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THE IMPACT OF KNOWLEDGE FROM LEARNING-ABOUT ELECTRONIC HEALTH RECORDS ON IT INNOVATION ADOPTION: THE MODERATING ROLE OF ABSORPTIVE CAPACITY

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ABSTRACT

Learning-by-doing is a crucial process to successful IT adoption. Yet, this type of organizational learning process is necessary but not sufficient to the adoption success. Learning-about, the pre-adoption learning activity, plays an equally important role in an organization's IT adoption. In healthcare industry, hospitals are not always able to utilize healthcare information technologies (HITs), such as electronic healthcare records (EHRs), to generate high quality information for decision making. Having pre-adoption knowledge and the capacity to absorb the knowledge is likely to better the adoption results. This research proposes a conceptual model to explain the importance of the knowledge from learning-about EHR technology and explore the role absorptive capacity plays in EHR pre-adoption. This study contributes to the existing EHR literature by (1) adding pre-adoption knowledge into the ingredients of successful adoption, and (2) discussing the moderating effect of absorptive capacity to the relationship between pre-adoption knowledge and outcomes of adoption.

Keywords

Knowledge-based view, learning-about, electronic health records (EHRs), IT Innovation Adoption, Absorptive Capacity

INTRODUCTION

Knowledge-based view (KBV) suggests that knowledge plays a pivotal role in increasing the firms' competitive advantage and financial performance (Grant 1996; Takeuchi 2013; Zack et al. 2009), including the healthcare industry. Effective knowledge activities in healthcare not only improve the existing operational capabilities of healthcare service but also reduce the care delivery costs and prevent potential medical errors (Agarwal et al. 2010; Wang et al. 2013). Such knowledge activities can be classified into two categories according to the level of material involvement with the knowledge: learning-by-doing and learning-about (Wang and Ramiller 2009). Learning-by-doing means that adopters (including individual and organization) obtain knowledge from materially engaged with an innovation (Salaway 1987). Learning-about means that adopters understand an innovation by summarizing the available information without any engagement with it (Wang and Ramiller 2009). Rather than focusing on learning-about, most researchers tend to frame knowledge activities as learning-by-doing when studying the organizational learning process related to information technology (IT) (Ke and Wei 2006). However, when organizations invest a large amount of cost and time in learning the implementation and utilization for the software and service, they still experience difficulty in operating or introducing new systems (Wang and Ramiller 2009). One of the key reasons for this difficulty is the lack of full consideration of software fitness to the specific situations of the particular organization prior to the adoption of IT innovation (Swanson and Ramiller 2004). Thus, it is important for IS academics and healthcare practitioners to pay greater attention to understand the IT innovation before organizations get materially involved with IT.

To address this, KBV provides excellent anchors to study how the impacts of learning-about affect healthcare performance. For example, Wang and Remiller (2009) suggest that pre-adoption knowledge about the technology would help the organization become more prepared to innovate with IT. It emphasizes the importance that organizations can learn about the innovation via external resources such as business partners, public media, and consultancies. However, little research has demonstrated the crucial impact of the obtained knowledge via the "learning-about" process on successful IT adoption. This paper aims to fill this gap by understanding the relationship between knowledge from learning-about and the outcomes of the IT innovation adoption (Swanson and Ramiller 2004; Wang and Ramiller 2009).

Firms' ability to obtain and apply knowledge becomes critical since knowledge per se cannot generate value (Malhotra et al. 2005; Cohen and Levinthal 1990; Lichtenthaler 2009). A concept called "absorptive capacity" was conceptualized by Cohen and Levinthal (1990) to describe how a firm to absorb their knowledge. Absorptive capacity refers to the ability identify, assimilate, and exploit knowledge to help organizations acquire and sustain competitive advantage (Cohen and Levinthal 1990; Zahra and George 2002). Tsai (2001) suggests that obtaining a wealth of knowledge to increase organizational innovation and performance cannot be guaranteed unless organizations have enough capacity to absorb the knowledge. Thus, we propose the moderating effect of absorptive capability on the relationship between the knowledge from learning-about and the outcome of IT innovation adoption.

In order to fulfill the goal, we choose to study the adoption of electronic health records (EHRs) as an example. This manuscript reviews the literature of organizational learning and absorptive capacity and proposed a research model and propositions. The contributions of this paper may provide recommendations to improve the meaningful use of the EHRs.

THEORETICAL FRAMEWORK

To deduce the relationship between knowledge from learning-about and outcomes of IT adoption, we reviewed the organizational learning and knowledge management literature, following by identifying the outcomes of IT adoption and the role of absorptive capacity. We propose a conceptualization of the expected relationships among the elements the research model. In this section, we discuss each of these elements in detail.

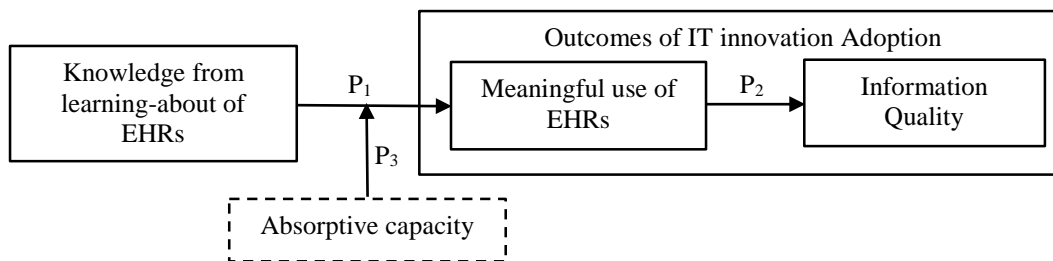


Figure 1. Research Model

Organizational Learning and IT Innovation Adoption

According to KBV, knowledge is one of the most important resources to support an organization's primary activities (Grant 1996), which include IT innovation adoption and implementation activities (Swanson and Ramiller 2004). Organizations need to gather and analyze information about the innovation first and then form an understanding and make the decision about whether to adopt. This rationalized process provides a solid knowledge base for the actual adoption and implementation. Therefore learning is a key to the outcome of IT innovation (Ke and Wei 2006).

Empirical studies have found the support of organizational learning processes to the development of IT innovations (Salaway 1987), adoption and assimilation of IT innovation (Fichman and Kemerer 1997), and overall organization performance (Tippins and Sohi 2003). These research findings are all from the perspective of learning-by-doing. However, this learning-by-doing perspective does not consider the full dimension of learning in that it does not consider the learning effort before the actual adoption activity. Wang and Ramiller (2009) point out that learning starts before the organization gets actually involved with the innovation and they named this kind of learning without doing: learning-about.

In the learning-about process, adopters understand IT innovation by summarizing the available information not generated from their actual investment in the innovation. This takes place through the engagement in innovation discourse (Wang and Ramiller 2009). Take the SaaS for example; one can learn its features, architecture, potential applications and problems by reading articles, books, attending conferences, observing the performance from other organizations or consulting with experts. Then, adopters would combine the gathered information with their specific situation to examine the innovation's fitness to their own circumstance. This learning process allows organizations rationally identify the proper IT innovation among all the available choices which has been suggested as an important antecedent to the successful adoption (Swanson and Ramiller 2004). Thus, this research argues that the importance of learning-about process is that organizations can acquire knowledge that supports the adoption decision making process.

Knowledge from Learning-about

Innovation adoption literature suggests that during the learning process, there are different types of explicit knowledge involved, including knowing-what and knowing-why, and they are not overlapped with each other (Hamel 2006; Lipshitz et al.

2007; Swanson and Ramiller 2004; Wang and Ramiller 2009). Learning-about knowledge is embedded in IT innovation adoption activities, aiming for acquiring knowledge for its effective use. Therefore, in this study, we use knowing-what and knowing-why to present the learning-about process.

Knowing-what refers to “the mastery of facts or opinions within an organization (Lipshitz et al. 2007, pp. 118).” This knowledge allows organizations to understand the IT innovation in certain detail, such as the principle and characteristics of the technology, and to generate to a certain tangible products or outcomes. In the context of healthcare, it means that hospitals need to understand what SaaS is, its features, and problems when it applies in practice. When they learn about this technology, hospitals would perceive an attitude towards it and form the basic idea of adoption or non-adoption (Swanson and Ramiller 2004).

Knowing-why refers to “a causal understanding about knowledge within an organization (Lipshitz et al. 2007, pp. 119).” This knowledge provides explanations for rationalization about adoption. In the context of healthcare, hospitals realize what new technologies are and generate an intention towards one of them, thus to evaluate its feasibility. This includes the examination of the specific situation of their organizations and comparison of other alternative solutions. Also, organizations should be aware of the impacts and consequences of adopting the technologies. Besides the financial and organizational impact of technology adoption, hospitals also have to harness the possible challenges once they decide to adopt the system.

Previous research has already pointed out the importance of knowledge and its relationship with organizational performance (Epple et al. 1991). However, the relationship between these specific types of knowledge and organizational performance has seldom been touched. Lee and Strong (2003) conduct a study about these two types of knowledge and their relationship with employee performance. This study looks at this relationship at the organizational level rather than individual level. Following the previous statement of learning-about, we proposed that it is actually the knowledge that hospitals obtained in the learning-about process that is related to the outcome of adoption.

Outcomes of IT Innovation Adoption

Successful IT innovation adoption can be studied from multiple perspectives, such as customer satisfaction (Wixom and Todd 2005), system utilization (Ker et al. 2014; Rai et al. 2002), information quality (Fitzgerald and Russo 2005; Wixom and Watson 2001), and financial performance (Law and Ngai 2007). The goal of EHR adoption is to improve healthcare providers’ operational performance with the support of IT. Thus, one of the indicators for successful EHR adoption is the system utilization. It has been argued that EHR can improve information quality in healthcare (Blumenthal and Tavenner 2010); therefore, this study uses information quality as the other indicator for successful EHR adoption.

Meaningful use of EHRs

EHRs have been suggested to enhance the healthcare service efficiency and effectiveness (Blumenthal and Tavenner, 2010), but simply adopting the system might not lead to those benefits. Healthcare providers need to make the use of EHR a routine on daily basis in order to realize the payback. Health Information Technology for Economic and Clinical Health (HITECH) Act introduces the “meaningful use” of EHR as the adoption goal. The main object is to create digital medical records, including the entry of basic data and optimizing the utilization of EHR (Blumenthal and Tavenner 2010). In this study, we adopt “meaningful use” of the EHR to evaluate the system utilization.

The meaningful use has been reflected in many ways based on different levels of adoption (Blumenthal and Tavenner 2010). The basic usage of the system includes the entry of basic data: patients’ vital signs and demographics, active medications and allergies, up-to-date problem lists of current and active diagnoses, and smoking status. Healthcare organizations would benefit from the system by reducing information errors. To realize the full potential of EHR, the advanced use of EHR involves using records to enter doctor prescriptions and transferring data among different healthcare organizations. These activities can help improve decision making for nurses, doctors, and pharmacists. Cost and time saving can also be achieved.

Although EHR has benefits on improving service quality in healthcare (Blumenthal and Tavenner 2010), some barriers for EHR, such as low usage rate after introduction and the quality of records (Bernat 2013) are reported, resulting in underutilization of EHR. To overcome these barriers, healthcare organizations have emphasized organizational learning activities (e.g., learning-by-doing) as the means of obtaining new knowledge, assimilating the complex EHRs technologies, and further adopting them effectively (Reardon and Davidson 2007). Beside these learning-by-doing activities, the notion of learning-about also provides an excellent lens to rethink these barriers (Wang and Ramiller 2009). Knowledge from learning-about is important in overcoming organizational learning barriers because organization members may identify the ways to solve problems with their own knowledge base that reduces IT resistance and increases the likelihood of effective use. Insufficient use of knowledge from learning-about has been highlighted as one of the main causes of raising firms’ IT spending and idling adopted IT. Similar, in the context of adopting EHR, the successful EHR implementation relies on the organizational members’

thorough acceptance. These members are willing to adopt and co-create the value of EHR as they have realized the true potential of any EHR system and gained the proficiency in the characteristics of EHR prior to the adoption (Noblin et al. 2013). This leads to our first proposition:

Proposition 1: Knowledge of Learning-about EHRs directly impacts the meaningful use of EHRs.

Information quality

Existing studies assert that information quality is critical for organizations (Fisher and Kingma 2001; Nelson et al. 2005). To evaluate the adoption of such information systems, information quality is the other crucial aspect to be considered. Researchers defined information quality in different ways (DeLone and McLean 1992; Fisher and Kingma 2001; Nelson et al. 2005), but the common key aspects of it being identified are “accuracy,” “timeliness,” and “reliability.” Therefore, this paper uses these three factors to define the information quality in healthcare industry. Accuracy means that information for the clinical decision-making needs to be consistent with the real situation of the patient. Healthcare information need to be correct, consistent, and clear for interpretation. Timeliness indicates that the records are not out dated and should be available in time for the clinical decision making. Reliability refers to the dependability of the information; clinicians could rely on the record to make the decision or communicating with patients or other partners. It means besides being accurate and up-to-date, all records should also be complete and trustworthy.

A successful adoption of EHRs can improve the overall information quality when an organization correctly uses the system (Noblin et al. 2013). In the healthcare industry, EHRs are adopted by an increasing number of hospitals to provide accurate, comprehensive, and up-to-date information for clinicians to deliver high quality healthcare services. When the EHR is utilized properly, the quality of the information received by each party or individual can be improved because data digitalization can reduce the error and time cycle of the information flow within and between hospitals. Patients could receive a more accurate, reliable and faster service. This helps clinicians to make better clinical decisions and avoid preventable errors. For example, Noblin et al (2013) indicate that physicians are able to speed up to complete their medical documentation by using the features of the templates of EHR and auto text for filling up the complex medication’s name. Furthermore, the extent literature supports that using EHRs and sharing the information through the cloud are related to health records integration (Zhang and Liu 2010) and thus decrease information redundancy and errors. The above arguments lead to our second proposition:

Proposition 2: Meaningful use of EHRs directly impacts the healthcare information quality.

Absorptive Capacity

The role of absorptive capacity in organizational learning process attracts many researchers’ attention. In the past two decades, a substantial body of research applies the concept of absorptive capacity in various research stream in management information system, such as knowledge management (Alavi and Leidner 2001), IT governance (Sambamurthy and Zmud 1999), and IT business value (Bhatt and Grover 2005). Cohen and Levinthal (1990) originally identify three dimensions of absorptive capacity: identification, assimilation and exploitation. It is later extended into four dimensions: acquisition, assimilation, transformation, and exploitation knowledge (Flatten et al. 2011; Zahra and George 2002). This study follows this extended conceptualization and considers these four processes together for the absorptive capacity of the organization.

Acquisition reflects the process of identifying valuable knowledge from external resources, such as conferences, suppliers, and news. Assimilation means the process of understanding or interpreting the meaning of the knowledge. Transformation denotes the integration of new knowledge with current knowledge, preparing the knowledge ready for application (Zahra and George 2002). Exploitation illustrates the process of using the “integrated” knowledge to improve organization’s existing performance and generate new value. These processes reflect firms’ ability to highlight and apply new knowledge, which is critical to firms’ long term survival (Cohen and Levinthal 1990).

Research has emphasized that absorptive capacity enables firms to recognize and evaluate new IT and lead to the better understanding of IT potential, and react to these opportunities (Sambamurthy et al. 2003). Nevertheless, absorptive capacity is likely to moderate the effect of knowledge from learning-about on the outcomes of IT adoption. Although knowledge from learning-about is an important elements to enhance IT adoption performance (Noblin et al. 2013), its impact on meaningful use of EHRs may depend on the extent to which a healthcare organization can in identify, assimilate, and exploit such knowledge. Tsai (2001) suggests that obtaining a wealth of knowledge to increase organizational innovation and performance cannot be guaranteed unless organizations have enough capacity to absorb this knowledge. In other worlds, higher absorptive capacity helps a firm use their knowledge to have potential to foresee the innovation trends and grasp opportunities faster than other competitors with lower absorptive capacity (Cohen and Levinthal 1994). Without a serious consideration of absorptive capacity to be a moderator, it is hard to elucidate the relationship between knowledge and its impact on any outcomes (Tsai 2001). Thus, the last proposition is:

Proposition 3: The impact of knowledge from learning-about positively on the meaningful use of EHRs increases when the healthcare organization has a higher absorptive capacity.

METHODOLOGY

Instrument

Questionnaire was created based on the literature search of the constructs. The instrument was adapted from previously validated instruments. We adapted the 12-item scale developed by Lee and Strong (2003) to measure the knowledge about the EHRs in this study. The 5-item measurement about the meaningful use of the EHR was adopted from the regulation published by Department of Health and Human Services (DHHS) for the year 2011-2012. The 7-item information quality measurement was adapted from two previous studies. The measure for accuracy and reliable is adapted from Gattiker and Goodhue's (2005) study about the impact of enterprise resource planning system (ERP) implementation. The timeliness measure was adapted from Wang and Strong's (1996) study about the importance of data quality to data consumers. The 12-item absorptive capacity measurement was adapted from the scale that brought up by Flatten and colleagues (2011). In total, 36 questions are used to measure the relationship under investigation in this study.

Data Collection

The focus of this research is to explore the importance of organizations' learning-about process on the outcome of remote EHR adoption. We will collect data from the hospitals who adopt remote EHR in the United States. The unit of analysis is at the organization level. The data collection will be facilitated through Healthcare Information and Management System Society (HIMSS). A query was built to list hospitals currently using remote hosting EHR service. From this data pool, 2254 hospitals were identified to solicit the participation. Invitations for participation will be emailed to individuals tasked as CEO, CIO, CMIO or information system director via Qualtrics Survey Software.

CONCLUSION

We developed a conceptual model, proposing that the relationship between knowledge from learning-about IT and the outcomes of IT adoption is moderated by absorptive capacity. Relevant research related to organizational learning, IT adoption in healthcare and the elements of the research model are reviewed. Based on the review of the literature, relationships between the elements of the research model and three propositions were presented. The major contribution of this paper is to emphasize the concept of knowledge from learning-about EHRs in health care and demonstrate its impact on the outcomes of IT Innovation Adoption. This proposed model is likely to help scholars and practitioners understand the importance of pre-adoption knowledge about EHRs. The next step of our research is to collect data via the proposed methodology and analyzed with proper statistical method.

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