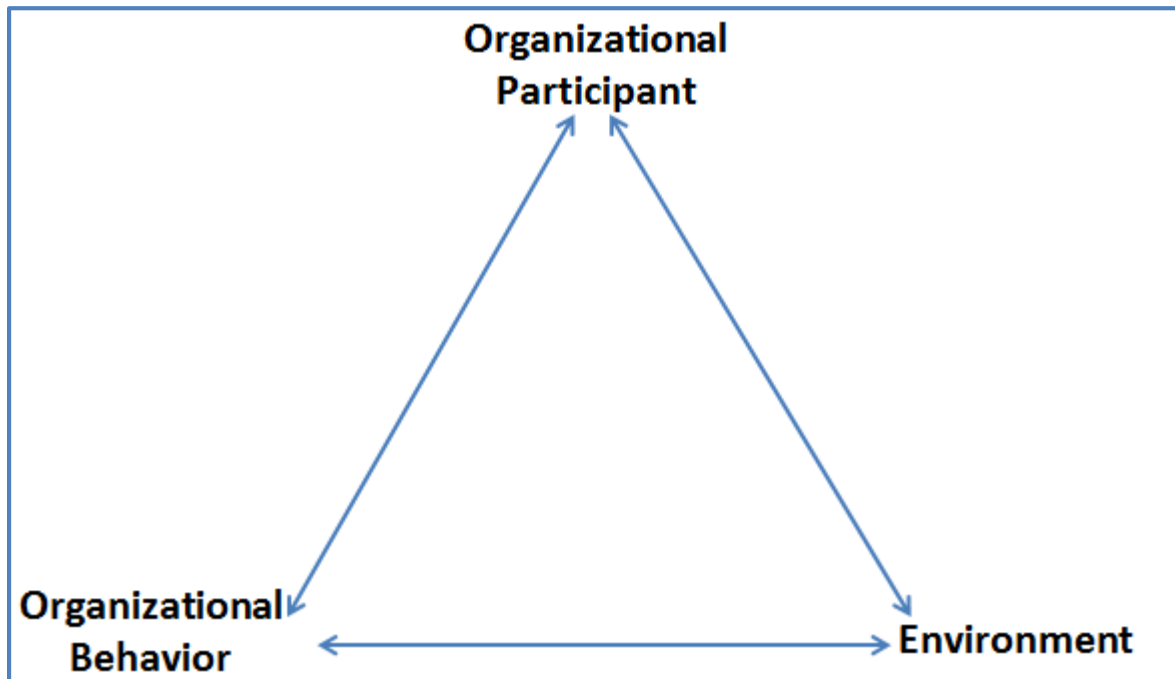
Bandura (1988) relates the theory of social cognition, or social learning, to the interaction among cognitive and personal factors, environment, and people's behaviors, with a main interest on how personal factors can improve organizational functioning. This psychosocial explanation involves a triadic reciprocal causation, where the theory highlights the impact that human abilities have to stimulate individuals' self-regulation and self-motivation.

CHAPTER III

RESEARCH MODEL

From a theoretical point of view, the study of IQ practice in healthcare is better

approached through multiple perspectives, looking to clarify complexities found in all disciplines

involved or caused by their interaction. In this scenario, cognitive social psychology can provide

a framework for the rest of the theoretical platforms involved, highlighting the importance of

personal beliefs and rational processes as antecedents of behavior (Manis, 1977). Cognitive

social psychology is followed by self-determination theory supporting people's motivation.

Later, theory of planned behavior continues the flow to individuals' behavior, and finally, social

cognitive theory is utilized to assist with the analysis of interactions among cognitive factors, the

environment, and behavior.

The previous theoretical path, which is depicted in Figure 2, presents the scope of the

theories listed and their corresponding constructs, showing the direction toward behavior.

Therefore, the research model shown in Figure 6 is the specialization of this theoretical scenario.

In this model, the cognitive social psychology is still the theoretical background for the whole

system, and the other three theories support the constructs included, where some constructs are

covered by two theories creating some overlays.

Figure 6. Research Model
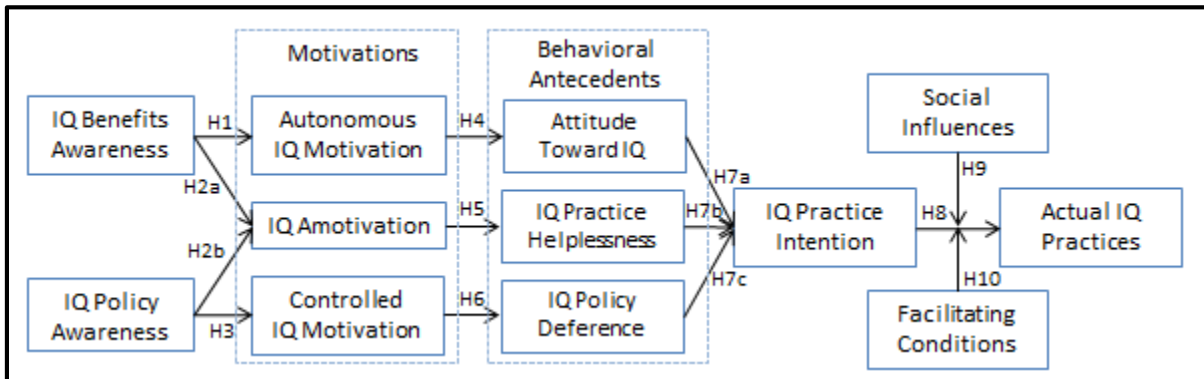
As can be appreciated within the research model in Figure 6, the first group of constructs on the left section corresponds to awareness representing the increased cognition within social cognitive psychology. The awareness of different aspects of IQ would influence desires or needs of IQ stakeholders. These desires or needs are the different types of motivations that people hold.

Constructs related to motivations held by individuals, impact their attitudes and intentions toward an action, together with additional factors such as the availability of resources or the improvement of collaboration with coworkers. The third group of constructs, that is, the behavioral antecedents involves attitudes and beliefs that will define the actions to be taken by individuals regarding IQ practice.

By the final section inside the model, individual's behavior would be moderated by social/organizational influences and by resources available to all information stakeholders such as helpdesk support, training on information systems, and even the required amount of time.

3.1 IQ Awareness

Research on the awareness topic within information systems has a short history with sparse work. Mainly, researchers linked to information security have worked with constructs

related to awareness. For example, Dinev & Hart (2005-2006) studied social awareness interaction related to internet privacy within electronic commerce, where they call our attention toward the scarce research performed on awareness in information systems, in particular regarding internet privacy. Additional work about the relationship of awareness impacting user behavioral intentions regarding protecting information technologies developed the construct for technology awareness (TA) (Dinev & Hu, 2007). This study highlights differences between Rogers' research on diffusion of innovation where awareness is more about communicating an innovation with a perceived benefit, and information security research where awareness is more about identifying a problem, communicating it, increasing consciousness, and searching for solutions.

Awareness is an initial stage in a developmental progression, followed by knowledge, and later by skills (Pedersen, 1988). An initial study on the impact of TA on self-efficacy about deception detection with the objective to reduce users' threats with fake antivirus, used Dinev & Hu's (2007) construct of TA (Ormond, Warketin, Marett, & Johnston, 2011). Awareness is essential to promote a complete understanding of issues and the associated actions and procedures to follow (Furnell, Gennatou, & Dowland, 2002).

The set of problems associated with IQ also require better strategies and processes to be solved and sustain continuous improvement. IQ awareness promotes incentives to IS users, with a focus in our study toward EHR stakeholders, by allowing them to perceive outcomes as self-rewarding. For example, EHR users can become mindful of positive outcomes such as self-fulfillment, with a sense of competence and professionalism, and compassion feelings toward patients for whom it is sought to improve their wellbeing by reducing the number of medication errors, for example.

IQ awareness must be emphasized through the reinforcement of policies incentivizing IS users to avoid deviating from established processes associated with sanctions. These policies set up what users should avoid, or the negative side or consequences of not following specified rules. Among these sanctions, for instance, stakeholders would find financial disincentives or delays in their career advancement.

Siponen (2000) developed a conceptual analysis with proposals toward studying characteristics of information security awareness, and where awareness programs are suggested to be divided into two categories. The first category, referred to as a framework, involves technical concepts such as standards, and a second category, referred to as content, linked to a behavioral structure with motivation and attitude concepts. Following this idea, we split the concept of IQ awareness into awareness linked to its positive aspect labeling it as IQ benefits awareness. And a second concept of awareness related to its negative side, a more regulatory and technical framework labeling it as IQ policy awareness.

3.1.1 IQ Benefits Awareness

A stronger reliance on electronic information to optimize organizational operations, and a higher volume of information highlight the importance of IQ. Data is considered an essential organizational resource, and its quality is strongly based on techniques and procedures aimed to improve it (Tayi & Ballou, 1998). Many benefits from EHRs are still pending and IQ plays an important role in their optimization. For example, IQ is highly useful for chronic disease management, where a high level of IQ is the product of multiple operations and can be reached through continuous processes (Sunyaev & Chornyi, 2012).

IQ affects decision making, improving it when users know about the relationships among problem variables (Raghunathan, 1999). Additionally, Kokemueller (2011) posits that IQ has a significant influence on perceived net benefits, providing incentives to stakeholders.

Moreover, Dinev & Hu (2007) defined technology awareness as "a user's raised consciousness of and interest in knowing about technological issues and strategies to deal with them" (p. 391). Considering the positive aspect of IQ, that is, the benefits that IQ can bring to organizations that work to improve it, we develop a construct about the awareness of IQ. Since IQ benefits are not always noticeable at first glance due to the fact that others down the information usage chain will find advantages from its improvements, it is highly important to be mindful of the benefits. Therefore, we define IQ benefits awareness as a user's raised consciousness of and interest in knowing about IQ benefits and strategies to procure the corresponding advantages and aids for patients and for the organization itself.

3.1.2 IQ Policy Awareness

Training and education are needed to reduce uncertainty generated through change, by informing about new environment, developing new skills, and sharing the understanding of the objective (Wells, 1997). As the importance of information security policies (ISP) grows, its quality becomes essential. Research on IT fields such as auditing, software development, and IQ contribute to define factors influencing quality in ISP (Maynard & Ruighaver, 2006). Information security awareness relates to forming and maintaining their users' knowledge regarding IS risk and associated consequences of implementing security training programs (Kruger & Kearney, 2006). As part of a security culture, awareness needs to go beyond informing users of their responsibilities and motivate them too (Hinson, 2008). A similar

situation is faced with IQ since it is a group of issues not commonly recognized. In this type of scenarios, subjective dimensions such as believability, value-added, & relevancy are important for IQ (Kokemueller, 2011).

The number of information systems applications and users are constantly expanding, and Petter, DeLone, & McLean (2012) still include IQ, system quality, use, and outcomes as key elements of their information systems success model. Moreover, IQ can reveal how well an information system is working, where IQ has a relevancy when studying its impact on firm's performance (Sheng & Mykytyn Jr, 2002).

Information quality can be improved by applying appropriate concepts and procedures from product quality control programs (Ballou et al., 1998). This is confirmed by Huh, Keller, Redman, & Watkins (1990) who assert that attention on IQ should be directed to processes since faulty data is extremely difficult to clean. Without a quality initiative, information obtained from information systems can rapidly lose quality as time and their utilization progress (Batini et al., 2009).

Bulgurcu, Cavusoglu, & Benbasat (2010) developed the information security policy (ISP) awareness construct as a component of a research model studying the impact of IS awareness on intention to comply with the organization's IS policies. Bulgurcu and associates define ISP awareness as "an employee's knowledge and understanding of the requirements prescribed in the organization's ISP and the aims of those requirements" (p.532). Focusing on the regulatory aspect of IQ, linked to negative consequence if users do not comply with rules & prohibitions, we worked out the construct of awareness for IQ policy. To be effective, policies regarding any subject need to be announced, explained, and reinforced, so stakeholders understand their value and reasons to be pursue, and IQ policies are no exception to this fact. Thus, we define IQ policy

awareness as a user's raised consciousness of and interest in knowing about IQ policy with specific processes, rules, and the corresponding sanctions for stakeholders who would not comply.

To achieve a solid information security, it is essential that all IT users be aware of and follow appropriate security guidelines (Johnson, 2006). At the same time, to improve information security, users need to collaborate where awareness is crucial to reach this cooperation (Luciano, Mahmood, & Maçada, 2010). In similar scenarios to information security, such as IQ, emphasis should be on process management to improve quality (Kon, Lee, & Wang, 1993). For example, users responsible to record data should be aware of the role data plays in the system operation, and the impact on decision making performed by them or by other information users (Mikkelsen & Aasly, 2005). Not forgetting that error in data can cost millions to organizations, make them lose customers, and inhibit the implementation of new strategies (Redman, 1995).

3.2 IQ Motivations

Awareness and motivation are key elements reaching higher IQ (Wang, Storey, & Firth, 1995). There is an interaction between awareness and individuals' mental models where awareness can influence the mental models that users may have (Endsley, 2000). Moreover, in a study regarding information security awareness, Shaw and associates (2009) explain how users can improve their understanding of information security relevance using mental models representing their cognitive structure. Individuals can form a mental model with a positive, negative, or neutral opinion depending on the perceived benefits of using information systems or adhering to proposed policies. Consequently, positive, negative, or neutral sentiment toward the support of initiatives like IQ would impact users' motivation.

3.2.1 Autonomous IQ Motivation

As Deci (1971) explains the concept of intrinsic motivation when he states that "One is said to be intrinsically motivated to perform an activity when he receives no apparent rewards except the activity itself." (p. 105). Ryan & Deci (2000b) mention the autonomous characteristic of intrinsic motivation, highlighting the continuum of extrinsic motivation going from integrated activities with high autonomous feelings associated to external regulated activities, and with high controlled sensations linked. Therefore, autonomous motivations are associated to intrinsic motivation but linked also to integrated regulations which are located on one extreme of the extrinsic motivation continuum. This explanation is highly useful in IQ research for all the direct and indirect benefits that can alleviate diverse issues. Particularly within the healthcare field IQ problems have not always been indicated, although Linder and associates (2007) provide some examples of IQ benefits such as quality of care improvements, and reduction of medication errors that increases patients' safety.

Ryan & Deci (2000b) describe an autonomous behavior, although considered under an extrinsic motivation when saying "the most autonomous form of extrinsic motivation is integrated motivation. Integration occurs when identified regulations are fully assimilated to the self, which means they have been evaluated and brought into congruence with one's other values and needs" (p.72). Furthermore, taking into account the positive aspect of being aware of IQ benefits, this can be linked to activities that can provide rewards and satisfactions creating a possibility to be integrated by EHR users. Thus, we define autonomous IQ motivation as individuals' desire to pursue IQ practice due to perceived benefits associated to it.

Self-Determination Theory (SDT) studies volitional behaviors within the social and cultural environments surrounding the person, and considers human beings as active individuals

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that by nature are curious, seek challenges and opportunities to learn, relating these attributes to

intrinsic motivation. Deci (1971) and Vallerand & Bissonnette (1992) described behaviors led by

intrinsic motivation as those actions incentivized by the sole satisfaction of performing it.

Moreover, an example of an extrinsic motivated behavior of a student working diligently on her

homework assignments can be considered as autonomous regulation since she could have

evaluated and integrated the regulation considering that it will benefit her overall development,

not only a better grade for her class (Ryan & Deci, 2000b). In this same path of ideas,

information users would pursue IQ since they perceive that this behavior would lead to benefits,

generating feelings of satisfaction and professionalism.

Following these concepts based on motivation, a direct influence by people's awareness

on IQ benefits can be anticipated, along with the intrinsic and autonomous motivation regarding

IQ practices since they would increase individuals' positive sentiments (satisfaction performing

the activities). IS users who become aware of possible benefits to patients and the organization

by compliance to IQ practices can integrate them as their own believes and needs. Therefore, it is

hypothesized that IQ Benefits Awareness shape individuals' Autonomous IQ Motivation. Thus,

H1: IQ Benefits Awareness positively influences Autonomous IQ Motivation.

3.2.2 Controlled IQ Motivation

Explaining the basic difference between intrinsic motivation and extrinsic motivation

Deci & Ryan (2008) posit that "Extrinsic motivation, in contrast, involves engaging in an activity

because it leads to some separate consequence. The clearest examples of extrinsically motivated

behaviours are those performed to obtain a tangible reward or to avoid a punishment" (p. 15). In

addition, Ryan and Deci (2000b) clarifies that extrinsic motivation is more a continuum than a

single concept, which goes from the integration of regulations where users have an autonomous

motivation, to external regulations where users have a controlled motivation. A similar set of ideas can be applied in IQ work, considering that organizations need to follow processes and rules to improve IQ. These instructions usually included in policies, will provide the rewards and punishments when complying or not with them. Thus, considering a more regulatory or negative aspect of IQ awareness which involves all the restrictions established in the IQ policies along their associated consequences, we define controlled IQ motivation as the individuals' incentive to pursue IQ looking for rewards or avoiding punishments.

Ryan & Deci (2000a) initially differentiate intrinsic motivation from extrinsic motivation, where the former refers to performed actions by their inherently interest, and the latter relates to actions executed with a distinct goal in mind. Thus, a person can be motivated, or moved to do an activity at different degrees ranging from an state of autonomy, passing through a controlled sensation, and ending in a total disinterest namely amotivation.

Awareness of rules and guidelines in IQ policies can generate expectation on information users. IS users are usually evaluated within their working environments for which they know compliance with policies is a requirement. Either, personnel working with EHRs want to earn rewards or avoid any penalties by conforming to policies. From this line of thought, we hypothesize that IQ Policy Awareness shapes Controlled IQ Motivation. Thus,

H3: IQ Policy Awareness will positively influence individuals' Controlled IQ Motivation

3.2.3 IQ Amotivation

Describing the construct of amotivation, Gagne & Deci (2005) compare it against intrinsic and extrinsic motivations summarizing that "Autonomous motivation and controlled motivation are both intentional, and together they stand in contrast to amotivation, which

involves a lack of intention and motivation.", p. 334). Having a state different from intrinsic and extrinsic motivation, where individuals are not incentivized to conform to common practices, becomes useful in the IQ field to better comprehend users behaviors. Since IQ stakeholders need to perform additional tasks to their regular work activities in order to comply with IQ practices, this creates for them a sense of constrain. Therefore, IQ amotivation is defined as individuals' lack of motivation by the perception of preference for inactivity when additional actions toward IQ are needed.

IS users are expected to perceived IQ practices as an impediment for their regular activities, following similar situations within IS research areas (Herath & Rao, 2009). Healthcare working environments already have pressure to follow diverse rules and detailed processes, so IS users need to assign additional time and efforts to comply with IQ guidelines. Moreover, Ryan and Deci (2000b) posit that human motivation toward activities not intrinsically rewarding shows varied degrees ranging from an energetic resolution to a complete unwillingness or amotivation.

IQ amotivation is influenced by two different types of individuals' awareness. IQ amotivation is shaped by IQ benefits awareness and by IQ policy awareness, since people realize that they need to execute additional activities to their regular ones. IS users under this circumstances would perceive that activities have no value, that they might not be competent to execute them, or not expecting an adequate result (Ryan & Deci, 2000b). Thus,

H2$_a$: IQ Benefits Awareness will negatively influence users' IQ Amotivation

H2$_b$: IQ Policy Awareness will negatively influence individuals' IQ Amotivation

3.3 Behavioral Antecedents

People develop attitudes toward a behavior based on the beliefs they hold about the anticipated outcomes of this behavior (Ajzen, 1991). Such beliefs can rely, for example, on

perceptions about health care quality improvements, rewards or recognitions for complying with IQ practices. Moreover, behavior is impacted by individuals' perception of the control they can have to overcome behavioral constraints, this is, the perception of a lack of control due to job-related limitations such as time, equipment, and other resources. Their consideration of others' opinions that influence their adherence to organizational policies can also have an influence on their behavior.

We rely on TPB for its relevance in the study of human behavior, which have an extensive number of research supported with diverse empirical studies, many condensed in meta-analysis studies (Albarracin, Johnson, Fishbein, & Muellerleile, 2001; Downs & Hausenblas, 2005; Durantini, Albarracin, Earl, & Mitchell, 2006; Hardeman, Johnston, Johnston, Bonetti, Wareham, & Kinmonth, 2002; Sheeran & Taylor, 1999; Sheppard, Hartwick, & Warshaw, 1988; Webb & Sheeran, 2006) . TPB helps us to better understand individual's behaviors which are led by their behavioral intentions, where behavioral intentions are influenced by three behavioral antecedents of intention. These determinants of intention are attitudes, perceived behavioral control, and subjective norm.

An important point, considering that TPB was developed from the theory of reasoned action (TRA), is clarified by Ajzen & Albarracin (2007). They explain that even though attitudes, subjective norms, and perception of control are determined from a cognitive foundation, this foundation is based on a group of beliefs that might be accurate or could be biased by different cognitive and motivational processes. This creates the possibility to continue researching for those factors that could influence constructs determining behavioral intentions.

3.3.1 Attitude toward IQ

Ajzen (1991) posits that TPB describes attitude toward behavior as "to the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question" (p. 188). In IQ context, this reference gives us the possibility to relate the benefits associated to it, and in this study, particularly within a healthcare environment. Then, individuals' attitudes can be characterized by their feelings toward performing an action, based on their cognitive beliefs about its outcome. These attitudes are influenced by people's beliefs along with the beneficialness these actions might bring. Thus, we define attitude toward IQ as the degree to which individuals have a favorable or unfavorable evaluation of IQ practices.

TPB has been used to study the acceptance of technologies by individuals in professional environments (Harrison, Mykytyn, & Riemenschneider, 1997). Taylor & Todd (1995) studied the usage of a computer resource center basing their research on users' attitudes and intentions. Inside healthcare, important work has been developed by researchers such as Kasprzyk, Montaño, & Fishbein (1998) and Wolitski & Zhang (2007) around the application of attitude research on condom use and HIV prevention behaviors for example.

SDT portray a person willing to perform an activity with a sensation of autonomy when she can receive rewards and satisfaction from doing it, or she integrated the regulation generating this satisfaction. Gagne & Deci (2005) posit that supportive working environments lead to full internalization of extrinsic motivation, which in turn contribute toward job satisfaction and positive work attitudes. Taking this into consideration, autonomous motivation will most surely impact an IS user's disposition in favor of these activities, influencing positively her attitudes. Therefore, it is hypothesized that autonomous IQ motivation influence attitudes toward IQ. Thus,

H4: Autonomous IQ Motivation positively influences Attitude toward IQ.

3.3.2 IQ Practice Helplessness

TPB, explained by Ajzen (1991), describes control beliefs as associated to perceived behavioral control and involving required resources, for which he expresses "The more resources and opportunities individuals believe they possess, and the fewer obstacles or impediments they anticipate, the greater should be their perceived control over the behavior" (p. 196). This explanation can be related to studies where improvements to IQ list users' capabilities and resources demanded in IQ processes and guidelines. IQ practices, either representing benefits for its stakeholders or portraying rules and restrictions, demand users to perform additional tasks to their regular activities. This extra work is perceived by individuals as an impediment or reduced control over their actions. Therefore, we define IQ practice helplessness as individuals' perception of the difficulty to perform their work due to the lack of control over their activities.

Eagly & Chaiken (1993) described behavioral control as the perception of the difficulty to execute a task. At the same time, it is suggested that TPB considers people with different degrees of control over their behaviors, going from those individual performing tasks effortlessly, to individuals performing tasks expending significant effort or resources.

To clarify the concept of amotivation, which is key to SDT, Vallerand & Bissonnette (1992) posit that "Individuals are amotivated when they perceive a lack of contingency between their behavior and outcomes. There is an experience of incompetence and lack of control." (p. 602). Users' amotivation accentuate their sensation of helplessness by the feelings of incompetence and lack of control about IQ activities. Consequently, it is hypothesized that IQ amotivation influence IQ practice helplessness. Therefore,

H5: IQ Amotivation positively influences IQ Practice Helplessness.

3.3.3 IQ Policy Deference

Within TPB, Ajzen (1991) regards for subjective norm, and normative beliefs which are its antecedents, with the statement "Normative beliefs are concerned with the likelihood that important referent individuals or groups approve or disapprove of performing a given behavior" (p. 195). Which provides us with the understanding that when deciding to perform an activity or not, people ponder expectations from people important to them, regarding the behavior. In the IQ context, better practices toward IQ improvement are based on policies expected to be followed by users. These policies contain expectations from organizational leaders looking to comply with third parties demands, such as insurance companies, Medicaid/Medicare, specifying IQ as a condition to reimburse medical bills. Thus, we define IQ policy deference as individuals' perception of the organizational pressure whether they should comply with IQ policies.

Fishbein & Ajzen (1975) list subjective norm as a construct of the theory of reasoned action and describe it as influences from the environment. Particularly, subjective norm are the influences from those important to the subject, about whether they should perform or not, a specific behavior. Moreover, these opinions are weighted by considering the desire that individuals have to comply with the expectations about their behavior.

Deci & Ryan (1987) describe people extrinsically motivated when the goal in performing the action is different from the activity itself. In addition, Ryan & Deci (2000b) posit that controlled motivation is associated to experiences externally regulated. That is, actions having goals outside the activity itself, such as rewards, or punishment avoidance. In the IQ field, policies determine tasks required by organizations pursuing IQ improvements. These guidelines and restrictions are related to behavior based on incentives such as positive evaluations or

shunning penalties; that is, behavior sought for its instrumentality to achieve a separable result. Thus, it is hypothesized that controlled IQ motivation shape the IQ policy deference. Therefore,

H6: Controlled IQ Motivation positively influences IQ Policy Deference.

3.3.4 IQ Practice Intention

Harrison et al (1997) supported a study of the adoption of information technology in small businesses using TPB, defining intention as "the strength of conscious plans to perform the target behavior" (p. 176). Furthermore, intentions were delineated by Ajzen (1991) when he stated that "Intentions are assumed to capture the motivational factors that influence a behavior; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior" (p. 181). Practices related to IQ involve set of processes, activities, efforts and energy that must be applied to achieve a higher degree of IQ. Without users' willingness, their capabilities, resources, and general organizational support, IQ initiatives or programs can never be successful. Thus, IQ practice intentions can be defined as the strength of individuals' willingness to comply with IQ practice.

Ajzen (1991) posits that intention's construct is influenced by three antecedents including attitudes, subjective norm, and perceived behavioral control. He suggests that attitudes unfold from what people believe about the object linked to the attitude. That is, the individual generates positive or negative beliefs about an object based on the positive or negative attributes associated to it. Other beliefs influencing behavioral intentions are perceived behavioral control, which involve control beliefs that could include past experiences with the behavior, but also with resources required. Individuals will hold a greater perceived behavioral control when they perceive more resources and fewer obstacles. Moreover, TPB describes subjective norm as

normative beliefs that people generate when they consider the opinion from persons important to them regarding if they should or not perform the behavior. Thus, it is hypothesized that IQ practice intention is influenced by attitudes toward IQ, IQ practice helplessness, and by IQ policy deference. Therefore,

H7a: Attitude toward IQ positively influences IQ Practice Intention.

H7b: IQ Practice Helplessness negatively influences IQ Practice Intention.

H7c: IQ Policy Deference positively influences IQ Practice Intention.

3.3.5 Actual IQ Practices

As is well known, the main analysis in TPB is toward the behavior individuals have consistent with their attitudes, the subjective norms, and their perceived behavioral control, which are the antecedents of behavioral intentions. Ajzen (1991) posit that "the stronger the intention to engage in a behavior, the more likely should be its performance." (p. 181). Behaviors in the IQ field are no different than in other fields, in the sense that they need to be performed in order to be helpful toward the established goals. Therefore, we can define actual IQ practices as those activities required to improve IQ.

From the same previous citation about intentions leading to actual behavior by Ajzen, we can draw the relationship between these two concepts. Then, it is hypothesized that IQ practice intention influences actual IQ practices. Therefore,

H8: IQ Practice Intention positively influences Actual IQ Practices.

3.4 Social Interaction

Cognitive theories are highly popular within social psychology highlighting the relevance of personal belief and rational procedures as antecedents of behavior (Manis, 1977). Moreover, goals of social cognition are related to the study of how information is stored, processed, and later used in our perception and interaction with others (Hamilton, 2005). Within this research stream of cognitive theory, social cognitive theory (SCT) looks to understand why and how individuals change their personal behaviors modifying at the same time the social and physical environments where they interact (McAlister, Perry, & Parcel, 2008).

Social learning theory (SLT), as predecessor of SCT, accentuates the importance of learning, either from personal experiences, or through a vicarious experience observing others' actions affecting the environment (Davis & Luthans, 1980). Bandura (1986) differentiates SCT from SLT by acknowledging that for SCT, cognition plays a key role when individuals intend to form reality, self-regulate, process information, and execute tasks. SCT has become one of the most important theoretical foundation studying individuals' behavior. Nevertheless, individuals live in societies, and tend to perform their work through organizations, therefore the concept of human agency is extended to include collective agency (Bandura, 1986).

3.4.1 Social Influences

Thompson, Higgins, & Howell (1991) in a study regarding the use of personal computers utilized the definition made by Triadis of social factors. This definition describes social factors as "the individuals' internalization of the reference groups' subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations" (p. 126). With this description, and following Venkatesh, Morris, Davis, & Davis (2003), who

used Thompson and associates' definition of social factors to develop their own, naming it as social influences, we follow this same pattern and label the construct as social influences. In this definition, Thompson and associates explain that subjective culture relates to self-instructions by users to do what is correct by members of a culture in specific situations, roles linked to correct behaviors considering users' positions in a group, and values representing "abstract categories with strong affective components". Moreover, in the same way personal computers usage is affected, IQ practices require support from its stakeholders, who are ultimately who can define its success.

According to social cognitive theory, human behavior can be studied as the interaction of distinct factors including personal, behavioral, and environmental. Moreover, individuals can work collectively influenced by the environment, and at the same time have the capacity to impact their organizational environment toward a more beneficial situation for all (McAlister, Perry, & Parcel, 2008). Thus, the construct of social influences can be connected to SCT since there is an interaction by a user and her social environment assuming a goal to improve the situation of both by her behavior. Therefore, social influences concept is defined as the support provided by the culture in the working environment.

The direct relationship between behavioral intention and actual behavior has been confirmed throughout multiple studies. In healthcare environments, there are no apparent factors that would change this interaction, although it can be moderated. SCT views individuals as agents planning ahead their progress through their actions, where people have self-beliefs that allow them to adjust their thoughts, feelings, and behaviors (Bandura, 2001). Therefore, it is hypothesized that the interaction between IQ practice intention and actual IQ practice will be moderated by social influences. That is,

H9: Social Influences moderates the relationship between IQ Practice Intention and Actual IQ Practices positively.

3.4.2 Facilitating Conditions

The construct of facilitating conditions is used by Thompson et al. (1991) based on Triandis' work who defines it as "objective factors, 'out there' in the environment, that several judges or observers can agree make an act easy to do" (p. 129). These researchers make an emphasis on users' need for training and assistance to eliminate any real or imaginary barrier to use the technology. This concept suits nicely to activities linked to IQ since related practices requires an adequate supportive environment. In this same group of ideas, SLT highlights the importance of the reciprocal dependence between individuals and the environment (Davis & Luthans, 1980). Thus, we define facilitating conditions as the degree that a user perceives to have a supportive working environment adequate to comply with IQ practices.

As indicated few paragraph before, the direct relationship between behavioral intention and actual behavior has been confirmed, although it can be moderated. In the case of facilitating conditions, it is hypothesized that the interaction between IQ practice intention and actual IQ practice will be moderated by this concept. That is,

H10: Facilitating Conditions moderates the relationship between IQ Practice Intention and Actual IQ Practices positively.

CHAPTER IV

METHODOLOGY

This chapter presents the methodology utilized in this study with the objective of assessing the hypotheses posited in the previous chapter. In particular, we explain the design of this study following corresponding questions to be answered. Furthermore, we detail the development of the instrument built to test the research model, the validity and reliability of the instrument evaluated, the data collection procedures, and the statistical analyses applied to gathered data.

4.1 Research Design

This study considers the definition used by Gable (1994) of research design, which lists the organization for the collection and analysis of the data in order to obtain relevance and efficiency. Additionally, the purpose of this study is to develop and test a model related to IQ awareness towards the compliance of IQ practices. Therefore, we selected a quantitative research method where statistical analysis can support hypotheses testing assessing constructs and their interactions.

Newsted, Munro, Schwarz, & Cu's (2003) work posit that surveys are useful when it comes to quantitative research. They mention survey's strengths such as the ability to determine values and relations of variables and constructs, their ability to predict behavior, and the easiness to be reused providing objective comparison between different groups, times, and places. Moreover, information systems research presents survey instruments as the most frequent used

instrument (Orlikowski & Baroudi, 1991, Pinsonneault & Kraemer, 1993), where empirical research rely on surveys to assess new models that utilize existing theories.

In order to verify the relevance and comprehension EHR users could have of the questions, we searched for experts in the field. We were able to talk to Quality & Security manager, together with the Health Information Management director of a large hospital in the southwest of the US. When they asked for a clarification on the meaning of information quality, they proposed to use to consider the terminology of Quality of Documentation. This term is used by a renowned and well known organization named the Joint Commission. One of their main goals is to provide accreditation to healthcare organization and certification of their programs.

As part of the Joint Commission's accreditation procedures, they use assessment processes, including particular review tools, such as the one utilized to verify clinical records. Comparing this type of reviews, we matched the items listed in them to IQ dimensions. Within IQ research 15 dimensions are used grouped into 4 categories (Table 2).

Table 2. Information Quality Dimensions

IQ Category	IQ Dimensions
Intrinsic IQ	Accuracy, Objectivity, Believability, Reputation
Accessibility IQ	Access, Security
Contextual IQ	Relevancy, Value-Added, Timeliness, Completeness, Amount of data
Representational IQ	Interpretability, Understandability, Concise representation, Consistent representation

Out of the 15 dimensions used in IQ research, we were able to match 12 that are used within the clinical record review tool. Below we list all related item used in this tool.

Table 3. IQ Dimensions and Joint Commission's Items in Clinical Record Review

IQ Dimension	Items within Review
Completeness	There is a record for every patient
Amount of data	The record contains sufficient information to identify the patient
Understandability	The record contains sufficient information to support the diagnosis
Relevancy	The record contains sufficient information to justify treatment or services
Interpretability	The record contains sufficient information to document the course and results of treatments or services
Value-Added	The record contains sufficient information to track the patients movement through the care system and facilitate continuity of care both internally and externally to the program
Accuracy	Records appear to be complete and accurate with all necessary information available
Objectivity	Comments are added in accordance with organization policy and procedure
Access / Security	Consent for release of information is on the records in accordance with organization policy or procedure
Concise representation	(*) The use of CPGs is evident in the record
Consistent representation	(*) The tailoring of CPGs for the patient is evident in the record
Relevancy	The management or the communication to the appropriate practitioner for the management of concurrently occurring conditions for the patient is evident in the record

(*) Note on Clinical Practice Guidelines
Clinical Practice Guidelines (CPGs) are tools that describe a specific procedure or processes found, through clinical trials or consensus opinion of experts, to be the most effective in evaluating and/or treating a patient who has a specific symptom, condition, or diagnosis. CPGs function to direct care toward evidence-based practice, provide a standard of care for varied populations, and increase collaboration efficiency of team members.

With the confirmation on the similarity of the concept of information quality and quality of documentation we proceeded to use this concept widely spread by the Joint Commission in the wording for the questionnaire. We expected that most of the personnel working in a healthcare organization would be familiar with the term quality of documentation.

Following Moore and Benbasat's (1991) practice when developing an instrument, we ran a pilot study. This short study was conducted through an experiment were we asked students

enrolled in a premedical program, to answer the survey in two different occasions. Our objective was to assess any difference between the students' answers before and after we provide them a brief training. The training included information from an independent and non-for-profit organization regarding the importance of quality of documentation. This organization, known as the Joint Commission, accredits healthcare organizations and certifies programs within healthcare organizations. An important area for accreditations is the quality of documentation, which provides quality of care improvements, objective assessments of clinical excellence, strengthens community confidence in the quality and safety of care, among others benefits. With this treatment, we were able to manipulate the information provided to students and compare pre and post answers relative to the treatment. Another group of EHRs users were accessed during a workshop directed mainly to administrative personnel working for organizations within the healthcare industry. Their responses helped us to verify and revise once more the wording in the instrument's questions.

After the pilot study and revisions of the questionnaire wording, we looked for group of people who could answer it. The first group we considered consisted of practitioners in the medical field with working experience utilizing EHRs. Their responses would help us to examine the proposed research model. A second sample we considered were students enrolled in medical programs. Since many of them are assumed lacking working experience, we considered them to help us assessing the impact of training programs may have. In this second sample, two rounds of the surveys were considered to compare the effects of training between an initial survey and a later one. We provided the students a first round of the survey with the simple request to read the introductory text, and asking them to respond the questionnaire. Before the second round of the survey, we presented to them information regarding the importance and relevance of QoD in the

medical field. The information was delivered through a video that included another brief video by the Joint Commission that explained the impact of QoD on performance and quality in medical organizations. The topics covered in this video included both concepts we linked IQ awareness to, that is, IQ benefits and IQ policies (Table 4).

Table 4. Information Presented in Training Video Linked to the Joint Commission

Benefits	Policy
Better quality patient care	Insurance reimbursement management
Support of future research	Objective outcomes assessment
Public safety strengthened	Healthcare economics (costs, efficiencies)
Continuity of patient care	New technologies usage
Improved decision making	Accreditation and program certifications
	Framework for program structure and
Strengthens community confidence	management
Promote culture of excellence across organizations	Can fulfill regulatory requirements in selected states
Creates a loyal, cohesive clinical team	

An important function of the Joint Commission is the accreditation of healthcare organizations and the certification of their programs. These accreditations and certifications are supported through processes that require a detailed management of multiple rules and guidelines, although the ultimate goal is the improvement of healthcare quality for the benefit of patients. In following sections, measures are detailed, subjects are described, and statistical analyses are explained.

4.2 Measurement

In order to test the relationships presented in the research model, a survey was developed which according to Gable (1994) are reliable instruments to measure associations between variables in a sample, being excellent tools helping to reduce bias. Pinsonneault & Kraemer (1993) posit that survey instruments are well known and highly used method within the

information system research, offering a valid and easily interpretable data when procedures are followed in detail.

Instrument validation involves five key concepts, including content validity (i.e. when instruments measures are derived from all possible measures of the properties under investigation), construct validity (i.e. when measures show stability across methodologies), reliability (i.e. when measures show consistency across observation), internal validity (i.e. when there are not untested rival hypotheses), and statistical conclusion validity (i.e. when variables demonstrate relationships not explainable by chance) (Straub, 1989).

The instrument utilized for this study was a survey developed through steps. Initially, we performed an extensive literature review searching for all major constructs and related antecedents. Most of the items were based on these previous research works and were adapted considering the objectives in this study. This process helped to take advantage of all the tests applied on previous instruments providing validity to the included items. When no items were useful to support the constructs, the operationalization of the variable was done following the description found in related studies adapting them to our particular context.

Once we got all factors operationalized we asked the opinion of an expert in charge of management of a small practice which uses an EHR system. He provided us feedback on the survey's main concepts that according to his comments could be considered associated to typical situations found in their working environment. After this initial refinement, we consulted two additional experts, who are practitioners involved with initiatives linked to information quality and security, in a large hospital located in a southwestern area of the United States. They also considered that main terms and ideas were related to common occurrences in their working environment, providing us with the confirmation that we were working with true possible issues

in healthcare organizations. One of the main outcomes from this consultation was the change of the wording for the concept of Information Quality into Quality of Documentation, since this is a concept well known by most clinical organizations. Healthcare organizations look for accreditations or certifications to prove their work reaching high standards, to comply with governmental policies, incentives programs, or new initiatives. For example, the Joint Commission is an independent and not-for-profit organization which accredits healthcare organizations and receives support from government agencies looking for healthcare quality improvements, objective assessment of clinical excellence, and additional quality related objectives. This accrediting organization utilizes the term quality of documentation through diverse programs related to performing measures, and healthcare quality.

Later, we ran a pilot study asking students enrolled in a pre-medical program within the university, to answer the survey after they finish a one-week long visit to a hospital in their local geographical area. We asked the same students to answer a second time the survey after providing them information regarding the importance of quality of documentation, and the associated benefits that the Joint Commission (an independent, and non-for-profit organization) claims that health organization can gain by following this type of initiatives. Results from the pilot study allowed us to compare which questions were contributing better to obtain a clearer explanation of each construct. So, for example, those variables that showed a higher score for the construct when removed were revised because it could mean that the wording could be improved. With this process we were able to identify possible changes in wording for variables that might not be relating to the rest of the variables within the construct. Sometimes, the reason might be wording not corresponding with associated concepts, which could be better explained modifying the phrase, for example.

With a refined instrument, we addressed a group of people attending a workshop on changes linked to the healthcare market in south Texas, where healthcare organizations deal with issues related to quality and security measures. We asked them to fill out the survey given us an invaluable feedback since they poses not only knowledge on quality problems, but also practical experiences. These answers would guide us towards the best path to a better instrument.

All constructs were measured on a seven-point Likert scale (1=strongly agree; 7=strongly disagree) with the exception of the actual IQ practice construct which had a different seven-point Likert scale (1=never; 7=always). In the following paragraphs, constructs' scales are detailed. The table list all the constructs considered, along with their source and the number of items included for each one. The type of the measurement for each construct is also listed.

Table 5. Sources of Measurement Items.

Construct	Source	Items
IQ Benefit Awareness • I understand the importance of QoD to patient care. • Overall, I am aware of the potential benefits of QoD practices for the organization. • I have sufficient knowledge about the cost of potential QoD problems. • I see potential outcomes from QoD practices.	Bulgurcu et al. (2010)	4
IQ Policy Awareness • The rationale behind the QoD policy (written or implicit) is clear to me. • I know the rules and regulations prescribed by the QoD policy of my organization. • I understand the consequences of not following QoD policy (e.g. insurance reimbursement denial, medication errors, patient complaints etc.) • I can understand my responsibilities from the QoD policy.	Bulgurcu et al. (2010)	4
Autonomous IQ Motivation • Not following QoD practices violates my conscientiousness. • I try to ensure QoD for patients' well-being. • Endorsing QoD gives me a sense of doing my job professionally.	Thorpe & Loo (2003); Smith, Organ, & Near (1983)	4

- As a member of the organization, I feel the responsibility to contribute to QoD.

IQ Amotivation	Bulgurcu et al. (2010)	4

- Complying with the requirement of QoD holds me back from doing my actual work.
- Complying with the requirement of QoD slows down my response time to patients and colleagues.
- Complying with the requirement of QoD distracts my attention from other job-related activities.
- Complying with the requirement of QoD hinders my productivity at work.

Controlled IQ Motivation	Kirsch & Boss (2007)	4

- It is important to comply with QoD requirements for insurance reimbursement, auditing, or accreditations.
- My job evaluation pertains to whether I comply with the requirements of QoD.
- I may face tangible or intangible sanctions if I do not comply with the requirements of QoD.
- Complying with the requirements of QoD enhances my job security.

Attitude Toward IQ	Taylor & Todd (1995)	4

- Endorsing QoD is a good idea.
- Endorsing QoD is a wise idea.
- I like the idea of endorsing QoD.
- Endorsing QoD is a right decision.

IQ Practice Helplessness	Taylor & Todd (1995)	4

- If workloads are too heavy, I would not be able to conform to QoD practices.
- Conforming to QoD practices is not entirely within my control.
- I do not have enough resources, knowledge and skills to conform to QoD practices.
- Circumstances prevent me from abiding to QoD practices.

IQ Policy Deference	Taylor & Todd (1995); Chau & Hu (2002)	4

- I should conform to QoD policy to meet job expectations.
- In my organization, I feel the need to conform to QoD policy.
- My conformity to QoD policy has an impact on the assessment of my job performance.
- Ignoring QoD policy is not an option to me.

IQ Practice Intention	Taylor & Todd (1995); Chau & Hu (2002)	3

- I intend to follow QoD best practices.
- I intend to comply with QoD policy.

• To the extent possible, I would ensure QoD in my work.		
Actual IQ Practices	Developed for this study	4
• I verify my data entries before final submission.		
• I enter every record on time.		
• I try to reach the highest accuracy working with the system.		
• I correct or report errors when I detect them.		
Social Influences	Thompson, Higgins, & Howell (1991).	4
• To my knowledge, departmental co-workers conform to QoD practices.		
• Senior management has been helpful pursuing QoD practices.		
• My boss is very supportive of QoD practices conformance for my job.		
• In general, the organization has supported QoD practices.		
Facilitating Conditions	Thompson, Higgins, & Howell (1991).	4
• Professional guidance regarding QoD practices is readily available.		
• A specific person (or group) is available for assistance with QoD problems.		
• Training concerning QoD practices (e.g. use of standards, ICD codes) is provided.		
• There is collegial feedback to improve our QoD practices.		

4.3 Statistical Analyses

4.3.1 Field Study

This dissertation was based on two studies. The first one, the field study, is based on answers by practitioners working with EHRs. The main goal with this study was to assess the hypotheses, and to test empirically the proposed research model. Professionals in the healthcare industry rely more and more on information systems to make decisions for patients and operational matters in general. Staff working for healthcare organizations interact with EHR systems to complete many of their daily activities. All these interactions become invaluable to understand the impact that QoD can have in most, if not, all activities within a healthcare organization.

With this objective in mind, we collected the data by administering the survey in healthcare organizations such as hospitals, clinics, and to individual practitioners who had working experience with EHRs. The statistical analysis tool selected was SEM due to the possibilities and versatility it provides. Moreover, since this study looks to develop and test a research model to study the impact of information quality awareness on actual practices promoting it, we followed the recommendation by Lowry & Gasking (2014) to use PLS as the statistical analysis tool. Below figure 7 presents the relationships among independent variables and dependent variables for the research model in the field study.

Figure 7. Constructs' Relationships in Field Study.
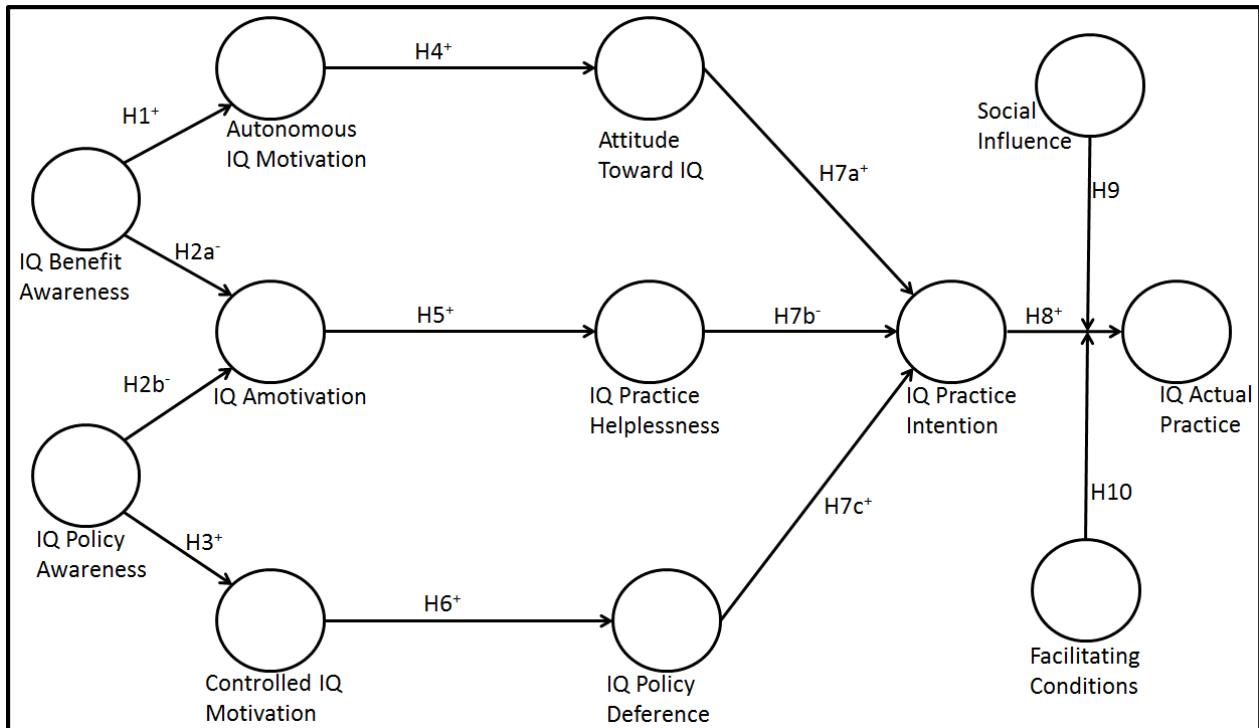
4.3.2 Experiment Study

The second study, the experiment study, involves students from programs in the medical field. In particular, we had access to students enrolled in a nursing program at a southwestern university in the United States. The objective of the experiment study was to assess the impact

that training can have on EHR users. For this experiment study, we considered a paired sample t

test with two rounds to collect data from students. During the first time we administered the

questionnaire to students they just received general instructions to complete the survey, without

any further information. One week later we conducted the second round, before which we

presented to the students relevant and important information regarding quality of documentation.

Such information is used by the non-profit organization the Joint Commission, which provides

accreditations and programs certification for organizations in healthcare. Immediately after,

students were asked to complete for a second time the questionnaire. The expectation was to see

response values to increase as participants became aware of the benefits and threats patients, and

healthcare organizations in general, face without a proper degree of information quality.

Compared with the regular one-time survey observations collected in the field study,

there are two rounds of observations collected from the same group of participants in the

experiment study. The statistical methods to analyze repeated measures should pair the

observations rather than randomizing them as with cross-sectional data. For instance, the testing

of the direct relationship between training and awareness variables in this study needs to use the

paired-sample *t* test instead of independent-sample *t* test. Through the hypothesized relationships

among the rest psychological constructs, the differences that the experiment treatment makes are

carried over.

Hypothesis testing in the experiment study, therefore, take a somewhat different twist

from that in the field study. Rather than the linear relationship between two variables, it is about

how the change in one variable leads to the change in another. In Chapter 3, a research

hypothesis states "an independent variable positively influences a dependent variable". This

implies the covariation between two variables. That is, a higher value of independent variable

leads to a higher value of dependent variable, and vice versa. With repeated measures, such a relationship can be translated to a statement like "the increase in an independent variable leads to the increase in a dependent variable". This way of hypothesis specification is common to longitudinal studies in fields like economics. This dissertation follows a book-chapter format, and the field and experiment studies share the same research hypotheses that take the more general form (i.e. A positively influences B) applicable to both cross-sectional and longitudinal studies based on the causal relationships in theory.

Nevertheless, cross-sectional and longitudinal data demand different statistical methods. For this experiment study that collected pre-and-post-test observations, the hypothesized causal relationships were tested with difference scores by subtracting the first round values from the second round values. One potentially critical issue with difference scores is the lack of reliability (Edwards, 2001). When the reliability of difference scores is acceptable, however, they can be used in SEM to test mediating relationships (MacKinnon, 2008, pp. 197-199). Other methods such as latent change score modeling and latent growth modeling may be used in the absence of reliability condition (McArdle, 2009), yet they employ other latent variables to capture changes, which makes the testing of mediating relationships difficult. In this experiment study, the difference scores are reliable, which justifies the use of them to test the structural model.

Below, Figure 8 presents the relationships among independent variables and dependent variables for the research model in the experiment study. As can be observed, the training has a direct influence on two constructs, IQ benefit awareness and IQ policy awareness.

Figure 8. Constructs' Relationships in Experiment Study.
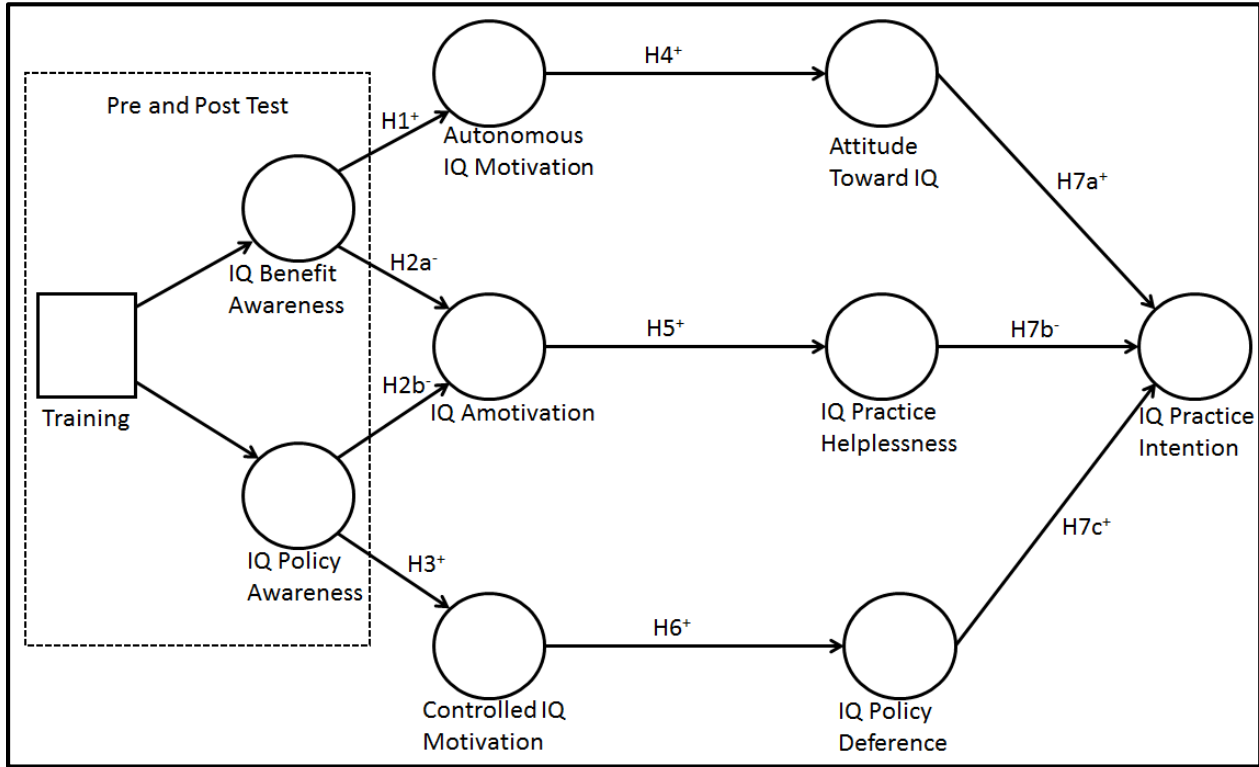
4.3.3 Instrument Assessment

It is an essential practice to assess instruments such as surveys for data gathering within research. Among the assessments we conducted, we included reliability, content validity and construct validity tests on the measurement items. Initially, to test the content validity, we consulted three different experts regarding the questions included in the survey. From these tests we modified the scale items to include more familiar terms to EHR users such as quality of documentation rather than information quality, and additional minor changes such a couple of prepositions. Relying on the knowledge and experience from individuals dedicated to manage, operate, and keep updated the operation of departments which use on a daily basis data from information systems in healthcare environments, provided us with the confirmation needed to continue using the instrument.

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The research model's assessment was also critical in this research work. First generation statistical methods, such as ANOVA or t-tests, complement newer second generation statistical methods, such as structural equation modeling (SEM), to get more powerful statistical analysis (Lowry & Gaskin, 2014). The advantage that techniques like SEM provide is the possibility to analyze simultaneous causal networks in research models, with multiple independent and dependent variables, where reliability and validity test can also be performed. Exploratory factor analysis (EFA) helps to test two components of construct validity which are the convergent validity and the discriminant validity (Straub, Boudreau, & Gefen, 2004). Basically, EFA search for latent constructs, or factors, that reflect the pattern of correlations within a group of measurement items (Gefen & Straub, 2005). It can consist of two steps with the extraction of the factors being first, utilizing diverse methods such as Principal Component Analysis (PCA), and a second and optional step, where factors are rotated to make the interpretation of the measurement items easier. Gefen & Straub (2005) provide a detailed guide to assess both components of construct validity, that is, convergent and discriminant validity. They describe how an exploratory factor analysis (EFA) provides elements to test convergent validity observing that each measurement correlates to the corresponding construct, previously established by theory. At the same time, EFA allows to test discriminant validity by displaying each measurement item correlating strongly only with the corresponding construct.

To evaluate the research model proposed in chapter 3 considering the characteristics of the data obtained from practitioners (field study) and students (experiment study), and the number of cases in each option we decided to use partial least squares and structural equation modeling (PLS-SEM) to perform the statistical analyses. Chin (2010) provides an explanation on how PLS modeling does not have such strict assumptions regarding distribution and

independence of cases as covariance-based modeling do. This is also supported by Hair and associates (2013) when they provide rules of thumb to select either PLS-SEM or CB-SEM. In addition, PLS is considered better option when the sample size is not large.

A minimum sample size should be ten times the largest number of structural paths directed to a single construct in the structural model (inner model) (Hair et al., 2013). In this case the structural model shows a maximum of three arrowheads directed to a single construct, indicating a minimum of 30 cases. Moreover, the determination of the sample size is suggested to be according to the technique used to perform the statistical analysis. PLS for example demands a smaller sample size than CB based analysis performed using AMOS or LISREL (Westland, 2010).

In particular, we considered the indication provided by Hair and associates (2013) for the minimum sample size requirements considering a power analysis. They list a table (page 21) for the minimum sample size required to detect minimum R^2 values with significant levels of 1, 5, and 10 percent. So we decided we could work with 124 cases for a significant level of 5 percent, and a minimum R^2 of 0.10, since we have a maximum of 3 arrows pointing to any construct in the model.

The software used to perform the statistical analyses following the PLS-SEM technique was SmartPLS version 2.0.M3. Data was uploaded using the excel file format of comma separated values (CSV). Following recommendations by Hair et al. (2013) we ran the software first to obtain the path coefficients, and then we ran a bootstrapping with 5000 subsamples to obtain the t-statistics values.

4.4 Subjects

Two samples were considered for this study. The first involves practitioners in the healthcare environment with experience working with EHRs, which we named the field study. The target population for the field study is people from private, governmental, or academic healthcare organizations who have had experience working with EHR's. Individuals would ideally play different roles in information collection processes where EHR's contribute importantly as an essential component. The main idea is that participants have to deal with one or more of the different stages of data processing, that is, they enter data when it is initially obtained through a patient treatment, for example. They could also participate maintaining and looking after data, or as consumer who requires this resource to take decisions and actions as part of their work.

The second sample included students from programs in the medical field, who commonly have heard and even have experience utilizing EHR's. We considered this second group as the experiment study since a second round of the survey was administered after they received relevant information to QoD, showing its importance and the impact it can have on patients. With two rounds of the survey from the same group, we compared their responses looking for changes that can be linked to possible trainings on QoD. The target population for the experiment study were students in a nursing program from a university in the southwest of the USA.

Research linked to information systems within healthcare environments have covered two main areas involving the adoption of health information technology (HIT) and the impact HIT may have, where a variety of stakeholders have been included to support these studies. These individuals include physicians, nurses, physician assistance, administrators, and staff directly or

indirectly related to medical treatments (Agarwal, et al., 2010). Therefore, we looked for these personnel who should be able to use their knowledge and experience to complete the survey on the practitioner side. For the student group, we looked for physician assistants and nursing programs, although we only had access to students from the nursing program for both required round of the survey. With students from the physician assistant program, we could only obtained the first round of the survey, and for this reason, this additional group was not included in this study.

In order to avoid common issues when sampling the target population, we considered threats to external and internal validity (Cook & Campbell, 1986; Trochim & Donelly, 2008). External validity threats refer to the degree of truth of propositions or conclusions regarding generalizability. Internal validity, on the other hand, is related to possible problems with causal conclusions due to systematic errors. Possible internal validity issues include maturation, testing, instrumentation, statistical regression, selection biases, differential mortality and selection-maturity (Campbell & Stanley, 1963).

The sampling was designed with the objective of optimizing internal validity together with external validity. Among main threats to validity in behavioral research there is common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), where random and systematic errors occur, being the latter the reason for a larger number of errors. In addition, selection bias can also impact negatively results in research, for which we included varied sampling groups in order to minimize it.

The target population consisted of people with working experience in healthcare organizations such as hospitals, clinics, or physician offices that have used an EHR as part of their regular work. This description of the target population yield to a large number of people

from which we took the sample, following a purposive sampling method. With the objective of reaching a sample of people with experience using EHRs and working for public or private healthcare organizations, we search for organizations in the area that would allow us to administer the survey. Individuals in a variety of healthcare organizations were contacted using communications facilitated through high level administration, emails, posters in common areas, and face to face requests. The goal regarding the final sample was to have personnel from large hospital, clinics, and small healthcare practices who could fill out the survey. We searched for physicians, nurses, physician assistants, and every person who has interaction with EHRs entering data, maintaining it, or making use of it. The main geographical area from which we obtained data was from a southwestern region of the United States of America. Moreover, following Hair and associates' (2013) considerations on effect size in social research we aimed towards an 80% minimum for this study. Along with this consideration and the voluntary participation of EHRs users, the inclusion of multiple set of people, with diverse professional profiles, we looked to reduce possible selection bias. At the same time, this inclusion would support the generalizability of the study's results.

As explained in a previous section, a survey was developed following recommendations by Dillman (2000), functioning as our method to gather required data. The survey was administered according to procedures specified in the approval by the university's Institutional Review Board. Participants were initially invited utilizing non-coercive methods, using subsequent reminders when needed. A consent form was included in the front page of the survey, as specified by the IRB office. Individuals were informed of the objective of this study, the assurance that their anonymity was going to be kept secure, with no possibility to identify any person. Additionally, participants were notified that their participation was completely voluntary,

with the possibility to leave any question without answer, or stop at any point without any type of negative consequences.

A pilot study helped to assess the measures included in the questionnaire verifying their validity and reliability. As explained above, the pilot study consisted of a small experiment among students in a premedical program, answering the survey in two different rounds. We ran a paired t test to compare the means from the same group of students at two different points in time. The first time, as noted before, was prior to the brief training about quality of documentation and its benefits. Responses by students can be of good support to test relationship causation among constructs in the research model, although, results from this type of assessment are not so helpful when it comes to support predictions using the research model. In addition, we ran a power analysis for this experiment to estimate the sample size, considering an effect size of 80 percent, which for social research is considered adequate (Hair, et al., 2013), an alpha value of 5 percent representing the probability of finding significance when there is not (false positive), and power value of 80 percent representing the probability of finding true significance (true positive). Using a tool for power analysis named GPower, version 3.0, we obtained a sample size of 12 members for each group, which was covered with our sample of 17 students answering both occasions. Analyzing Cronbach's Alpha for increased values when items associated to specific constructs were deleted, we were able to revise and modify wording of items. We changed questions in the survey that were not following the same idea or format of the rest of the questions associated to the construct.

CHAPTER V

DATA ANALYSIS AND RESULTS

This chapter presents the data analysis and the corresponding results. Firstly, the data collection process is summarized along a brief description of samples characteristics. Then, the specification and analysis of the model is presented, where a description of the model using a Structural Equation Modeling technique with Partial Least Square approach is used.

Results are shown following Chin's (2010) proposal using a two steps process. First, the model evaluation is presented showing the measurement model outcomes. Then, to complete the model evaluation, we present the structural model results. A final summary containing the results and corresponding hypothesis tests is listed.

5.1 Field Study

For the field study, that is, for practitioners, we included large hospitals, clinics, medium and small medical practices, and individuals such as nurses working using EHRs but who preferred to answer the questionnaire outside their offices. The questionnaire was administered as indicated in the previous section of research design looking for personnel in healthcare organizations, who have had experience working with EHRs. Most of the respondents were physicians, nurses, physician assistants, and staff in medical offices working with EHRs. We were able to find practitioners, that is, medical professionals and staff working with EHRs in organizations of different sizes, and in individual cases for those professionals such as nurses working for school districts, for example.

The total responses received were 142 questionnaires. For which we verified, following recommendations by Hair et al (2010) they do not contain more than ten percent of missing data per case. We discarded 18 cases reaching a final number of 124 questionnaires used in the analysis. For the rest of cases we found missing values completely at random staying below five percent of each indicator (Hair et al, 2013). We imputed missing values within variables by calculating the mean value of the variable using all valid answers (Hair et al., 2010).

From the number of practitioners, less than 12 percent had 2 years of experience working with EHRs or less, and close to 89 percent of them had 3 or more years of experience working with EHRs. These numbers provided a good metric to perceive that most of the participants could have responded questions with a degree of certainty about their answers. Regarding gender distribution we observed more than 70 percent of female respondents. The distribution for the participants' age shown a larger concentration for the 31 to 40 years old range, and practically 80 percent of respondents being 30 years or older. All these statistic values are presented in Table 6 below:

Table 6. Field Study Statistics

	Frequency	%
Gender		
Male	35	28.2
Female	89	71.8
Range of years-old		
21 to 30	25	20.2
31 to 40	46	37.1
41 to50	38	30.6
51 to 60	14	11.3
61 to 70	1	0.8
Years of experience		
2 years or less	14	11.3
3 years or more	110	88.7

Sample source		
Large - facility	39	27.5
Medium - facility	60	42.3
Small - facility	43	30.3

5.2 Experiment Study

For the student sample, or experiment study, we asked permission to administer the questionnaire to students in their first and second year within the physician assistant program, and to students in the nursing program in a southwestern university. Unfortunately, physician assistant students could not complete their second round of the survey as planned, so a comparison could be ran on both responses, therefore this group was excluded from the study. Students in the nursing program were able to complete both rounds, where I asked them to provide their last four digits of their student ID. This way, we were able to make a match of students' questionnaires. Nevertheless, not all students answered in both occasions.

In the first round from students in the nursing program we collected a total of 130 surveys, and in the second round only 116 students participated answering the questionnaire. From these two groups we could found 109 matches utilizing the last four digits of the students' ID. Later, we verified the responses for missing values, discarding 4 pairs of responses for which at least one response from a student had more than ten percent of missing values. So, the final number for students was 105 pairs. Table 7 below presents the proportions for female and male students along their age ranges. As can be appreciated, the table does not include years of experience since it was assume that some of them could have some working experience, many of them would not have it.

Table 7. Experiment Study Statistics

	Frequency	%
Gender		
Male	35	33.3
Female	70	66.7
Range of years-old		
10 to 20	10	9.5
21 to 30	89	84.8
31 to 40	5	4.8
41 to 50	1	1.0

Having a sample from the same population in two different times, allow us to compare differences, in this case from students' responses. Where, the difference is considered to be positive if we expect that responses increase from the first round to the second one. Students received specific information on benefits that healthcare organizations face when they embrace quality of documentation supporting accreditation of their institutions, or the certification of procedures or processes by a third party. In the other hand, students also are informed of the threats and problems patients suffer when institutions do not comply with best practices, improvement processes or even corrective actions.

For this test we ran a dependent sample t-test, or paired test to determine any statistically significant difference in students' answers within their first and second answers. The assumption is that constructs' means from the first round, shown in Table 10, are lower than constructs' means from the second round where students already had received information on the importance and relevance of Quality of Documentation.

Table 8 below shows the mean and the corresponding standard error of the mean for the difference (first round minus second round) for those constructs that are directly impacted by the training. At the same time, this table presents the t-value and the statistically significance for the

constructs difference, considering that answers' values increase from the first round to the second round. Results showed p-values below 0.05 indicating that null hypotheses of equal means are rejected in favor of the alternative hypotheses indicating that there is a significant difference.

Table 8. Experiment Study - Paired t-Test.

Construct	Mean of Difference	t	Significance (1-tailed)
Benefit Awareness	-5.85 (0.15)	-2.51	0.007
Policy Awareness	-0.5 (0.21)	-2.41	0.009

5.3 Assessment of Measurement Validation

In order to present how accurate the measures used to describe latent variables are we present their reliability and validity (Chin, 2010). Latent variables are better described through the use of numerous measures since a single variable usually cannot describe them entirely, and the data collection commonly involves measurement errors (Nunnally & Bernstein, 1994).

Following directions by Straub et al. (2004) and Hair and associates (2010) we used Cronbach's alpha, and composite reliability to test for reliability of all measures used in the model. Where, reliability refers to the consistency of the measure producing similar responses in similar conditions. For both benchmarks, the value should be above 0.70 to be considered a high reliability (Gefen et al., 2000; Hair et al., 2010). Table 9 and table 10 present Cronbach's alpha values for both samples, with amounts above 0.70 indicating adequate measurement reliability.

Table 9. Field Study – Reliability & Convergent Validity

Constructs	Means (Std. Dev.)	Cronbach's Alpha	Composite Reliability	AVE
Benefit Awareness	5.98 (0.79)	0.77	0.85	0.6
Policy Awareness	5.78 (0.90)	0.86	0.91	0.71
Autonomous Motivation	5.90 (0.84)	0.74	0.84	0.57
Controlled Motivation	5.44 (0.99)	0.75	0.83	0.56
Amotivation	4.07 (1.55)	0.91	0.94	0.79
Attitude	5.67 (1.13)	0.94	0.96	0.85
Policy Deference	5.35 (1.02)	0.83	0.89	0.67
Practice Helplessness	3.83 (1.18)	0.77	0.85	0.59
Practice Intention	5.96 (0.89)	0.93	0.96	0.88
Actual Practice	1.77 (0.66)	0.80	0.87	0.62
Social Influence	5.60 (1.07)	0.91	0.92	0.74
Facilitating Conditions	5.26 (1.11)	0.89	0.92	0.73

Convergent validity is considered to happen when all variables are strongly correlated to the constructs they are theoretically describing (Gefen & Straub, 2005). Benchmarks used to assess convergent validity are AVE with values above 0.50, and composite reliability with values above 0.70.

Table 10. Experiment Study – Reliability & Convergent Validity

Cons-tructs	Mean (Std.Dev.) 1st. Round	Mean (Std.Dev.) 2nd. Round	Mean (Std.Error) Difference	Cronbach Alpha 1st Round	Cronbach Alpha 2nd Round	Cronbach Alpha Differ.	Composite Reliability	AVE
BA	5.51 (1.10)	5.89 (0.55)	0.39**(0.15)	0.76	0.82	0.84	0.89	0.68
PA	5.06 (1.51)	5.56 (0.83)	0.50**(0.21)	0.89	0.89	0.92	0.94	0.8
AM	6.06 (0.92)	6.16 (0.77)	0.10 (0.12)	0.78	0.88	0.86	0.91	0.72
CM	5.51 (1.03)	5.76 (0.76)	0.26* (0.13)	0.78	0.80	0.79	0.86	0.62
Amot.	3.46 (1.61)	3.36 (0.96)	-0.11 (0.16)	0.94	0.94	0.91	0.93	0.78
Att.	5.96 (1.10)	6.17 (0.86)	0.21‡ (0.14)	0.94	0.96	0.95	0.96	0.87
PH	3.75 (1.18)	3.60 (0.88)	-0.15 (0.13)	0.70	0.73	0.63	0.78	0.47
PD	5.52 (1.03)	5.84 (0.88)	0.32**(0.12)	0.82	0.80	0.82	0.88	0.65
PI	6.27 (0.87)	6.44 (0.87)	0.18* (0.10)	0.94	0.96	0.94	0.96	0.89

BA-Benefit Awareness; PA-Policy Awareness; AM-Autonomous Motivation; CM-Controlled Motivation; Amot.-Amotivation; Att.-Attitude; PH-Practice Helplessness; PD-Policy Deference; PI-Practice Intention   **<0.01; *<0.05; ‡<0.10

Discriminant validity indicates that measures relate weakly to all latent variables

(constructs) except for the one it is theoretically related (Gefen & Straub, 2005). A common

benchmark used, is the square root of average variance extracted (AVE), which should be greater

than all correlation values between any pair of latent variables. Below, the values for the

experiment and field studies are shown in table 11 and table 12 correspondingly. Where, values

through the diagonal represent the square root of AVE, and all other values below the diagonal

line represent the correlation among constructs.

Table 11. Field Study – Discriminant Validity

	Benefit Aw	Policy Aw	Auton. Motiv.	Contol. Motiv.	Amotiva-tion	Attitude	Policy Defer.	Prac. Helpless ness	Prac. Intention	Actual Prac.
Benefit Aw	0.77									
Policy Aw	0.67	0.84								
Auton. Motiv.	0.58	0.57	0.75							
Control. Motiv.	0.44	0.51	0.62	0.75						
Amotivation	0.02	-0.02	0.05	0.13	0.89					
Attitude	0.31	0.30	0.55	0.57	0.16	0.92				
Policy Defer.	0.37	0.40	0.61	0.43	0.04	0.42	0.82			
Prac. Helplessness	0.05	0.00	0.06	-0.08	0.59	0.07	-0.01	0.77		
Prac. Intention	0.43	0.59	0.58	0.43	-0.11	0.37	0.61	-0.09	0.94	
Actual Prac.	-0.16	-0.18	-0.13	-0.08	0.17	-0.04	-0.06	0.16	-0.09	0.79

Table 12. Experiment Study – Discriminant Validity

	Benefit Aw	Policy Aw	Auton. Motiv.	Control. Motiv.	Amotiva-tion	Attitude	Policy Defer.	Prac. Helpless ness	Prac. Intentio n	Social Infl.	Facil. Cond.
Benefit Aw	0.82										
Policy Aw	0.84	0.89									
Autonomous Motiv.	0.72	0.74	0.84								
Controlled Motiv.	0.57	0.57	0.64	0.78							
Amotivation	-0.10	-0.15	-0.05	-0.09	0.88						
Attitude	0.54	0.58	0.64	0.76	-0.05	0.93					
Policy Deference	0.35	0.27	0.34	0.53	-0.13	0.52	0.81				
Prac.Helplessness	-0.06	-0.10	-0.02	-0.21	0.46	-0.17	-0.15	0.69			
Prac. Intention	0.51	0.43	0.54	0.59	-0.05	0.66	0.64	-0.16	0.95		
Social Influence	0.57	0.48	0.43	0.58	-0.06	0.55	0.56	-0.01	0.56	0.83	
Facil. Conditions	0.39	0.36	0.26	0.35	-0.18	0.24	0.54	-0.07	0.33	0.65	0.86

5.4 Model Evaluation: Structural Model Results

Once the evaluation criteria for the measurement model have been assessed, in particular reliability, discriminant validity and convergent validity, the second step in the evaluation of PLS-SEM results is the evaluation of the structural model. The assessment of the structural model allows us to verify if the empirical data support the theory in the model. In order to do this, Hair et al. (2013) suggest testing the significance of path coefficients and the coefficient of determination (R^2 value).

Since PLS-SEM technique is based on ordinary least squares (OLS) method to estimate path coefficients in the structural model, we should test for collinearity issues. When two or more constructs which are antecedents of another latent variable are highly correlated, this can increase the standard error and generate problems with results interpretation.

A method to assess collinearity (between two constructs) or multicollinearity (among more than two constructs) is verifying that the variance inflation factor (VIF) for each construct has a value above 0.20 and below 5 (Hair, Ringle, & Sarstedt, 2011). In the following two tables we present the VIF values for students and for practitioners' sample. Where, VIF is the reciprocal value of the tolerance, which can represent high correlation between two or more independent variables (Hair et al., 2010). A high correlation among independent variable would reduce their potential to explain the latent variable to which they relate. Therefore, we show all sets of two or more exogenous variables related to every latent variable in the model. For the experiment study there are only two sets of dependent variables with two or more variables, and for the field study, there are three sets of two or more independent variables linked to a latent variable. For each and every construct their VIF value was greater than 0.20 and lower than 5. This shows that there are no collinearity issues with any construct in the model.

Table 13. Field Study - Collinearity Assessment

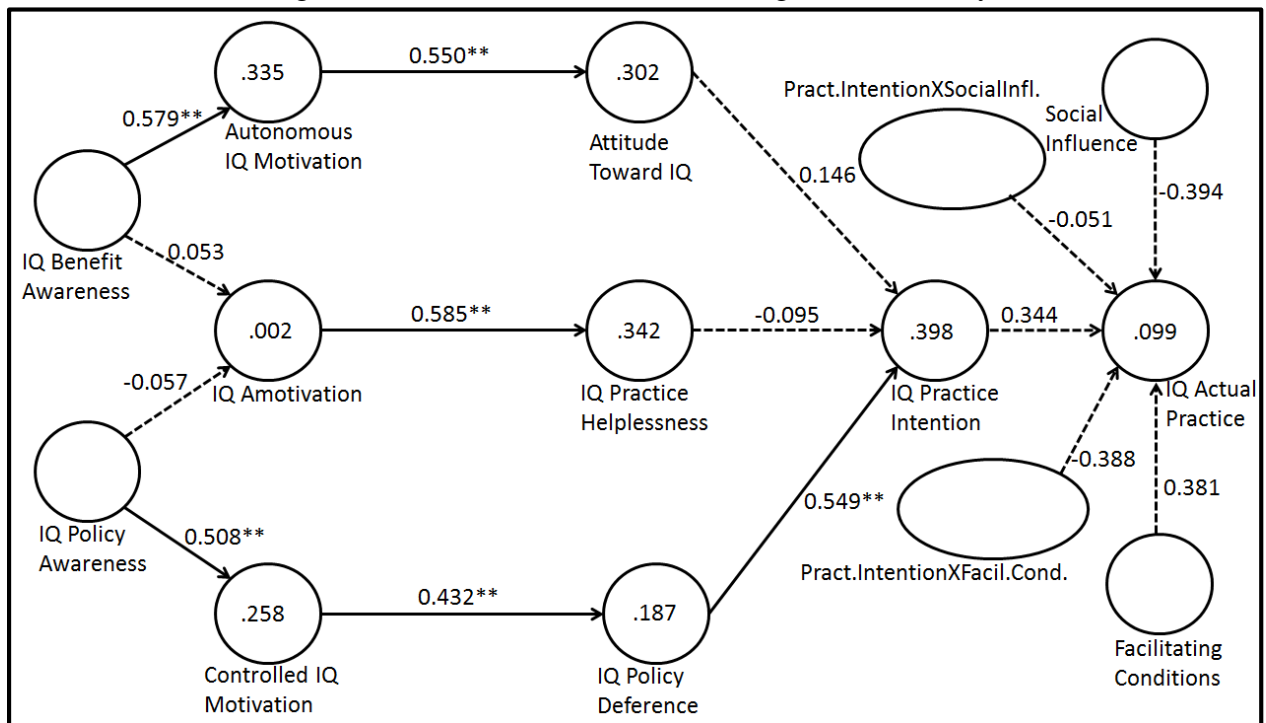| IQ Amotivation		IQ Practice Intention		IQ Actual Practice	
Construct	**VIF**	**Construct**	**VIF**	**Construct**	**VIF**
Benefit Awareness	1.810	Attitude	1.217	Prac. Intention	1.663
Policy Awareness	1.810	Prac. Helplessness	1.006	Social Influence	2.422
		Policy Deference	1.212	Facil. Conditions	1.976

Table 14. Experiment Study - Collinearity Assessment

IQ Amotivation		IQ Practice Intention	
Construct	**VIF**	**Construct**	**VIF**
Benefit Awareness	3.319	Attitude	1.772
Policy Awareness	3.319	Prac. Helplessness	1.066
		Policy Deference	1.851
		Social Influence	2.535
		Facil. Conditions	2.080

To assess the structural model relationships we looked into the path coefficients values along with their statistical significance, and variance explained by associated constructs of endogenous variables (Chin, 2010). We performed the bootstrapping process to obtain the t values which are computed by dividing their standard value of the path coefficients by the corresponding standard error. Where values above 1.645 are taken as significant when we consider a one-tail test, and a 95 percent confidence level.

As can be seen in figure 9, IQ benefits awareness had a strong influence on autonomous IQ motivation, IQ policy awareness had strong impact on controlled IQ motivation, and therefore hypotheses H1 and H3 were supported. Both hypotheses H2a and H2b that relate IQ benefit awareness and IQ policy awareness to IQ amotivation respectively, are not supported presenting weak relationships. Moreover, autonomous IQ motivation strongly impacted attitude toward IQ, IQ amotivation had a strong influence on IQ practice helplessness, and controlled IQ motivation

had a strong influence on IQ policy deference, which supported hypotheses H4, H5, and H6

respectively. Hypotheses H7a and H7b describing the relationships between attitude toward IQ

and IQ practice intention, and between IQ practice helplessness and IQ practice intention

respectively, are not supported showing low values. In addition, IQ policy deference had a strong

impact on IQ practice intention which supported hypothesis H7c. Moreover, figure 9 shows that

39.8 percent of IQ practice intention's variance was explained by IQ policy deference. The

constructs contained within behavioral antecedents (figure 6), that is, Attitude toward IQ, IQ

practice helplessness, and IQ policy deference had 30.2 percent, 34.2 percent, and 18.7 percent

of their variance explained by corresponding antecedents, respectively. Finally, constructs within

motivations, that is, autonomous motivation and controlled IQ motivation, had 33.5 percent and

25.8 percent explained by IQ benefit awareness and IQ policy awareness respectively. Leaving

IQ amotivation without statistically significant antecedents.

Figure 9. PLS Results for Model Testing for Field Study

The relationship between IQ practice intention and IQ actual practice was not significant indicating that hypothesis H8 was not supported. The constructs, social influences and facilitating conditions were considered as moderators of the interaction of IQ practice intention over IQ actual practice. The diagram in figure 9 presents the moderation analysis utilizing SmartPLS functionality. For both constructs of social influence and facilitating conditions, their impact are not significant indicating a lack of moderating effect. The relationship between IQ practice intention and IQ actual practice is not affected by any of these two constructs. Therefore, hypotheses H9 and H10 were not supported.

Considering that the path based on IQ benefits being not significant was not an expected outcome, we did a post-hoc analysis verifying a direct relationship between IQ benefit awareness to IQ practice intention. In this test, we also assessed the mediation of autonomous IQ motivation and attitude toward IQ constructs, between IQ benefits and IQ practice intention.

Figure 10. Direct Effect within Mediation Assessment for Field Study
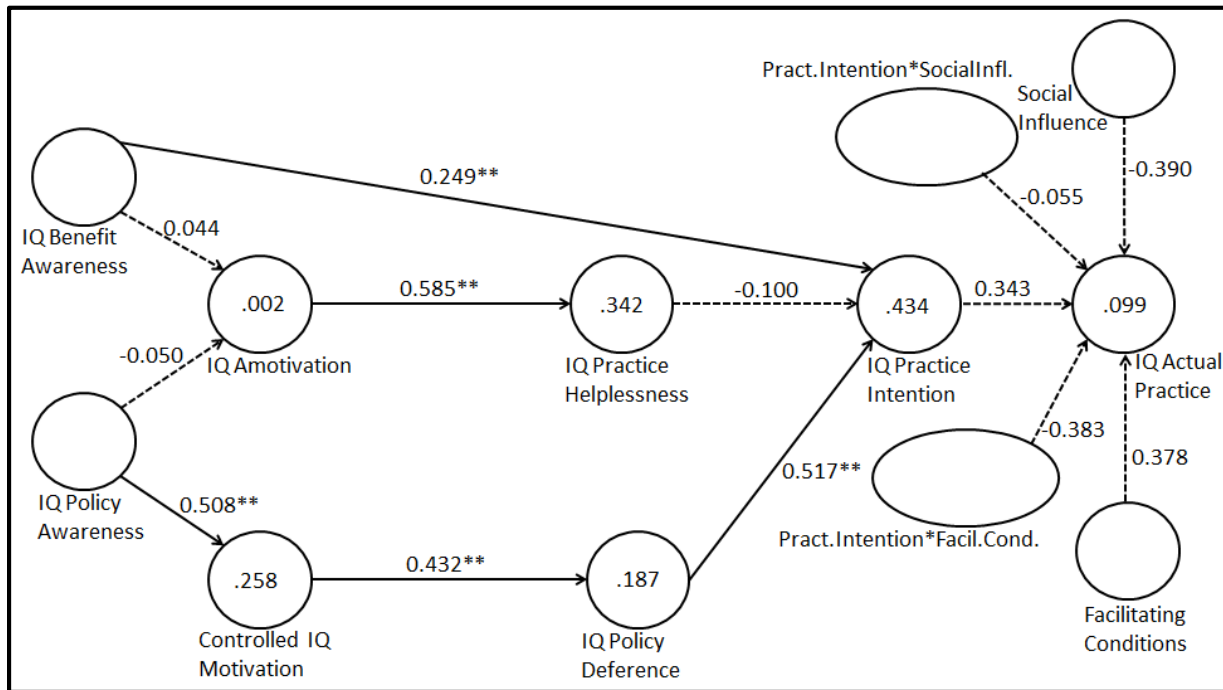
According to Hair et al. (2013), mediation can be tested by observing the significance of the direct effect without including the mediation constructs (Figure 10). In this case, the direct relationship between IQ benefit awareness and IQ practice intention showed a path coefficient significant value of 0.249 at 0.01 level.

When mediator constructs were added, in this case, autonomous IQ motivation and attitude toward IQ, the path coefficient value of the direct effect remained significant at 0.01 level although decreasing to a value of 0.229. At the same time, the relationship between attitude toward IQ and IQ practice intention was not significant demonstrating that there was not mediation (Figure 11).

Figure 11. Final Step in the Mediation Assessment for Field Study
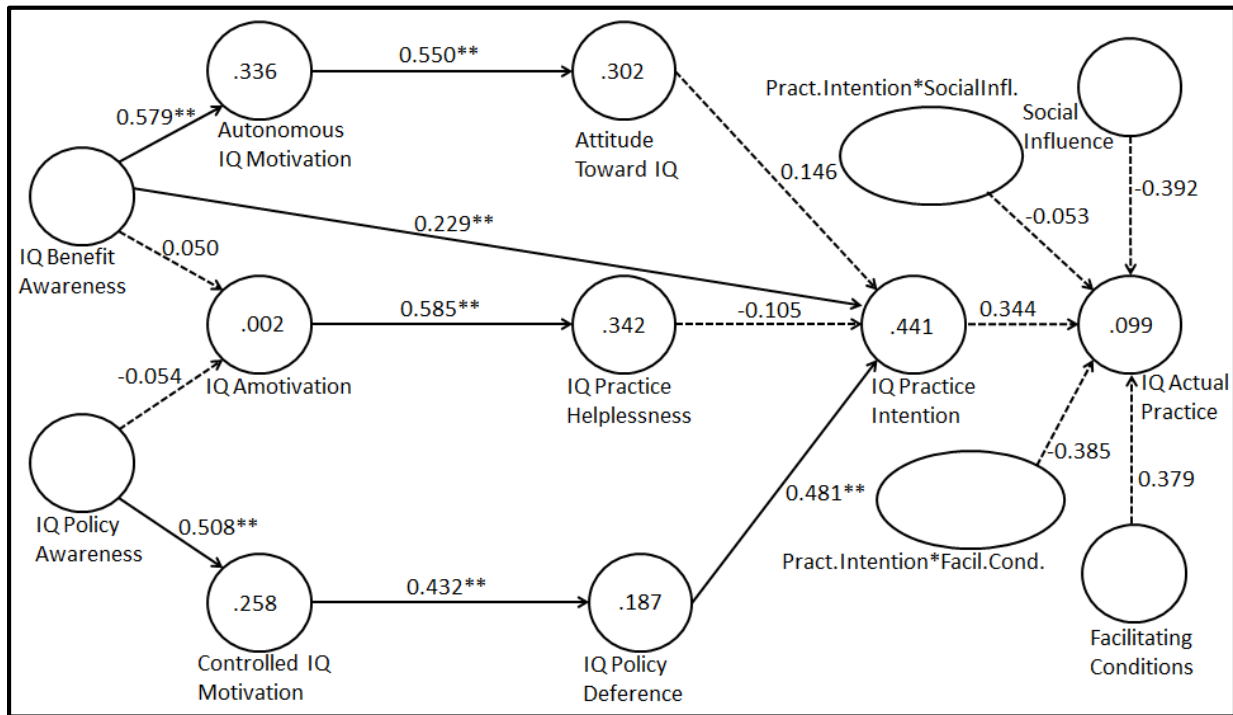
For the student's responses in the experiment study, we ran the PLS-SEM technique using the difference between questionnaires in the second round minus those in the first round. We were expecting higher values after they received specific information on QoD. Results are

shown below in figure 12, where IQ benefits awareness had a strong effect on autonomous IQ motivation, IQ policy awareness had strong influence on controlled IQ motivation, and therefore hypotheses H1 and H3 were supported. Hypotheses H2a and H2b representing the relationship between IQ benefit awareness and IQ amotivation, and between IQ policy awareness and IQ amotivation were not supported since they presented low values. Moreover, autonomous IQ motivation strongly impacted attitude toward IQ, IQ amotivation had an impact on IQ practice helplessness, and controlled IQ motivation had a strong influence on IQ policy deference, which supported hypotheses H4, H5, and H6 respectively. In addition, attitude toward IQ had a strong effect on IQ practice intention, and IQ policy deference had a strong impact on IQ practice intention which supported hypotheses H7a and H7c. Nevertheless, hypothesis H7b linked to the relationship between IQ practice helplessness and IQ practice intention was not supported. In addition, IQ practice intention's variance of 57.6 percent was explained by attitude toward IQ and IQ policy deference. Constructs part of behavioral antecedents, that is, attitude toward IQ, IQ practice helplessness, and IQ policy deference had 40.4 percent, 21.1 percent, and 27.6 percent of their variance explained by corresponding antecedents. Finally, the variance of autonomous motivation and controlled motivation, which are constructs considered within motivation, had 51.3 percent and 33.0 percent explained by IQ benefit awareness, and IQ policy awareness, respectively.

Figure 12. PLS Results for Model Testing for Experiment Study
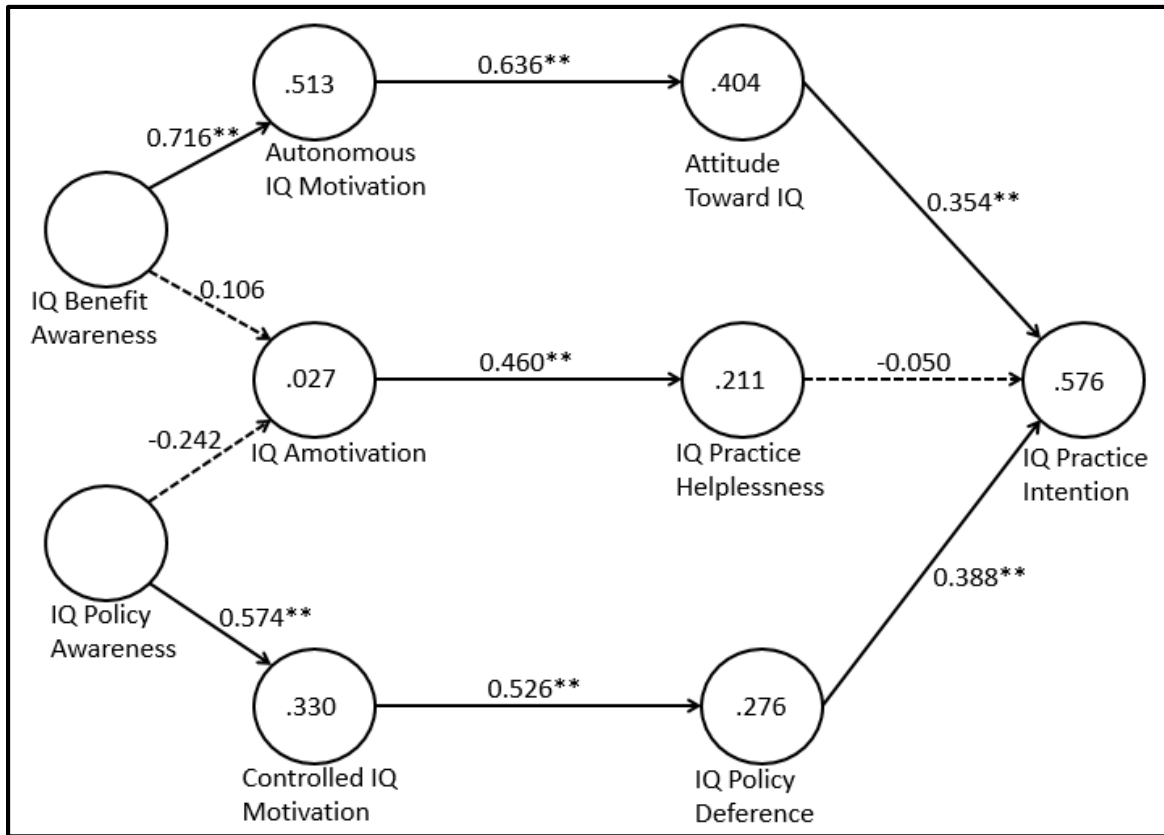
Based on results showed above, we list all hypotheses supported in each study and those which were not supported as well. As can be seen, the only difference of hypotheses supported between studies was H7a for the relationship between attitude toward IQ and IQ practice intention. The experiment study shows a support for this hypothesis H7a which completes a new influence path of IQ awareness on IQ practices. So, the experiment study presents two significant path of influence of IQ awareness over IQ practices. One being the regulatory path, based on rules and guidelines listed in organizational policies, and the second one, based on benefits awareness obtained from the training. This should be compared to the field study, where just the regulatory path is significant.

Table 15. Results of Hypotheses Testing

Hypothesis	Experiment Study	Field Study
H1: IQ Benefits Awareness positively influences Autonomous IQ Motivation	Yes	Yes
H2a: IQ Benefit Awareness will negatively influence users' IQ Amotivation	No	No
H2b: IQ Policy Awareness will negatively influence users' IQ Amotivation	No	No
H3: IQ Policy Awareness will positively influence individuals' Controlled IQ Motivation	Yes	Yes
H4: Autonomous IQ Motivation positively influences Attitude toward IQ	Yes	Yes
H5: IQ Amotivation positively influences IQ Practice Helplessness	Yes	Yes
H6: Controlled IQ Motivation positively influences IQ Policy Deference	Yes	Yes
H7a: Attitude toward IQ positively influences IQ Practice Intention	Yes	No
H7b: IQ Practice Helplessness negatively influences IQ Practice Intention	No	No
H7c: IQ Policy Deference positively influences IQ Practice Intention	Yes	Yes
H8: IQ Practice Intention positively influences Actual IQ Practices	N/A	No
H9: Social Influences moderates the relationship between IQ Practice Intention and Actual IQ Practices	N/A	No
H10: Facilitating Conditions moderates the relationship between IQ Practice Intention and Actual IQ Practices	N/A	No

CHAPTER VI

DISCUSSIONS AND CONCLUSION

We present the discussion on the findings resulted from the research work. Later we provide the theoretical and practical implications with a perspective of a large and complex industry such as the healthcare industry. New demands and stronger regulations reinforce the reliance on information systems, in particular, electronic health records (EHRs). In addition, we propose future research to be elaborated in coming manuscripts considering findings in this study. Finally, conclusions are developed supported on theories listed in previous chapters.

6.1 Discussions of Results

The main goal of this study was to develop and assess a research model that involved awareness on IQ. This topic has an increased relevance due to the accelerated data growth that most organizations are experiencing, although usually without a plan or strategy in place, where original objectives differ with current needs (Sadiq, Yeganeh, & Indulska, 2011). As a consequence, the successful use of EHR's by health organizations can positively be influenced by practices towards the improvement of IQ (Kahn, Raebel, Glanz, Riedlinger, & Steiner, 2012). Additionally, answering the following research questions becomes important: (1) How will awareness of information quality impact IS users' intention to follow practices of IQ assurance? (2) How will IQ awareness influence IS users' motivation to follow practices toward the assurance of information quality? (3) How will IS users' motivation/amotivation influence their

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inclination to endorse information quality? (4) How will IS users' inclination toward IQ practices influences their intention to advocate IQ practices? And (5) How will training on IQ influence IS users' awareness? In order to search for answers to these questions we used the self-determination theory, theory planned behavior, and social cognitive theory to set constructs and assess corresponding relationships and associated hypotheses.

6.1.1 Field Study

Professionals in healthcare environment, along with administrative people tend to work longer periods of time with EHRs due to a more frequent requirement established in the industry, along their own reliance on information obtained from the systems. Results in this research work helped to assess the proposed research model showing that IQ awareness has an impact on the intentions toward IQ practices. Out of the three constructs within the behavioral antecedents, that is, attitude toward IQ, IQ practice helplessness, and IQ policy deference, only the latter construct impacts IQ practice intention construct. This implies that the regulatory component of IQ awareness, established through organizational policies exerts an influence on EHR users increasing their intention to adhere to IQ practices. Results support the idea that people following guidelines established in organizational policies will increase their intention to comply with IQ practice (D'Arcy et al, 2009; Herath & Rao, 2009). The relationship is a solid one with a value of 0.549 at 0.01 level.

In contrast, components of IQ awareness based on possible benefits do not influence IQ practice intention since the last section in this path, from attitude toward IQ to IQ practice intention is not significant. Nevertheless, a post-hoc analysis, testing the direct relationship between IQ benefit awareness to IQ practice intention, excluding autonomous IQ motivation and

attitude toward IQ construct, showed a significant value. Immediately, the mediation of autonomous IQ motivation and attitude toward IQ was tested, finding that there is no mediation. Previous research found a significant direct relationship between benefits and intention (Hartmann & Apaolaza-Ibanez, 2012) where researchers used the theory of reasoned action (TRA). As a consequence, we conclude that IQ benefit awareness directly influence IQ practice intention without the intervention of autonomous IQ motivation or attitude toward IQ. Moreover, IQ practice helplessness relationship with IQ practice intention is not significant. Where, in this study, IQ practice helplessness refers to the difficulty or easiness to execute the behavior considering capabilities and the required time to complete assigned tasks (Ajzen, 1991). So, results indicate that personnel working with EHRs, in general, consider to have adequate levels of these resources.

Data supports the relationships established in the research model from IQ policy awareness to controlled IQ motivation, presenting a strong and significant relationship (0.508 significant at 0.01). This indicates that healthcare personnel are motivated to follow rules and guidelines in order to obtain rewards or avoid punishments. These rules and guidelines are usually listed in policies promoted within organizations as part of required processes in patient treatments and other routine chores. This must be compared to a more autonomous employees' motivation where healthcare personnel is willing to perform an activity because they agree and look forward the outcomes. Usually, people with autonomous motivation are encouraged to perform activities by their perception on associated benefits to patients, to the organizations, and/or to themselves. As Gagne and Deci (2005) posit, autonomous and controlled motivation are intentional, which can be compared against amotivation, defined as the lack of intention and motivation. Data in this study show that IQ awareness, along the required activities to reach and

maintain quality, does not influence IQ amotivation. EHR's users usually work in highly dynamic and hectic environments, which might explain the absence of influence in favor of inactivity.

The relationship between controlled IQ motivation and IQ policy deference is also supported with results found in the data analysis, with a relationship of 0.432 at a 0.01 level. The need that people might develop in order to obtain a reward or avoid a penalty by following organizational policies leads to IQ policy deference. They may consider IQ policies essential to perform their working activities in a satisfactory way. The relationship between autonomous IQ motivation and attitude toward IQ is supported as well, indicating that those individuals motivated about helpful results from IQ will favor related activities. Finally, for this middle section, the relationship between IQ amotivation and IQ practice helplessness is supported. This indicates that personnel in favor of inactivity could have feelings of lack of control about their work.

Results show that IQ practice intention does not predict IQ actual practice presenting a week relationship. Previous studies tend to indicate that medium to large changes in intention lead to small to medium changes in behavior (Webb & Sheeran, 2006) indicating perhaps that changes in EHR users' intention were not large enough to influence their actual behaviors. Moreover, both constructs, social influence and facilitating conditions did not moderate the relationship between IQ practice intention and IQ actual practice. For the first moderator construct Krosnick & Petty (1995) list resistance to change when individuals are challenge, which might describe when healthcare professionals reject when they are told what to do. Regarding facilitating conditions Taylor & Todd (1995a) list time, money and particular resources, which in this case could be technical support, influencing individuals' intentions.

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Could be that most, if not all, healthcare organizations do not lack of these resources, being the reason for the absence of moderating effect.

6.1.2 Experiment Study

Data from the experiment study helped us to better comprehend the effects that training can have over EHR users. An initial round of data collection using the questionnaire was performed before providing students in a nursing program any information regarding quality of documentation (QoD). Later, a second round of data collection was done with the same students, providing a prior training presenting to them relevant information to QoD from the non-profit organization of the Joint Commission.

Results confirmed that two paths for IQ awareness influence the intention towards IQ practice. One of them was the regulatory path that was significant in the field study too. In this path IQ policy awareness impacts personnel's motivation, and at the time, this motivation influenced users behaviors towards their IQ practice intention. Data support that people working with EHRs remain vigilant of rules and guidelines established in organizational policies. The three relationships between IQ policy awareness and controlled IQ motivation, between this latter construct and IQ policy deference, and between IQ policy deference and IQ practice intention, were strong with values of 0.574, 0.526, and 0.388 respectively, at a level of 0.01 all of them.

At the same time, a second path based on QoD's benefits, became stronger and significant. The relationship between IQ benefit awareness and autonomous IQ motivation was significant with a value of 0.716 at the 0.01 level. This motivation is not linked to possible

rewards or penalizations, rather is based on IQ benefits. People that become aware of QoD benefits can integrate them and be motivated to follow and support related activities.

The relationship between autonomous IQ motivation and attitude toward IQ presented a solid and significant value of 0.636 at the 0.01 level. This supports the vision that personnel motivated towards IQ practices will change their feelings towards IQ activities, based on their cognitive beliefs about related outcomes. By consequence, people's attitudes toward QoD will be increased. In addition, the relationship between attitude toward IQ and IQ practice intention presented a strong and significant value of 0.354 at 0.01 level. This is in concordance with previous research that proved that positive attitudes toward specific actions lead to positive intentions of the same activities. This contrast with results from the field study where this last relationship between attitude toward IQ and IQ practice intention is not significant. The difference could be explained by the fact that students in the experiment study were exposed to important and relevant information regarding benefits and errors avoidance linked to IQ.

6.2 Theoretical and Practical Implications

6.2.1 Theoretical Implications

As far as we could find, this is the first time a research model included the theories of cognitive social psychology, self-determination, planned behavior, and social cognitive to study quality of information within a healthcare environment. An individual perspective involving awareness and motivation leads to an organization view where behavioral antecedents and the working environment are considered in the research model. We posit that this can help to better comprehend complex working environments such as healthcare organizations.

The impact that IQ awareness can have on the intention of IQ practices is analyzed within a framework that integrates constructs from motivation and behavioral research. As far as we could possible verify among current literature, this is the first time this combination is used in a research model aiming to study the influence of information quality within a healthcare environment. Results from this research work allowed us to better understand antecedents of IQ practices in a healthcare context where there is an increasing dependence and consequently a larger demand for reliable information.

The research model can be tested in different working environments since similar demands and new requirements for reliable information are becoming common. More industries are facing exponential growth in their data processing and storage, along a bigger need to obtain a solid platform with reliable information for decision making. This is true by a larger data processing volume and by required solutions of more diverse type of problems, which rely on the same processed information, not initially planned nor intended for these new demands.

The experiment study provided an opportunity to assess the impact that training can have on EHR users, where the assumption was that awareness would be increased improving the intention toward IQ practice. IQ awareness was proved to have an additional significant route, stronger relationships, and a higher variance explained (57.6 percent) for the dependent variable of IQ practice intention. Similar situations can be studied in working environments that require higher information reliability utilizing the proposed research model.

6.2.2 Practical Implications

Healthcare institutions are being pushed to start using EHRs or to improve their quality care through such information systems. Along these demands, organizations in this industry are

facing exponential growth in operational processes and data volumes. There is an urgency to make better use of all this information, for which they need a high degree of quality. Non-profit organizations such as the Joint Commission have established programs to provide accreditations to healthcare institutions, and to certify some of their programs. An essential component in these programs is the quality of documentation (QoD).

The field study showed that EHR users in healthcare environments have present the organizational policies they to follow. Rules and guidelines are the strongest influencers for personnel toward IQ practice intention. Therefore, a good practice to improve the quality of information in any healthcare organization is to revise related policies to ensure they cover all required perspectives for IQ.

Regarding the experiment study, important implications were found, where additional to organizational policies, IQ benefits are also strong influencers of EHR users towards IQ compliance. Moreover, the relationships among constructs were stronger and the variance explained of IQ practice intention grew up to 57.6 percent. Therefore, all institutions with similar demands for high information quality need to pay special attention to training programs. Initiatives in this direction can support better compliance of IQ practices since users will follow rules and guidelines, along with an increasing integration of IQ activities considering them more and more as part of their own values.

6.3 Limitations and Future Studies

This dissertation has its limitation as all research works do. For example, the data collection was performed using a convenience sample including students from one single university, and healthcare professionals from one specific region in the southwest of the US,

limiting the generalizability of results. Both studies can be considered having a cross-sectional design which limits the interpretation of results, where changes that could be captured through a longitudinal study design would help to better explain relationships within the research model.

Even though the instrument was revised by people with administrative and working experience related to EHRs, support by researchers with the same level of experience could provide more precise and meaningful feedback. In this same topic, a larger sample for the pilot study could help much more, obtaining better results.

The relationship between the intention of IQ practice and its actual practice was not significant. This could be explained by IQ actual practice measurement which is not always reliable since people tend to report what they consider sociably desired.

As possible future research, we want to propose the inclusion of scenarios. These could involve particular controlled situation linked to IQ issues allowing EHR users to respond closer to their feelings and beliefs, avoiding as much as possible "sociably correct" responses. Another path to better data could be objective sources such as reports and logs from information systems that could provide information on actual usage, or results from training and educational programs related to IQ assessing perhaps the use of simulated EHRs. This proposal could bring additional light to the conflict that many EHR users reported with additional chores hindering their performance.

6.4 Conclusion

In addition to previous issues within healthcare industry, such as poor efficiencies, higher costs, and inconsistent quality, organizations have the pressure to use EHRs to support their decision making. Current situation for most healthcare organizations usually involves

exponential growth of transactional information, and a stronger reliance on EHRs to support their daily processes. This complex environment can only get worse if information is not reliable with high quality.

Information quality requires continuous processes to achieve and maintain a high degree, for which all stakeholders need to perform IQ activities. Multiples factors have an impact on users' intentions toward IQ practice, and better comprehension of the corresponding antecedents is vital. The proposed research model includes routes that can help to better understand the degree of influence constructs may have on IQ practice intention. Based on results from this research work, rules and guidelines included in policies supported by healthcare organizations have clearly an impact on IQ practices. EHR users are influenced to follow and comply with activities toward IQ improvement and its maintenance. On the other side, possible benefits from IQ practices are not that influential on EHR users, losing its impact regarding the support in favor of IQ practices. Nevertheless, training has the possibility to activate the influence that IQ benefits provide towards IQ activities. Users' awareness, through the exposure to IQ advantages, and threats avoidance for patients and the organization itself, can improve the interest to support activities toward high information quality.

REFERENCES

Agarwal, R., Gao, G. G., DesRoches, C., & Jha, A. K. (December 01, 2010). The digital transformation of healthcare: Current status and the road ahead. Information Systems

Agmon, N. and Ahituv, N. (1987). Assessing Data Reliability in an Information System. *Journal of Management Information Systems*, 4(2), 34-44.

Ajzen, I. (1985). *From intentions to actions: A theory of planned behavior* (p. 11-39). Springer Berlin Heidelberg.

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211.

Ajzen, I. & Albarracin D. (2007). Chapter 1: Predicting and changing behavior: A reasoned action approach. In I. Ajzen, D. Albarracin, & R. Hornik (Eds.) *Prediction and change of health behavior: Applying the reasoned action approach* (p. 3-21). Psychology Press.

Ajzen, I., & Fishbein, M. (1973). Attitudinal and normative variables as predictors of specific behavior. Journal of personality and Social Psychology, 27(1), 41.

Ajzen, I., & Fishbein, M. (1980). Understanding attitudes and predicting social behavior. Englewood Cliffs, NJ: Prentice-Hall.

Al-Hejin, B. (2005). Attention and awareness: Evidence from cognitive and second language acquisition research. Teachers College, Columbia University Working Papers in TESOL & Applied Linguistics, 4(1).

Albarracin, D., Johnson, B. T., Fishbein, M., & Muellerleile, P. A. (2001). Theories of reasoned action and planned behavior as models of condom use: a meta-analysis. Psychological bulletin, 127(1), 142.

Albrechtsen, E., & Hovden, J. (2010). Improving information security awareness and behaviour through dialogue, participation and collective reflection. An intervention study. *Computers & Security*, 29(4), 432-445.

Alderfer, C. P. (1972). Existence, relatedness, and growth: Human needs in organizational settings. New York: Free Press.

Allport, G. W. (1935). Attitudes. In C. Murchison (ed.). Handbook of social psychology, 798-844. Worcester, MA: Clark University Press.

Anderson, K.M., Marsh, C.A., Flemming, A.C., Isenstein, H., & Reynolds, J. (2012). Quality measurement enabled by health IT: Overview, possibilities, and challenges (Prepared by Booz Allen Hamilton, under Contract No. HHSA290200900024I.) *AHRQ Publication* No. 12-0061-EF. Rockville, MD: Agency for Healthcare Research and Quality.

Andrade, J. (2005). Consciousness. In N. Braisby & A. Gellatly (Eds.). Cognitive psychology (p. 545-577). Oxford, UK: Oxford University Press.

Aqil, A., Lippeveld, T., & Hozumi, D. (2009). PRISM framework: a paradigm shift for designing, strengthening and evaluating routine health information systems. *Health Policy and Planning*, 24(3), 217-228.

Arts, D. G., De Keizer, N. F., & Scheffer, G. J. (2002). Defining and improving data quality in medical registries: a literature review, case study, and generic framework. *Journal of the American Medical Informatics Association*, 9(6), 600-611.

Arts, D. G., Bosman, R. J., de Jonge, E., Joore, J. C., & de Keizer, N. F. (2003). Training in data definitions improves quality of intensive care data. Critical Care, 7(2), 179.

Ash, R. B. (1990). Information theory. New York: Dover Publications, Inc.

Ballou, D., Wang, R., Pazer, H., & Tayi, G. K. (1998). Modeling information manufacturing systems to determine information product quality. *Management Science*, 44(4), 462-484.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, N.J: Prentice-Hall.

Bandura, A. (1988). Organizational applications of social cognitive theory. *Australian Journal of Management*, 13(2), 275-302.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual review of psychology*, 52(1), 1-26.

Baron, R. J., Fabens, E. L., Schiffman, M., & Wolf, E. (2005). Electronic health records: just around the corner? Or over the cliff?. *Annals of internal medicine*, 143(3), 222.

Batini, C., Cappiello, C., Francalanci, C., & Maurino, A. (2009). Methodologies for data quality assessment and improvement. *ACM Computing Surveys (CSUR)*, 41(3), 16.

Bermúdez, J. L. (2010). *Cognitive science: An introduction to the science of the mind*. Cambridge University Press.

Berndt, D. J., Hevner, A. R., & Studnicki, J. (June 01, 2003). The Catch data warehouse: support for community health care decision-making. *Decision Support Systems*, 35, 3, 367-384.

Best, J. B. (1986). Cognitive psychology. St. Paul: West Pub. Co.

Blumenthal, D. (2009). Stimulating the adoption of health information technology. *New England Journal of Medicine*, 360(15), 1477-1479.

Blumenthal, D., & Tavenner, M. (2010). The "meaningful use" regulation for electronic health records. *New England Journal of Medicine*, 363(6), 501-504.

Botsis, T., Hartvigsen, G., Chen, F., & Weng, C. (2010). Secondary use of EHR: data quality issues and informatics opportunities. *AMIA Summits on Translational Science Proceedings*, 2010, 1.

Bovee, M. W. (2004). Information quality: a conceptual framework and empirical validation.

Braisby, N., & Gellatly, A. (2005). Cognitive psychology. Oxford: Oxford University Press.

Bray, G. A., Nielsen, S. J., & Popkin, B. M. (2004). Consumption of high-fructose corn syrup in beverages may play a role in the epidemic of obesity. *The American journal of clinical nutrition*, 79(4), 537-543.

Brewin, B. (2007). Free e-prescription software initiative launches. *Government Health IT*. Retrieved from http://govhealthit.com/news/free-e-prescription-software-initiative-launches-0

Broadbent, Donald E. (1958). Perception and Communication. Elsevier Science Ltd.

Bulgurcu, B., Cavusoglu, H., & Benbasat, I. (2010).Information security policy compliance: An empirical study of rationality-based beliefs and information security awareness. *MIS Quarterly*, 34,3, 523-548.

Caballero, I., Gómez, Ó., & Piattini, M. (2004). Getting better information quality by assessing and improving information quality management. *In Proceedings of the Ninth MIT International Conference on Information Quality*.

Campbell, D.T., & Stanley, J.C. (1963). Experimental and quasi-experimental designs for research on teaching. In N.L. Gage (Ed.), *Handbook on Research on Teaching*, Chicago: Rand McNally

Canadian Institute for Health Information (2009). The CIHI Data Quality Framework (Ottawa, Ont.: CIHI, 2009).

Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source versus message cues in persuasion. Journal of personality and social psychology, 39(5), 752.

Chan, K. S., Fowles, J. B., & Weiner, J. P. (2010). Electronic health records and reliability and validity of quality measures: a review of the literature. Medical Care Research and Review.

Chau, P. Y., & Hu, P. J. H. (2002). Investigating healthcare professionals' decisions to accept telemedicine technology: an empirical test of competing theories. *Information & management*, 39(4), 297-311.

Chaudhry, B., Wang, J., Maglione, M., Wu, S., Mojica, W., Roth, E., … & Shekelle, P. G. (2006). Systematic review: impact of health information technology on quality, efficiency, and costs of medical care. Annals of internal medicine, 144(10), 742-752.

Chin, W. W. (January 01, 2010). How to Write Up and Report PLS Analyses. In V. V. Esposito (Ed.) *Handbook of partial least squares: Concepts, methods and applications* (pp. 655-690) Berlin: Springer

Choi, N., Kim, D., Goo, J., & Whitmore, A. (2008). Knowing is doing: An empirical validation of the relationship between managerial information security awareness and action. Information Management & Computer Security, 16(5), 484-501.

Classen, D. C. & Bates, D. W. (2011). Finding the meaning in meaningful use. *The New England Journal of Medicine*, 365, 9, 855-858.

Compeau, D. R., & Higgins, C. A. (1995a). Computer self-efficacy: Development of a measure and initial test. *MIS quarterly*, 19(2).

Compeau, D. R., & Higgins, C. A. (1995b). Application of social cognitive theory to training for computer skills. *Information systems research*, 6(2), 118-143.

Cook, T. D., & Campbell, D. T. (July 01, 1986). The Causal Assumptions of Quasi-Experimental Practice: The Origins of Quasi-Experimental Practice. *Synthese*, 68(1), 141-180.

D'Arcy, J., Hovav, A., & Galletta, D. (2009). User awareness of security countermeasures and its impact on information systems misuse: a deterrence approach. *Information Systems Research*, 20(1), 79-98.

Davis, T. R., & Luthans, F. (1980). A social learning approach to organizational behavior. *Academy of Management Review*, 5(2), 281-290

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (July 01, 1992). Extrinsic and Intrinsic Motivation to Use Computers in the Workplace. *Journal of Applied Social Psychology*, 22(14), 1111-1132.

Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of personality and Social Psychology*, 18(1), 105-115.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York and London: Plenum.

Deci, E. L., & Ryan, R. M. (1987). The support of autonomy and the control of behavior. *Journal of personality and social psychology*, 53(6), 1024.

Deci, E. L., & Ryan, R. M. (2008). Facilitating optimal motivation and psychological well-being across life's domains. Canadian Psychology/Psychologie canadienne, 49(1), 14.

DesRoches, C. M., Campbell, E. G., Vogeli, C., Zheng, J., Rao, S. R., Shields, A. E., & Jha, A. K. (2010). Electronic health records' limited successes suggest more targeted uses. *Health Affairs*, 29(4), 639-646.

Deutsch, M., & Gerard, H. B. (1955). A study of normative and informational social influences upon individual judgment. *The journal of abnormal and social psychology*, 51(3), 629.

Dillman, D. A. (2000). *Mail and internet surveys: The tailored design method* (Vol. 2). New York: Wiley.

Dinev, T., & Hart, P. (2005-2006). Internet privacy concerns and social awareness as determinants of intention to transact. International Journal of Electronic Commerce, 10(2), 7-29.

Dinev, T., & Hu, Q. (2007). The centrality of awareness in the formation of user behavioral intention toward protective information technologies. *Journal of the Association for Information Systems*, 8(7).

Downs, D. S., & Hausenblas, H. A. (2005). Elicitation studies and the theory of planned behavior: a systematic review of exercise beliefs. Psychology of Sport and Exercise, 6(1), 1-31.

Durantini, M. R., Albarracín, D., Earl, A., & Mitchell, A. L. (2006). Conceptualizing the influence of social agents of change: A meta-analysis of HIV prevention interventions for different groups. Psychological Bulletin, 132, 212-248.

Eagly, A. H., & Chaiken, S. (1993). The psychology of attitudes. Harcourt Brace Jovanovich College Publishers.

Edwards, J. R. (2001). Ten difference score myths. *Organizational Research Methods*, 4(3), 265-287.

Endsley, M.R. (1995). Toward a theory of situation awareness in dynamic systems. Huaman Factors and Ergonomics Society, 37(1), 32-64.

Endsley, M.R. (2000). Theoretical underpinnings of situation awareness: A critical review. In M. R. Endsley, & D. J. Garland. Situation awareness: Analysis and measurement. Mahwah, NJ: Lawrence Erlbaum Associates.

Endsley, M. R., Farley, T. C., Jones, W. M., Midkiff, A. H., & Hansman, R. J. (1998). Situation awareness information requirements for commercial airline pilots. *International Center for Air Transportation*.

English, L. P. (2009). *Information quality applied: Best practices for improving business information, processes and systems.* Wiley Publishing.

Festinger, L. (1957). A theory of cognitive dissonance. Evanston, Il: Row, Peterson.

Fishbein, M., & Ajzen, I. (1975). Belief, attitude, intention and behavior: An introduction to theory and research. Reading, Mass.; Don Mills, Ontario: Addison-Wesley Pub. Co.

Flach, J. M. (1995). Situation awareness: Proceed with caution. Human Factors: The Journal of the Human Factors and Ergonomics Society, 37(1), 149-157.

Ford, E. W., Menachemi, N., Peterson, L. T., & Huerta, T. R. (2009). Resistance is futile: but it is slowing the pace of EHR adoption nonetheless. *Journal of the American Medical Informatics Association*, 16(3), pp. 274-281.

Freitas, J. A., Silva-Costa, T., Marques, B., & Costa-Pereira, A. (2010). Implications of data quality problems within hospital administrative databases. In XII Mediterranean *Conference on Medical and Biological Engineering and Computing 2010* (pp. 823-826). Springer Berlin Heidelberg.

Furnell, S. M., Gennatou, M., & Dowland, P. S. (2002). A prototype tool for information security awareness and training. *Logistics Information Management*, 15(5/6), pp. 352-357.

Gable, G. G. (1994). Integrating case study and survey research methods: an example in information systems. *European journal of information systems*, 3(2), 112-126.

Gagne, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational behavior*, 26(4), 331-362.

Garg, A. X., Adhikari, N. K., McDonald, H., Rosas-Arellano, M. P., Devereaux, P. J., Beyene, J., ... & Haynes, R. B. (2005). Effects of computerized clinical decision support systems on practitioner performance and patient outcomes: a systematic review. Jama, 293(10), 1223-1238.

Garman, A., & Scribner, L. (2011). Leading for quality in healthcare: development and validation of a competency model. *Journal of healthcare management/American College of Healthcare Executives*, 56(6), pp. 373.

Ge, M., Helfert, M., & Jannach, D. (2011). Information quality assessment: Validating measurement dimensions and processes. *ECIS 2011 Proceedings. Paper 75.*

Gefen, D., & Straub, D. (2005). A practical guide to factorial validity using PLS-Graph: Tutorial and annotated example. *Communications of the Association for Information systems*, 16(1), 5.

Gefen, D., Straub, D., & Boudreau, M. C. (2000). Structural equation modeling and regression: Guidelines for research practice. Communications of the association for information systems, 4(1), 7.

Gendron, M. S., & D'Onofrio, M. J. (2000). An Exploratory Study Investigating Data Quality in the Healthcare Industry: What are the Implications for Data Warehousing?

Goodhue, D. L., & Straub, D. W. (1991). Security concerns of system users: a study of perceptions of the adequacy of security. Information & Management, 20(1), 13-27.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., and Tatham, R. L. (2010). Multivariate data analysis: A global perspective. Upper Saddle River, N.J: Pearson/Prentice-Hall

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *The Journal of Marketing Theory and Practice*, 19(2), 139-152.

Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2013). A primer on partial least squares structural equation modeling (PLS-SEM). SAGE Publications, Incorporated.

Hamilton, D. L. (2005). Social cognition: Key readings. New York: Psychology Press.

Hardeman, W., Johnston, M., Johnston, D., Bonetti, D., Wareham, N., & Kinmonth, A. L. (2002). Application of the theory of planned behaviour in behaviour change interventions: a systematic review. Psychology and health, 17(2), 123-158.

Harrison, D.A., Mykytyn, P.P., and Riemenschneide, C.K.(1997). Executive Decisions About Adoption of Information Technology in Small Business: Theory and Empirical Tests *Information Systems Research*, 2, pp. 171-195

Hartmann, P., & Apaolaza-Ibanez, V. (September 01, 2012). Consumer attitude and purchase intention toward green energy brands: The roles of psychological benefits and environmental concern. *Journal of Business Research*, 65, 9, 1254-1263

Herath, T., & Rao, H. R. (2009). Protection motivation and deterrence: a framework for security policy compliance in organisations. *European Journal of Information Systems*, 18(2), 106-125.

Herzberg, F. (1968). One More Time: How Do You Motivate. Harvard Business Review, January-February, 56-57.

Hinson, G. (2009). Information Security Awareness. Handbook of Research on Social and Organizational Liabilities in Information Security.

Hogan, W. R., & Wagner, M. M. (January 01, 1997). Accuracy of data in computer-based patient records. Journal of the American Medical Informatics Association : Jamia, 4, 5.)

HHS, 2010. Health Information Technology: Initial Set of Standards, Implementation Specifications, and Certification Criteria for Electronic Health Record Technology. *45 CFR Part 170*. RIN 0991–AB58.

Hu, Q., & Dinev, T. (2005). Is spyware an internet nuisance or public menace?. *Communications of the ACM*, 48(8), 61-66.

Huh, Y. U., Keller, F. R., Redman, T. C., & Watkins, A. R. (1990). Data quality. Information and Software Technology, 32(8), 559-565.

Johnson, E. C. (2006). Security awareness: switch to a better programme. Network Security, 2006(2), 15-18.

Kahn, B. K., Strong, D. M., & Wang, R. Y. (2002). Information quality benchmarks: product and service performance. *Communications of the ACM*, 45(4), pp. 184-192.

Kahn, B. K., Pierce, E. M., & Melkas, H. (2004). IQ research directions. Proceedings of the 9th *International Conference on Information Quality* (ICIQ), 326-332

Kahn, M.G., Raebel, M.A., Glanz, J.M., Riedlinger, K., Steinder, J.F. (2012) A pragmatic framework for single-site and multisite data quality assessment in electronic health record-based clinical research. *Medical Care*, 50, 21–29.

Kaplan, B., & Brennan, P. F. (2001). Consumer informatics supporting patients as co-producers of quality. *Journal of the American Medical Informatics Association*, 8(4), 309-316.

Kasprzyk, D., Montaño, D. E., & Fishbein, M. (1998). Application of an Integrated Behavioral Model to Predict Condom Use: A Prospective Study Among High HIV Risk Groups1. *Journal of Applied Social Psychology*, 28(17), 1557-1583.

Kattimani, P. S. (2010). Quality awareness of online information resources: A study. *International Journal of Library and Information Science*, 1(2), 031-034.

Katz, D. (1960). The functional approach to the study of attitudes. Public opinion quarterly, 24(2), 163-204.

Kelman, H. C. (1958). Compliance, identification, and internalization: Three processes of attitude change. Journal of conflict resolution, 51-60.

Kerr, K., Norris, T., & Stockdale, R. (2007, December). Data quality information and decision making: a healthcare case study. *In 18th Australasian Conference on Information Systems, Toowoomba* (pp. 5-7).

Kerr, K. A., Norris, T., & Stockdale, R. (2008). The strategic management of data quality in healthcare. Health informatics journal, 14(4), 259-266.

Kirsch, L., & Boss, S. (2007). The last line of defense: Motivating employees to follow corporate security guidelines. *ICIS 2007 Proceedings*, 103.

Klassen, V., Borek, A., Parlikad, A., & Kern, R. (2012). QUANTIFIYING THE BUSINESS IMPACT OF INFORMATION QUALITY-A RISK-BASED APPROACH. European Conference on Information Systems 2012 Proceedings. Paper 239.

Kokemueller, J. (2011). An empirical investigation of factors influencing data quality improvement success.

Kon, H. B., Lee, J., & Wang, Y. R. (1993). A process view of data quality.

Krosnick, J. A., & Petty, R. E. (1995). Attitude strength: An overview. In R. E. Petty & J.A. Krosnick (Eds.), Attitude strength: Antecedents and consequences. Hillsdale, NJ: Erlbaum.

Kruger, H. A., & Kearney, W. D. (2006). A prototype for assessing information security awareness. computers & security, 25(4), 289-296.

Kukafka, R., Ancker, J. S., Chan, C., Chelico, J., Khan, S., Mortori, S., Natarajan, K., Presley, K., & Stephens, K. (2007). Redesigning electronic health records systems to support public health. *Journal of Biomedical Informatics*, 40, pp. 398-409.

LaPiere, R. (1934). Attitudes versus actions. Social Forces, 13, 230-237.

Lee, Y. W., Pipino, L. L., Funk, J. D., & Wang, R. Y. (2006). *Journey to data quality*. Cambridge: MIT press.

Linder, J. A., Ma, J., Bates, D. W., Middleton, B., & Stafford, R. S. (2007). Electronic health record use and the quality of ambulatory care in the United States. *Archives of Internal Medicine,* 167(13), pp. 1400-1405.

Luciano, E. M., Mahmood, M. A., & Maçada, A. C. G. (2010). The influence of human factors on vulnerability to information security breaches. In Proceedings of the Sixteenth Americas Conference on Information Systems, Lima, Peru, August (pp. 12-15).

MacKinnon, D. P. (2008). *Introduction to statistical mediation analysis*. Routledge.

Madnick, S. E., Wang, R. Y., Lee, Y. W., & Zhu, H. (2009). Overview and framework for data and information quality research. *Journal of Data and Information Quality (JDIQ)*, 1(1), 2.

Manis, M. (1977). Cognitive social psychology. *Personality and Social Psychology Bulletin*, 3(4), 550-566.

Marakas, G. M., Yi, M. Y., & Johnson, R. D. (June 01, 1998). The Multilevel and Multifaceted Character of Computer Self-Efficacy: Toward Clarification of the Construct and an Integrative Framework for Research. *Information Systems Research*, 9, 2, 126-163.

Maslow, A.H. (1943). A theory of human motivation. Psychological Review 50 (4) 370–96.

Maynard, S., & Ruighaver, A. B. (2006, April). What makes a good information security policy: a preliminary framework for evaluating security policy quality. In Proceedings of the fifth annual security conference, Las Vegas, Nevada USA (pp. 19-20).

McAlister, A. L., Perry, C. L., & Parcel, G. S. (2008). How individuals, environments, and health behaviors interact: Social cognitive theory. In K. Glanz, B. K. Rimer, & K. Viswanath. Health behavior and health education: Theory, research, and practice. (pp.169-188). Jossey-Bass. San Francisco, CA.

McArdle, J. J. (2009). Latent variable modeling of differences and changes with longitudinal data. *Annual review of psychology*, 60, 577-605.

McClelland, D. C., & Burnham, D. H. (1976). Power is the great motivator. Boston, Mass: Harvard Business Press.

McCormack, J. L., & Ash, J. S. (January 01, 2012). Clinician perspectives on the quality of patient data used for clinical decision support: a qualitative study. *Amia ... Annual Symposium Proceedings / Amia Symposium. Amia Symposium*, 2012, 1302-9.

McGuire, W. J., Lindzey, G., & Aronson, E. (1985). Handbook of social psychology. Handbook of social psychology.

Menachemi, N., Yeager, V. A., Bilello, L., Harle, C. A., Sullivan, C. B., & Siler-Marsiglio, K. I. (2011). Florida doctors seeing Medicaid patients show broad interest in federal incentives for adopting electronic health records. *Health Affairs*, 30(8), pp. 1461-1470.

Mikkelsen, G., & Aasly, J. (2005). Consequences of impaired data quality on information retrieval in electronic patient records. International journal of medical informatics, 74(5), 387-394.

Mitnick, K. D., & Simon, W. L. (2011). The art of deception: Controlling the human element of security. John Wiley & Sons.

Mosca, L., Linfante, A. H., Benjamin, E. J., Berra, K., Hayes, S. N., Walsh, B. W., Fabunmi, R. P., ... Simpson, S. L. (January 01, 2005). National study of physician awareness and adherence to cardiovascular disease prevention guidelines. *Circulation*, 111, 4, 499-510.

Newsted, P., Chin, W. W., Ngwenyama, O. K., & Lee, A. (2003). A tutorial on survey instruments.

Niès, J., Colombet, I., Degoulet, P., & Durieux, P. (2006). Determinants of success for computerized clinical decision support systems integrated into CPOE systems: a systematic review. In AMIA Annual Symposium Proceedings (Vol. 2006, p. 594). American Medical Informatics Association.

Nunnally, J. C., & Bernstein, I. H. (1994). Psychometric theory. New York: McGraw-Hill

Orlikowski, W. J., & Baroudi, J. J. (1991). Studying information technology in organizations: Research approaches and assumptions. Information systems research, 2(1), 1-28.

Ormond, D., Warkentin, M., Marett, K., & Johnston, A. C. (2011). Perceived Deception: An Evaluation of Technology Awareness and Self-Efficacy. *International Federation for Information Processing (IFIP)*, Working group 8.11/Working group 11.13.

Pedersen, P., & American Association for Counseling and Development. (1988). A handbook for developing multicultural awareness. Alexandria, Va: American Association for Counseling and Development

Petter, S., DeLone, W., & McLean, E. R. (2012). The past, present, and future of "IS Success". Journal of the Association for Information Systems, 13(5), 2.

Petty, R. E., & Cacioppo, J. T. (1986). Communication and persuasion: Central and peripheral routes to attitude change. New York : Springer-Verlag.

Pinsonneault, A., & Kraemer, K. L. (1993). Survey research methodology in management information systems: an assessment. *Journal of management information systems*, 75-105.

Pipino, L.L, Lee, Y.W., Wang, R.Y. (2002). Data quality assessment. *Communications of the ACM*, 45(4), pp. 211-218.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of applied psychology*, 88(5), 879.

Puspitasari, I.M. and Soegijoko, S. (2009). Development of an Integrated e-Prescription System with Adverse Drug Events Alert for Community Health Center in Indonesia, Med-e-Tel Conference, 2009, Luxembourg, 1 – 3 April.

Raghunathan, S. (1999). Impact of information quality and decision-maker quality on decision quality: a theoretical model and simulation analysis. Decision Support Systems, 26(4), 275-286.

Redman, T. C. (1995). Improve data quality for competitive advantage. *Sloan Management Review*, 36, pp. 99-107.

Redman, T. C. (1998). The impact of poor data quality on the typical enterprise. *Communications of the ACM*, 41(2), pp.79-82.

Reza, F. M. (1994). An introduction to information theory. New York: Dover Publications, Inc.

Rogers, Everett M. (2003). Diffusion of Innovations. New York: Free Press.

Ryan, R. (2009). Self-determination theory and wellbeing. *Social Psychology*, 84, 822-848.

Ryan, R. M., & Deci, E. L. (2000a). Intrinsic and extrinsic motivations: Classic definitions and new directions. Contemporary educational psychology, 25(1), 54-67.

Ryan, R. M., & Deci, E. L. (2000b). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American psychologist, 55(1), 68.

Sadiq, S., Yeganeh, N. K., Indulska, M., & 22nd Australasian Database Conference, ADC 2011. (December 01, 2011). 20 Years of Data Quality Research: Themes, Trends and Synergies. *Conferences in Research and Practice in Information Technology Series*, 115, 153-162.

Santhanam, R., Sasidharan, S., & Webster, J. (2008). Using self-regulatory learning to enhance e-learning-based information technology training. *Information Systems Research*, 19(1), 26-47.

Schmidt, R. (1994). Deconstructing consciousness in search of useful definitions for applied linguistics. In Hulstijn, J.H., & Schmidt, R. (Eds.) Consciousness and second language learning: Conceptual, methodological and practical issues in language learning and teaching, Thematic issue of AILA Review - Revue de l'AILA, 11, 11-26.

Schunk, D. H. (1987). Peer models and children's behavioral change. *Review of educational research*, 57(2), 149-174.

Shannon, C. E. (1948). The mathematical theory of communication. *Bell System Technical Journal* 27 (3): 379–423.

Shaw, R. S., Chen, C. C., Harris, A. L., & Huang, H. J. (January 01, 2009). The impact of information richness on information security awareness training effectiveness. *Computers & Education*, 52, 1, 92-100.

Sheeran, P., & Taylor, S. (1999). Predicting Intentions to Use Condoms: A Meta-Analysis and Comparison of the Theories of Reasoned Action and Planned Behavior1. Journal of Applied Social Psychology, 29(8), 1624-1675.

Sheng, Y. H., & Mykytyn Jr, P. P. (2002). Information Technology Investment and Firm Performance: A Perspective of Data Quality. In IQ (pp. 132-141).

Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. Journal of consumer Research, 325-343.

Sherif, M. & Hovland, C. I. (1961). Social judgment: Assimilation and contrast effects in communication and attitude change.

Simborg, D. W. (2008). Promoting electronic health record adoption. Is it the correct focus? *Journal of the American Medical Informatics Association*, 15: pp. 127-129. Doi:10.1197/jamia.M2573

Siponen, M. T. (2000). A conceptual foundation for organizational information security awareness. *Information Management & Computer Security*, 8, 1, pp. 31-41

Siponen, M. T. (2001). Five dimensions of information security awareness. *Computers and Society*, June, pp. 24-29.

Smith, M. B., Bruner, J. S., & White, R. W. (1956). Opinions and personality. New York: Wiley.

Smith, M. D., & Institute of Medicine (U.S.). (2012). *Best care at lower cost: The path to continuously learning health care in America.* Washington, D.C: National Academies Press.

Spears, J. L., & Barki, H. (2010). User participation in information systems security risk management. *MIS quarterly*, 34(3), 503-522

Straub, D. W. (1989). Validating instruments in MIS research. MIS quarterly, 147-169.

Straub, D., Boudreau, M. C., & Gefen, D. (2004). Validation guidelines for IS positivist research. *The Communications of the Association for Information Systems*, 13(1), 63.

Strong, D.M., Lee, Y.W., Wang, R.Y. (1997a). Data quality in context. *Communications of the Association for Computing Machinery*, 40(5), pp. 103-110.

Strong, D. M., Lee, Y. W., & Wang, R. Y. (1997b). 10 potholes in the road to information quality. *Computer,* 30(8), 38-46.

Sunyaev, A., & Chornyi, D. (2012). Supporting chronic disease care quality: design and implementation of a health service and its integration with electronic health records. *Journal of Data and Information Quality* (JDIQ), 3(2), 3.

Tayi, G. K., & Ballou, D. P. (1998). Examining data quality. *Communications of the ACM*, 41(2), 54-57.

Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information systems research*, 6(2), 144-176.

Thiru, K., Hassey, A., & Sullivan, F. (2003). Systematic review of scope and quality of electronic patient record data in primary care. *British Medical Journal*, 326(7398), 1070.

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: toward a conceptual model of utilization. MIS quarterly, 125-143.

Thomson, M. E., & Von Solms, R. (1998). Information security awareness: educating your users effectively. *Information Management & Computer Security*, 6(4), pp. 167-173.

Trochim, W. M. K., & Donnelly, J. P. (2008). Research methods knowledge base. Mason, Ohio: Atomic Dog/Cengage Learning.

Vallerand, R. J., & Bissonnette, R. (1992). Intrinsic, extrinsic, and amotivational styles as predictors of behavior: A prospective study. Journal of Personality, 60(3), 599-620.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS quarterly, 425-478.

Venkatesh, V., & Speier, C. (1999). Computer technology training in the workplace: A longitudinal investigation of the effect of mood. *Organizational Behavior and Human Decision Processes*, 79(1), 1-28.

Wand, Y. and Wang, R.Y. (1996). Anchoring data quality dimensions in ontological foundations. *Communications of the Association for Computing Machinery*, 39(11).

Wang, R. Y., Storey, V. C., & Firth, C. P. (1995). A framework for analysis of data quality research. *Knowledge and Data Engineering, IEEE Transactions on*, 7(4), pp. 623-640.

Wang, R. Y., & Strong, D. M. (1996). Beyond accuracy: What data quality means to data consumers. *Journal of management information systems*, pp. 5-33.

Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. Psychological bulletin, 132(2), 249.

Weiskopf, N. G., & Weng, C. (2012). Methods and dimensions of electronic health record data quality assessment: enabling reuse for clinical research. *Journal of the American Medical Informatics Association*.

Weiskopf, N. G., & Weng, C. (January 01, 2013). Methods and dimensions of electronic health record data quality assessment: enabling reuse for clinical research. *Journal of the American Medical Informatics Association* : Jamia, 20, 1, 144-51

Wells, R. W. (1997). Growing a learning culture: new thinking in an old industry. Training for quality, 5(2), pp. 88-92.

Westland, J. (2010). Lower bounds on sample size in structural equation modeling. Electronic Commerce Research and Applications, 9(6), 476-487.

Wolitski, R. J., & Zhang, J. (2007). Understanding and motivating condom use among at-risk and HIV-seropositive persons: A review and demonstration of the applicability of the theories of reasoned action and planned behavior. Prediction and change of health behavior: Applying the reasoned action approach, 173-196.

Xu, H., Nord, J. H., Brown, N., & Nord, G. D. (2002). Data quality issues in implementing an ERP. *Industrial Management & Data Systems*, 102(1), pp. 47-58

BIOGRAPHICAL SKETCH

Dr. Javier Flores earned his Doctor in Philosophy in Business Administration, with a major in Computer Information Systems, from the University of Texas-Pan American (UTPA) in 2015. He received his Master in Business Administration from the Instituto Tecnológico y de Estudios Superiores the Monterrey (ITESM), campus Mexico, City in 1990. He earned his Bachelor Degree in Electronic Systems Engineering with a concentration in Computer Sciences, from the ITESM, campus Estado de México, in 1985.

Dr. Flores worked as a full time Lecturer, as an assistant instructor, and as a research assistant for the department of Computer Information Systems and Quantitative Methods at UTPA. In addition, Dr. Flores has more than 20 years of experience in the private sector working for organizations in the Information Technology industry, such as IBM México, Hewlett Packard México, and Softtek.

Dr. Flores' research works have been published in varied academic journals such as Decision Sciences Journal of Innovative Education, International Journal of Services and Standards, Information Systems Educational Journal, and Journal of Information Systems Applied Research. He has also presented his work in leading conferences such as AMCIS, DSI, ISECON, CONISAR, and SWDSI.

Among honors and awards obtained by Dr. Flores, there is a best paper in CONISAR 2013, a second place award in the student research day at UTPA, two research excellence awards at UTPA, and attended 2014 AMCIS doctoral student consortium.