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Levels of EMR Adoption in U.S. Hospitals: An Empirical Examination of Absorptive Capacity, Institutional Pressures, Top Management Beliefs, and Participation

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Abstract

Technology adoption literature generally focuses on behavioral and structural changes necessary for successful adoption. Little explored in that literature is the factors impacting the level of adoption which will be achieved within the organization. This healthcare industry research demonstrates that higher levels of technology adoption in organizations require the influences of both internal absorptive capabilities and external institutional pressures impacting the organization. We surveyed U.S. healthcare employees to assess top management beliefs, top management participation, absorptive capacity, institutional pressures, and level of electronic medical records (EMR) adoption in clinics and hospitals. Our results indicate no direct influence of mimetic and coercive pressures on the level of EMR adoption. Normative and mimetic pressures indirectly influence EMR adoption level through top management participation. Absorptive capacity enhances top management beliefs and participation associated with EMR adoption process, resulting in higher levels of EMR adoption in U.S. hospitals.

Keywords Top management beliefs · Absorptive capacity · Top management participation · Institutional pressures · Level of EMR adoption

1 Introduction

The Health Information Technology for Economic and Clinical Health (HITECH) Act portion of the American Reinvestment and Recovery Act (ARRA) of 2009 has applied considerable pressure on most healthcare organizations in the U.S. to adopt electronic medical records (EMR). The stimulus law supplies payments for providers who demonstrate reaching the "meaningful use" standard of EMR adoption. An EMR created in a hospital and ambulatory environment serves as the legal record which provides source data for electronic health records (EHR) designed to improve the quality and efficiency of patient care (Garets and Davis 2006). Higher levels of EMR adoption play an important role in integrating patient-specific recommendations and medical tasks as well as determining the most optimal treatment solutions. The higher levels of integration and evaluation may ultimately help in establishing a knowledge-based decision support that improves medical quality (Yang et al. 2012). As a result, significant scholarly effort identifies factors which contribute to successful EMR adoption (Ash and Bates 2005; Dwivedi et al. 2015; Ford et al. 2006). In a recent study, 33% of the U.S. university psychology clinics use an EMR system and another 46% are planning to adopt, suggesting a wide variation in adoption of EMR technology within this clinic population (Cellucci et al. 2015). Another study conducted on independent hospitals in the U.S. states that adoption rates for all independent hospitals grew from 48% in 2008 to 77% by 2011 (Dranove et al. 2015). In 2012, EMR adoption rates were significantly higher for practices in rural areas (56%) versus those in urban areas (49%) (Whitacre 2015).

Despite the known benefits of EMR adoption, the present rate and level of adoption has increased significantly since 2011, yet almost 25% of clinics still do not utilize even a basic EHR system (Charles et al. 2015), creating an interesting research question both in theory and practice. Recent research finds that even the removal of technical, financial, and legal barriers are not sufficient to ensure that the anticipated benefits of EMR adoption will be realized (Boonstra and Broekhuis 2010). *Organizational* and *change processes* mediate the main six categories of EMR adoption barriers namely;

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financial, technical, time, psychological, social, and legal barriers. It is essential therefore that top management must be fluent in the timing and assessment of organizational capabilities in order to successfully implement change. Further, top management must stay current and flexible in order to be able to adapt their anticipated organizational change strategy to fit with a dynamic, competitive, and technological environment (Grimm and Smith 1991; Seethamraju 2015).

As top management initiates the organizational change strategy, management is often required to reconfigure the firm resources (Teoh et al. 2012; Zahra and George 2002). One key firm resource is absorptive capacity (ACAP). ACAP plays a major role in shaping top management beliefs and adoption intentions in the face of changing market conditions and governmental regulations (Teo et al. 2003a). Lee et al. (2014) demonstrate the role of ACAP in empowering leadership which positively impacts information sharing in an information technology project environment. Sharing of information benefits the organization by employees helping each other to reach organizational goals (Tang et al. 2015). ACAP is a dynamic organizational capability associated with the creation, sharing, and utilization of firm knowledge to develop and sustain a competitive advantage (Zahra and George 2002). ACAP is typically defined as "a set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability" (Zahra and George 2002, p. 186). Roberts et al. (2012) elaborate the exploitation component of the definition as the ability to transform and apply valuable external knowledge.

Early research on an organization's dynamic capability shows absorptive capacity as a key determinant of organizational change behavior (e.g., Mowery et al. 1996). In particular, ACAP facilitates managing the tacit component of transferred knowledge through a broad set of human capital skills. ACAP therefore helps internalize the adopted technology allowing for the modifications necessary to accommodate organizational change (Mowery and Oxley 1995). The dynamism exhibited by ACAP helps to further organizational change and firm evolution (Zott 2003), particularly in the face of changing market conditions (Todorova and Durisin 2007). The dynamic capability of ACAP alone cannot influence higher levels of adoption unless top management believes in the same and supports it. Thus, top management participation and top management beliefs play an important role in higher levels of EMR adoption in the U.S. hospitals. It is therefore our intent to examine those organizations focused on providing a broad range of healthcare services with sufficient organizational structure so that top management can be readily identified. A further review of those organizations to be sampled can be found in section 3.2.

External stimuli such as changing market conditions help inform top management "belief structures" (Walsh 1988), which provide a foundation through which administrative behaviors are guided (Liang et al. 2007). The organizational strategies and decision making behaviors are guided by senior management beliefs and assumptions focused on a desired organizational state (Shrivastava 1983). Top management beliefs guide managers and business units toward opportunities leading to the desired organizational state and away from the risk associated with adopting new technologies (Fang et al. 2014; Yang and Lee 2016). Research by Bharati et al. (2014) posit a significant positive influence of institutional pressures on top management. Thus, it may also be inferred that the external influences in the form of institutional pressures may also a play a major role in shaping top management beliefs and the amount of support provided.

Organizations adopt a variety of different strategies when responding to institutional forces, (DeVaujany et al. 2014) choosing to cooperate, challenge, manipulate, or even avoid the institutional environments (Oliver 1991). Flood and Fennell (1995) describe organizational mimicry of other companies who achieved successful adoptions when the technology or system to be adopted is not well understood by the organization. Examining the complex organizational and political environment, which exerts external pressure on healthcare organizations, provides an opportunity to gain insight into how those institutional forces influence the mechanics that determine the level at which EMR will be adopted. Institutional forces including ACAP may have a significant impact on the level of technology adoption such as EMR in healthcare organizations.

As stated previously, ACAP enhances an organization's ability to acquire and exploit new technologies in changing market conditions (Zahra and George 2002) impacting top management beliefs and participation (Walsh 1988). Sun and Qu (2015) pointed out that most of the previous studies on health information technology (IT) adoption including EMR focused on individual-level factors and the need for more organizational level studies. A study by Crosson et al. (2005) posit that EMR adoption and implementation require higher levels of collaboration and considerable change in organizational culture. Their study suggests decision makers must address implementation issues by encouraging communication to allow conflicts to surface in a safe environment. This often demands that top management plays a major role in the process. Yet, there is a scarcity of empirical research on how ACAP influences top management beliefs and participation in technology adoption in healthcare organizations, which this study seeks to address. It has been noted that there exists a high level of variance associated with the level of EMR adoption in U.S. hospitals and clinics (Cellucci et al. 2015; Charles et al. 2015). Some research indicates that top management beliefs may play a role in the adoption of technology such as EMR in hospitals and clinics (Chatterjee et al. 2002), however what is little understood is the influence institutional pressures may have on framing top management beliefs and ensuring top management participation, particularly related to the level at which technology such as EMR is adopted. Therefore, this research examines the external influences such as institutional pressures (e.g. mimetic, coercive, and normative pressure) and the internal influences such as absorptive capacity, top management beliefs, and participation on the level of EMR adoption in U.S. hospitals and clinics.

2 Theoretical Model

2.1 Theoretical Overview

Theories of absorptive capacity (ACAP) propose that knowledge gained from prior experience facilitates the identification, selection, and implementation of practices within the organization to create a sustainable competitive advantage (Lenox and King 2004). Cohen and Levinthal (1990) note that knowledge gained from the firm's prior experience with technologies determines the ability of the firm to adopt new technologies and practices. Cohen and Levinthal (1990) also conclude that in order to sustain the economic rents from ACAP, organizations require "the transfer of knowledge across and within sub-units that might be quite removed from the original point of entry" (p.131). Lenox and King (2004) propose top management has a role to play in helping information flow throughout the organization in order to successfully adopt valuable new practices or technologies. Further, they note a manager's ability to successfully adopt new practices or technologies is contingent on ACAP and the distribution of technology adoption related experiences within the firm. There is anecdotal evidence that ACAP along with previous related experience increase the probability of that new technology successful adoption. For example, 'Design for Manufacturability' and 'Design for Serviceability' helped the management at Xerox to successfully adopt 'Design for Environment' thus improving environmental and financial performance (Lenox et al. 2000). As firms further develop ACAP, information increases across the firm which may indicate a higher degree of upper management awareness (Lenox and King 2004).

Adoption of new information technologies may be encouraged by management (Leonard-Barton and Deschamps 1988) or mandated by management (Moore and Benbasat 1991) indicating top management's role in the adoption of new technologies such as EMR. Research demonstrates that organizations do not utilize a binary decision of either to adopt or reject when facing technology adoption choice, but instead choose what level of adoption to undertake (Bayer and Melone 1989). It has been noted, "For some organizations, IT activities represent an area of great strategic importance; for other organizations, they play and appropriately will continue to play a cost-effective and useful role but one distinctly supportive in nature" (Cash et al. 1988, p. 76). The role of top management support and participation in IT project implementations are well documented (Doll 1985; Lederer and Mendelow 1988; Rockart and Crescenzi 1984; Young and Jordan 2008). EMR adoption, an important IT initiative, is highly supportive of the mission of healthcare organizations, but it requires top management participation for its successful adoption.

Additionally, the level of technology adoption depends on the dynamics of the relevant community, either individually or organizationally. Adoption levels vary dramatically as can the critical mass associated with network externalities (Katz and Shapiro 1986). Coercive institutional pressures (e.g. governmental regulations) exert considerable influence on the types of technology organizations select for adoption as well as the practices associated with its adoption (Lenox and King 2004).

While organizations confront changing external market conditions such as technological change or external influence in the form of governmental regulations, management must also manage a myriad of internal changes such as personnel interests and informal relationships of institutional commitments. Although the extent of institutionalization may vary from one organization to another, no organization is completely immune from either internal and/or external pressures (Scott 1987). In fact, institutional theory postulates that how organizations respond to change pressures (internal and/or external) are ultimately constrained by established social rules (Burger and Luckman 1991; Selznick 1949; Silva and Figueroa 2002). Therefore, institutional theory is used extensively in organizational research exploring external influences on technology and innovative practice adoptions (DiMaggio and Powell 1983; Fligstein 1985; Meyer et al. 1987; Wiredu 2012), technology adoption in healthcare organizations (Covaleski et al. 1993), and the influence on top management beliefs and participation (Liang et al. 2007; Teo et al. 2003b).

Further, institutional forces may have a beneficial impact on resource allocation, such as ACAP, which drive a sustainable competitive advantage for firms (Oliver 1997). As technology is increasingly seen as the driver of competitive advantage in healthcare (Sheng et al. 2013), it is institutional forces which are most likely to influence resource-based decisions (Zhang and Dhaliwal 2009). Focusing on institutional pressures helps in understanding and evaluating the influence of external factors on the level of EMR adoption by U.S. healthcare organizations, particularly given the complex organizational and political environment in the U.S. healthcare information systems (Heathfield et al. 1999).

The overarching reason for the institutionalization of technology is to attain isomorphism and thereby legitimacy (DeVaujany et al. 2014; DiMaggio and Powell 1983).

Institutional theory traces its origin to the disciplines of economics, sociology, political science, history, and ecology, and mainly examines the "effects" or "processes" of institutionalization (Bharosa et al. 2010; Currie 2009). Institutional pressures affect the extent of technology adoption in a variety of ways. When managers perceive high levels of uncertainty regarding the results of the technology being adopted they tend to mimic the actions of other organizations deemed successful with similar adoptions (Flood and Fennell 1995). Governmental regulatory pressure enacted through HITECH Act is reflective of coercive pressure designed to encourage organizations to adopt certain technology (Edelman and Suchman 1997). Thus, coercive pressure may result from interaction or dependencies with other organizations, but also may be formalized through external pressure applied from governmental regulations and policies (Doolan and Bates 2002). ACAP is a dynamic dimension (Zahra and George 2002) dependent on previously amassed firm knowledge. Therefore, ACAP is a key factor in EMR adoption within a healthcare organization. The dynamic nature of ACAP influences organizational change (Teece et al. 1997) helping to maintain a sustainable competitive advantage for the firm (Zahra and George 2002). ACAP is reflective of four organizational capabilities each building on the other and include; knowledge acquisition, assimilation, transformation, and exploitation (Zahra and George 2002). The capabilities developed for ACAP can be seen as using problem solving skills which top management leverage to increase participation across the firm (Kim 1998). A firm's ability to effect organizational change is dependent on knowledge modification which is developed through the transformation dimension (Kim 1998). Schmidt et al. (2001) identify top management support and participation as factors critical to the successful adoption of IT projects.

The model by Zahra and George (2002) helps to define how ACAP assists in creating sustainable competitive advantage without taking into consideration the role of external factors and other internal factors in different levels of adoption of technology in organizations. However, the relationships among the absorptive capacity, institutional pressures, and top management championship on different levels of EMR adoption are still unclear. Following Jarvenpaa and Ives (1991) and Liang et al. (2007), we operationalize the concept of top management championship in two separate dimensions: top management beliefs (TMB) and top management participation (TMP). We suggest specific external and internal mechanisms influencing EMR adoption and examine how they influence different levels of adoption of EMR. To structure our analysis, we discuss three types of institutional pressures in our study: (1) normative pressure (2) coercive pressure (3) mimetic pressure, two types of top management championships: (1) top management beliefs (2) top management support, and absorptive capacity.

2.2 Hypothesis Development

Participation refers to the behaviors and activities performed by individuals within organizations (Barki and Hartwick 1989). Top management participation refers to the extent to which top management actively participates in technology adoption (Liang et al. 2007). This research defines top management participation as the substantial personal involvement and/or interventions in the adoption process of EMR within the organization. Interventions or involvement relates to planning, development, and/or implementation. Top management participation entails the personal investment of time and energy in the adoption process (Jarvenpaa and Ives 1991), and it is identified as an important factor necessary for successful information technology (IT) adoption and implementation (Sanders and Courtney 1985). For successful participation, top management should believe in the benefits resulting from higher levels of EMR adoption. Further, specific to the healthcare environment, access to technology is less of a significant influence than active participation in the adoption process (Cabell et al. 2001). Additionally, single to limited exposure to technologies leads to limited adoption (Simon and Soumerai 2005). Adoption research identifies the need for active participation to achieve a positive result, however what remains yet unexplored is the examination of specific drivers of adoption rates in healthcare (Bradley et al. 2002; Erickson and Warner 1998; Haynes et al. 2006; Magrabi et al. 2007).

Top management beliefs refer to the extent top management considers the technology to be adopted as potentially beneficial to the organization (Liang et al. 2007). In this study, top management beliefs refer to the extent top management considers EMR adoption will benefit the organization. In the healthcare environment, management through organizational and administrative oversight and encouragement serve to impact the effectiveness and utilization of technology to be adopted (Perednia and Allen 1995). In a study of information system professionals in healthcare organizations, the leading antecedent for successful technology integration are identified as healthcare organization overview (HOO) (Wu et al. 2009). Further, measures associated with HOO are specific to performance expectations which align to the beliefs held by top management and evidenced by organizational objectives, success factors, performance, competition, and environment (Wu et al. 2009). This previous research shows top management beliefs toward the technology to be adopted significant for adoption effectiveness. Additionally, top management participation in the implementation of IT projects facilitates the adoption process. For example, top management may assign the necessary resources for successful IT adoption initiatives (Rockart 1988), develop high level policies and objectives affecting communication and control (O'Toole and O'Toole 1966), or plan and monitor processes which encourage effective employee relationships between IT teams and line managers to ensure successful implementation (Rockart and Crescenzi 1984).

Absorptive capacity helps organizations recognize the value of new technology, assimilate it, and apply it to commercial ends (Cohen and Levinthal 1990) and hence, the higher the absorptive capacity of the organization, the higher the confidence of top management to invest in new technologies. Elbashir et al. (2011) discuss the influence of organizational controls related to technology adoption and find the impact of top management on effective adoption primarily depends on the operational managers and organizational absorptive capacity. Absorptive capacity of an organization influences the direction and intensity of adoption for knowledge-intensive practices (Lund Vinding 2006). As healthcare organizations increase absorptive capacity, top management beliefs and support for adoption of technology increase due to improved performance and subsequent competitive advantage. Kash et al. (2013, p. 345) examine the role of ACAP in administrative support for healthcare applications, and find "initiatives that are clearly understood by the administrative team, as reflected in how well the respondents could define the initiative to the research team, are more likely drawing upon realized ACAP dimensions that help them with internalization, transformation, and exploitation of knowledge related to the initiative." This indicates absorptive capacity plays a major role in top management participation and belief in the adoption of EMR in healthcare organizations. Hence we hypothesize,

H1a: The level of ACAP positively influences top management beliefs regarding the successful implementation and benefits from the adoption of EMR.
H1b: The level of ACAP positively influences top management participation within the healthcare organization on the adoption of EMR.

New technologies and innovations require top management to explore and exploit firm resources (Smith and Tushman 2005) therefore, top management beliefs about the technology is important. Studies examining the causal link between top management beliefs and top management participation indicate top management beliefs and participation are strongly associated with their enthusiasm for the project, compatibility of the technology with firm goals, perceived advantages which may result from the technology adoption, and knowledge of the company's employees about computers (Mirchandani and Motwani 2001). Liang et al. (2007) posit top management beliefs play a major role in the level of adoption of ERP in organizations. Further, in a study of healthcare organizations, interactional justice could account for enhanced effectiveness of the technological adoption (Karsh 2004). Top management beliefs and participation are noted as providing benefits for the employees enhancing the adoption process (Karsh 2004). Hence we hypothesize:

H2a: Positive top management beliefs toward the benefits of technology adoption lead to increased top management participation in the EMR adoption process within the healthcare organization.
H2b: Top management beliefs mediate the relationship between absorptive capacity and top management participation in the EMR adoption process within the healthcare organization.

Jarvenpaa and Ives (1991) study four different industries and propose a positive relationship between top management support and progressive use of information technologies. Premkumar and Roberts (1999) identify top management support as one of the major factors influencing the adoption of various communication technologies by small businesses located in rural U.S. communities. Thong (1999) identifies top management support as one of the possible determinants of organizational adoption of technologies. Mirchandani and Motwani (2001) conceptualize top management's enthusiasm, support, compatibility, and relative knowledge of the company's employees as playing a major role in technology adoption in small and medium enterprises. Thus, top management participation is critical in creating a supportive climate and providing adequate resources for higher levels of adoption of new technologies.

Top management support is identified as the key recurring factor for higher levels of technology adoption successfully in both large and small businesses (Cerveny and Sanders 1986; DeLone 1988). Kwon and Zmud (1987) show higher levels of technology adoption occur when sufficient organizational resources are directed toward first motivating and then sustaining the adoption efforts. Lucas (1981) posit top management support is crucial for higher levels of adoption of technology, arguing top management ensures sufficient allocation of resources and acts as a change agent creating a more conducive environment for higher levels of technology adoption. According to Weill (1992), strong top management support helps overcome resistance or organizational barriers (Kankanhalli et al. 2016) to higher levels of adoption which may exist within organizations. Further, top management support leads to superior conversion effectiveness by ensuring higher levels of adoption of technology and productive outputs from technology adoption investments (Weill 1992). A management level champion is critical for the success of implementing technology adoption within healthcare (Gagnon et al. 2012). Hence we hypothesize,

H3: Top management participation in the EMR adoption process increases the level of EMR adoption within the healthcare organization.

Liang et al. (2007, p. 59) conceptualize "mimetic pressures positively affect top management beliefs, which then positively affects top management participation in the Enterprise Resource Planning assimilation process". Organizations working in similar environments tend to mimic behaviors of others based on several factors including the critical mass or number of organizations mimicking the behavior, the perceived similarity in organizations engaging in such behaviors (Krassa 1988), or the perceived outcome (Haunschild and Miner 1997). This mimicking is used to avoid embarrassment of being less innovative or less responsive (Fligstein 1985). Top management exhibit a tendency to imitate behaviors by structurally equivalent organizations perceived as successful (Teo et al. 2003b). Particularly relevant to the healthcare environment, mimetic pressure can be exceptionally strong due to the structure of the U. S. healthcare environment. Regardless of how specialized medical practices are, operating independently becomes challenging. The connections among top management through industry associations, community organizations, and academic journals provide high levels of mimetic pressure, particularly associated with high profile adoptions such as EMR (Sherer 2010). These findings are the basis for our next two hypotheses.

H4a: High levels of mimetic pressure increase top management participation in EMR adoption within the healthcare organization.
H4b: High levels of mimetic pressure lead to increased levels of EMR adoption within the healthcare organization.

Coercive pressures are formal and informal pressures exerted on firms by organizations in which they are dependent (Guler et al. 2002). The coercive pressure for technology adoption stems from the governmental agencies (Park and Luo 2001), dominant suppliers or customers (Teo et al. 2003b), or indirectly from the industry associations (Liang et al. 2007). The high regulation within the healthcare sector (Walshe and Shortell 2004) increases coercive pressure to adopt technologies such as EMR to show conformity and gain legitimacy (Zucker 1987). Legitimacy is embraced to gain approval from other organizations in the same industry and also from society (Droege et al. 2011). The role of coercive pressure on technology adoption is already recognized (Chwelos et al. 2001; Hart and Saunders 1997), and it is therefore logical to assume that the higher the coercive pressure, the higher the extent of adoption.

Liang et al. (2007) also posit a significant positive relationship between coercive pressure and level of adoption of technology in organizations. The need to comply with legislation or regulatory requirements is of paramount importance in healthcare industry (Poba-Nzaou et al. 2014). Top management is likely to experience coercive pressures such as governmental regulations associated with EMR and is therefore more likely to conform to industry standards regarding EMR adoptions. Coercive pressure and incentives provided by the stimulus law for providers (only those who reach "meaningful use" standard) are likely to influence higher levels of top management participation for higher level of EMR adoption within the healthcare organization. Top management is responsible for the fiscal security of the healthcare organization. The present regulatory environment which provides both penalties and incentives associated with certain technological adoptions further increases the coercive pressure on top management. These enhanced pressures increase top management participation in the adoption process in an effort to ensure a successful implementation (Sherer 2010). Hence we hypothesize,

H5a: High levels of coercive pressure lead to increased top management participation in EMR adoption within the healthcare organization.
H5b: High levels of coercive pressure lead to increase levels of EMR adoption within the healthcare organization.

Norms embraced by business and professional circles positively influence top management beliefs to adopt technology when the organizations adopting the technology demonstrate strong recognition, high visibility, and substantive influence (DiMaggio and Powell 1983). Senior managers often possess high institutional norms knowledge and play an important role in the integration of new technology adoption (Davenport 1998; Mitchell 2006). Normative pressure of technology adoption stems from professionalization, which in turn is directly related to the establishment of legitimacy (Lai et al. 2006). Normative pressures for technological adoption originate or permeate through channels of professional associations, conferences, suppliers, customers (Liang et al. 2007), or from interpersonal relationships between top level managers from different organizations (Lee and Dawes 2005; Park and Luo 2001). Teo et al. (2003b) posit that norms arising from more extensive adoptions of technology among similar organizations exert a strong positive influence on top management to adopt similar technology in their institutions. Furthermore, in the healthcare environment, the need to comply with governmental regulations drives technology adoption in medical practices. Normative pressures also increase for top management as technology adoptions from peer institutions increase (Sherer 2010). Additionally, physicians in top management positions who interface with larger institutions who have adopted EMR are exposed to increased levels of normative pressure to comply, driving their participation in adoption. Further, as more institutions and practices move past adoption and begin to generate positive results, top management will experience normative pressure impacting their opinion of possible benefits from a technology adoption (Sherer 2010). Hence we hypothesize:

H6a: High level of normative pressure increase top management participation in EMR adoption within the healthcare organization.
H6b: High levels of normative pressure lead to enhanced top management beliefs regarding the benefits of EMR adoption within the healthcare organization.

The study's research hypotheses, which encompass both external influences including normative, coercive, and mimetic pressures, and internal influences including absorptive capacity, top management beliefs and top management participation in the level of adoption of EMR in U.S. hospitals, are displayed in the research model provided in Fig. 1.

3 Research Methodology

3.1 Survey Design

In order to capture the determinants of EMR adoption level in U.S. hospitals and clinics, a survey approach was adopted targeting employees active in the healthcare industry. The survey was designed to measure six antecedent constructs affecting different levels of EMR adoption within the organization: internal elements-absorptive capacity, top management beliefs, top management participation, and external elements; mimetic, normative, and coercive pressure. For this research we examine the role absorptive capacity of the organization has on the level of EMR adoption. From this perspective it is necessary to evaluate what top management believes about EMR adoption and to what level they are perceived to support the adoption. To that end, we adapted an established measurement scale that captures organization level perspective of absorptive capacity (Liang et al. 2007). Maintaining this singular point of view is essential when examining absorptive capacity, as this in an organization level variable.

The perspective of top management regarding their beliefs and support has little impact on what the organization perceives. The organizational staff will be implementing the adoption so it is their perception regarding what top management believes and how much support they offer that is measured in this study. This is even more important for research that demonstrates the disparity which may exist between what organizational staff and employees perceive as top management beliefs and support from what top management perceives their beliefs and support to be. This is well discussed in the seminal article on organizations as interpretation systems by Daft and Weick (1984). Therefore for this research, what top management actually believes and offers in support of EMR adoption is not germane to this research. The survey instrument for absorptive capacity, top management beliefs, and top management participation were adapted from existing scales by Liang et al. (2007). The scales for coercive, mimetic, and normative pressures were derived from preexisting scales by Srinivasan et al. (2002) and Liang et al. (2007) and were adapted to fit the setting for this study. The scales for level of EMR adoption were adapted from the scales used by Srinivasan et al. (2002) (scales can be found in Appendix Table 5). The absorptive capacity, top management participation, normative pressure, coercive pressure, mimetic pressure, top management beliefs, and level of adoption scales were rated on a 7 point Likert type scale.

3.2 Sample Frame

The sample frame is essential in defining a pool of potential respondents that is representative of the population to be studied (Malhotra and Grover 1998). This sample is representative of medical professionals who are responsible to comply with

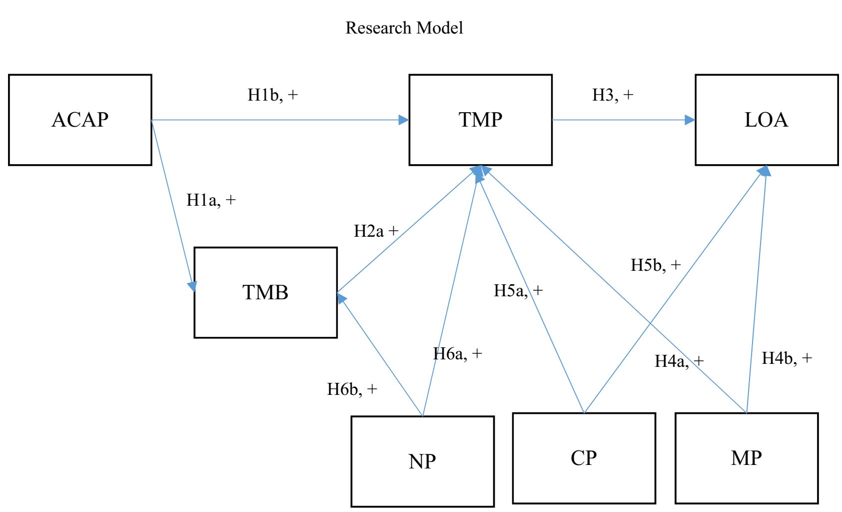


Fig. 1 Research Model. ACAP: Absorptive Capacity; TMP: Top Management Participation; TMB: Top Management Beliefs; NP: Normative Pressure; CP: Coercive Pressure; MP: Mimetic Pressure; LOA: Level of Adoption

the federal regulations associated with electronic medical records. While the more recent regulations associated with electronic medical records, HITECH and ARRA (both 2009), require more stringent compliance by healthcare providers, the covered entities are affiliated with the Health Information Portability and Accountability Act (HIPAA) of 1996. According to HIPAA 45 C.F.R. Part 162; “Every health care provider, regardless of size, who electronically transmits health information in connection with certain transactions, is a covered entity” (Act 1996). However, we are specifically examining the impact of top management in the adoption of electronic medical records which provides complexity with regard to the single physician practice. It might be difficult for a respondent in such a practice to identify “top management”, as it could be the office manager, the physician’s spouse, the bookkeeper, or the physician. Therefore, we specifically excluded single physician practices from the sample frame. The sample frame broadly included employees of healthcare organizations as follows; university affiliated health systems, medical centers, hospitals, and nursing homes. Due to the organizational structures of these facilities, it should be clear to all employees who represents the top management of their organization. Through contact with over 400 healthcare employees with whom we had access to their contact information, we generated a sufficient sample frame which is representative of the breadth of healthcare providers affected by electronic medical records regulation, which also had identified and recognized top management.

3.3 Pretesting

To assess the instrument, a preliminary online survey was conducted with undergraduate students at a university in the southwestern U.S. The sample consisted of 32 students. The study examined if the measurement items could be fully understood and to avoid “item characteristic” effects due to ambiguous items that might lead to unreliable answers. Respondents provided feedback and the necessary changes were made prior to the main study among healthcare employees in U.S. hospitals and clinics. The undergraduate student responses were not used in the analysis.

3.4 Study Demographic and Summary Statistics

We used the contact information of 410 healthcare employees enrolled in the online healthcare MBA program to whom we sent the online Qualtrics survey link. We allowed respondents to choose to give personal information or remain anonymous (for the identity of both the respondent and the company) to avoid “common rater” effects from respondent’s perceived need to provide consistent or socially desirable answers. We received 233 responses. From those responses, 42 respondents failed to complete the survey, so their responses were removed from the sample, resulting in $n = 191$. Online survey data may contain responses which skew the data due to heightened lack of attention. Two of the most prevalent discussed in the literature are careless (C) (Meade and Craig 2012) or insufficient effort (IE). Practical estimates have indicated that these types of responses can be as high as 30% of the collected data (Burns et al. 2014). Including C/IE responses in data can have a negative impact on the analysis and can result in inaccurate or inappropriate conclusions (Huang et al. 2015; Maniaci and Rogge 2014). For these reasons, a significant effort was undertaken to clean C/IE responses from the data prior to analysis.

One manner in which participants manifest C/IE responses is through the selection of some singular response selection to virtually every question (Curran 2016). These forms of C/IE responses known in the literature as ‘long string analysis’ or ‘response pattern indices’ (Huang et al. 2012; Meade and Craig 2012), were carefully screened for using response pattern indices, to make sure that the data being removed were truly invalid (Huang et al. 2015). A key indicator was maintenance of the string or pattern across the 4 reverse coded items in the survey. The result of the analysis was the removal of forty one responses C/IE responses. The second main indicator of C/IE responses is known as speed of response or response time. Normal or average response time will obviously differ by survey content and length (Curran 2016). Huang et al. (2012) have suggested that one method for determining a minimum acceptable response time for a survey item is 2 s. According to Curran (2016) this method is gaining approval as a useful measure across those fields which heavily rely on online survey data. To determine an acceptable response time cut-off, response time from the pilot study and average response time from the actual study along with the 2 s rule. When determining the statistic to eliminate invalid responses, the lowest average was utilized as it most closely approximated the 2 s rule. The result of the response time analysis was a removal of three responses, all of which were extremely rapid response rates exceeding the 2 s rule indicating C/IE responses. As a result of this further cleaning of the data, the final respondent set is $n = 147$ for use in the final analysis. Thus, we had an overall response rate of 57% with a 63% overall acceptance rate. A wide variety of employees working in U.S. healthcare organizations responded to the survey including; Administrators (54.6%) Medical Staffs (13.8%), Medical Records (4.6%), Nursing Services (8.5%), Diagnostic and Therapeutic Facilities (5.4%), Pharmacy (0.8%), Dietary Services (0.8%), General (8.5%), Emergencies (1.5%) and Infection control (1.5%). Disclosure of the organization type was optional, yet respondents disclosed the following organizations: hospitals (medical centers) and affiliated clinics (54.2%), healthcare services (24.8%), healthcare systems (12%), home-health and nursing homes (4.8%), university affiliated healthcare providers (4.2%).

Overall, the demographic breakdown of the respondents was Caucasian (Non-Hispanic) (41.9%), African American (28.1%), Hispanic (16.3%), Asian (6.3%), Native American (0.6%), and other (6.9%). The majority of the respondents were 25–34 year old (45%) and 35–44 years old (29.3%). As the survey was conducted among working healthcare employees enrolled in a MBA healthcare program, the sample was highly educated with 78.8% Bachelors degree and 13.1% Masters degree. The remaining respondents consisted of Doctorate (5%), professional degree 2.5% and Associate degree of 0.6%. The distribution of respondents' work experience for his/her current employer is as per the following 0–1 year (19.4%), 1 to 3 years (36.3%) and 4–6 years (20.6%), 7–9 years (11.3%), 10–15 years (8.8%) and more than 15 years (3.8%).

4 Analysis and Results

The survey provided respondents with assurances of anonymity and security of their responses. The survey items were carefully crafted to minimize complexity and ambiguity and subsequently validated through the pretest to help control for common methods variance (Podsakoff et al. 2003). Structural equation modeling (SEM) using Amos 21 was used to analyze the data. SEM requires a two-step methodology, in which a measurement model examines the fit of the data to the model, followed by a structural model examining the hypothesized relationships within the model (Anderson and Gerbing 1988; Krishnaraju et al. 2016; Schaupp and Carter 2010).

We examined the construct reliability, convergent, and discriminant validity of the constructs. The results are shown in Table 1. Convergent validity was examined through average variance extracted (AVE) which focuses on the shared or common variance of the latent variables in the study (Hossain et al. 2016). AVE of around 0.5 or higher was observed for each construct indicating acceptable convergent validity (Dillon and Goldstein 1984). Further support for convergent validity was provided by Composite Reliability (CR), whose values are greater than AVE (Hair et al. 2010). Discriminant validity was demonstrated through Average Shared Variance (ASV), having values less than the AVE (Hair et al. 2010). Furthermore, the maximum shared variance (MSV) of constructs were lower than average variance extracted (AVE), ensuring the discriminant validity (Sharma 2017). Reliability was assessed using Cronbach's coefficient with all the constructs exceeded the minimum recommended value of 0.6 (Black and Porter 1996; Nunnally et al. 1967). We also examined the composite reliability scores as an additional source for validity. Each latent variable exceeded the commonly accepted reliability threshold value for composite reliability of 0.7 or greater, as suggested by Hair et al. (1998) and Sabi et al. (2017). The mean, standard deviation (SD), factor loadings of item measures, CR, and AVE for all the constructs in this study is given in the Table 1. In order to further assess validity of our measurement instruments, a cross-loadings table (Table 2) was constructed, as suggested by Gefen et al. (2000). Factor structure was examined through factor loadings and cross-loadings. SPSS 24 using principle components analysis with varimax rotation was used in the analysis. The resulting analysis demonstrate a Kaiser-Meyer-Olkin (KMO) measure of 0.837 in excess of minimum standard of 0.7 indicating good sampling adequacy (Cerny and Kaiser 1977). Further the variables in the analysis represent 73.13% of the variance explained exceeding the minimum of 60.00% (Hair et al. 2010). All items load on their intended construct in excess of 0.5 and have at least a minimum load difference with other construct in excess of 0.20, further supporting convergent and discriminant (Hair et al. 2010). The factor loading and cross-loading table can be found in the Table 2.

To validate the constructs, confirmatory factor analysis (CFA) was used within structural equation modeling (Vaidya and Campbell 2016). We used Amos 21 to do CFA. AMOS uses a covariance based approach in which the covariance structure derived from the collected data is simultaneously used to fit both measurement and structural equations contained within the model (Dwivedi et al. 2017. As per the institutional theory "institutional pressure is a second-order

Table 1 Means, standard deviations, reliability and validity of the constructs

	Mean	SD	CR	AVE	MSV	ASV	TMB	ACAP	LOA	TMP	IP
TMB	5.98	1.01	0.846	0.652	0.403	0.303	**0.808**				
ACAP	5.37	1.15	0.824	0.612	0.551	0.359	0.581	**0.782**			
LOA	5.68	0.85	0.775	0.545	0.460	0.292	0.376	0.566	**0.738**		
TMP	5.75	1.11	0.943	0.846	0.551	0.409	0.574	0.742	0.678	**0.920**	
IP	5.50	0.84	0.955	0.876	0.403	0.293	0.635	0.476	0.496	0.546	**0.936**

Legend: Square Root of AVE in Bold

TMB, Top Management Beliefs; *ACAP*, Absorptive Capacity; *LOA*, Level of Adoption; *TMP*, Top Management Participation; *CR*, Composite Reliability; *AVE*, Average Variance Extracted; *MSV*, Maximum Shared Variance; *ASV*, Average Shared Variance

Table 2 Factor Loadings and Cross-Loadings

	ACAP	TMB	TMP	LOA
ACAP_1	**0.777**	0.155	0.213	0.092
ACAP_2	**0.830**	0.246	0.195	0.000
ACAP_3	**0.739**	0.182	0.177	0.058
TMB_1	0.177	**0.886**	0.145	0.034
TMB_2	0.170	**0.856**	0.159	0.174
TMB_3	0.240	**0.695**	0.163	−0.025
TMP_1	0.308	0.340	**0.722**	0.159
TMP_2	0.434	0.323	**0.759**	0.074
TMP_3	0.392	0.224	**0.768**	0.084
LOA_1	−0.078	0.083	0.194	**0.752**
LOA_2	0.010	−0.003	0.365	**0.846**
LOA_3	0.064	0.070	0.144	**0.746**

Extraction Method: Principal Component Analysis with Varimax Rotation Rotation Method: Varimax with Kaiser Normalization

The bold symbol shows that all items load on their intended construct exceeded 0.5 and have at least a minimum load difference with other construct in excess of 0.20, further supporting convergent and discriminant validity

ACAP, Absorptive Capacity; *TMB*, Top Management Beliefs; *TMP,* Top Management Participation; *LOA,* Level of Adoption

construct consisting of the three first-order factors coercive, mimetic and normative isomorphism" (Colwell and Joshi 2013, p.82). We created a second order construct with institutional pressures (as performed by Colwell and Joshi 2013) and proceeded with the confirmatory factor analysis. The five factor measurement model with Institutional pressure (including mimetic, coercive, and normative pressure), Level of Adoption, Top Management Beliefs, Absorptive Capacity, and Top Management Participation) showed an acceptable fit with $\chi2$ (df) = 282.162 (165), $p < 0.000$, and Normed $\chi2 = 1.710$ which is below 4.0 as recommended by Kline (2010). The relative fit indices of IFI = 0.926, TLI = 0.903 and comparative fit indices of CFI = 0.924, all exceed the recommended fit threshold of 0.9 (Hu and Bentler 1999). RMSEA of 0.069 is less than 0.08 as recommended by Hu and Bentler (1998).

4.1 Common Method Bias

To reduce the likelihood of common method variance, care was taken in the design and administration of the questionnaire by mixing the order of the questions (Podsakoff et al. 2003). To determine if common method bias is a problem, we conducted the Harman's one-factor test to ensure no common method bias (Craighead et al. 2011; Wong et al. 2015). For this we used SPSS 24.0 to run a factor analysis using principle axis factoring on all measurement items by extracting factors after setting number of factors to extract to 1, with no rotation. The percentage of variance explained by a single factor was 34.11%. Moreover, five factors exhibited the majority of the variance. Next we used AMOS 21.0 to run a common latent factor model. The fitness indices for the single factor model indicate an unacceptable fit $\chi2$ (df) =841.336 (189), $\chi2/df = 4.452$, NFI = .510, RFI = .455, IFI = .573, TLI = .519, CFI = .567, and RMSEA = .154. Also the chi-square difference between the single factor and seven factor models were statistically significant ($\Delta\chi2 = 559.17$; $\Delta df = 24$; p value is <0.001).

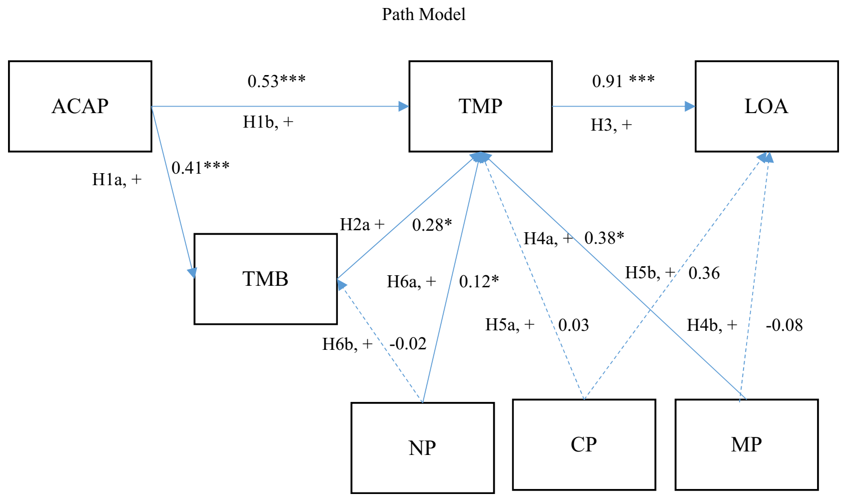
After establishing the satisfactory fit of the data through measurement model and the limited likelihood of common method bias influence, we move forward to hypothesis testing utilizing a structural model. The structural model was fit to test not only the internal organization elements but also the hypothesized differential relationships of the external elements of institutional pressure among the constructs. As established earlier by Colwell and Joshi (2013) institutional pressure is comprised of three distinct factors mimetic, coercive, and normative pressure. Therefore, to facilitate hypothesis testing associated with each constructs unique relationship(s), institutional pressure was modeled utilizing the first order factors (mimetic, coercive, and normative pressure) following the steps suggested by Kline (2010) and Becker et al. (2012) within the structural model. Figure 2 is the path model with the path weights and significance labeled.

5 Results

5.1 Path Model

The results of the path analysis reveal strong fit indices for the model $\chi2$ (df) =290.665 (172), $p < 0.000$, and Normed $\chi2 = 1.69$, IFI = .925, CFI = .923, TLI = 0.906 and RMSEA = 0.069. Examination of individual model paths (Fig. 2) shows significant positive paths between absorptive capacity with top management beliefs and top management participation

Fig. 2 Path Model. Legend: * $p<.05$, ** $p<.001$, *** $p<.0001$; Dotted lines: Non-significant relationship; ACAP: Absorptive Capacity; TMP: Top Management Participation; TMB: Top Management Beliefs; NP: Normative Pressure; CP: Coercive Pressure; MP: Mimetic Pressure; LOA: Level of Adoption



providing support for H1a and H1b. Top management participation has significant influence on the level of EMR adoption within healthcare organizations supporting H3. Also, stronger top management beliefs about the benefits of EMR adoption had a significant positive impact on top management participation in the EMR adoption process supporting H2a.

However, the structural model failed to find support for H4b or H5b. Therefore, neither coercive pressure nor mimetic pressure were found to have any significant relationship with the level of EMR adoption in healthcare organizations. This finding validates the Healthcare Information and Management Systems Society (HIMSS) Analytics argument that healthcare organizations may adopt EMR because of governmental pressure however, the level of adoption will be dependent on a variety of organization specific factors and the time it takes for hospitals to adopt EMR to the fullest extent may take two to three years (Garets and Davis 2006). Normative pressure surprisingly demonstrated no significant role in shaping top management beliefs about the benefits from higher levels of EMR adoption thus rejecting H6b. However, normative pressure and mimetic pressure demonstrated significant relationships with top management participation in the EMR adoption process thus supporting H4a and H6a. The results of our study indicate the role of external influences from institutional pressures, internal influences from top management beliefs, and top management participation on the level of adoption of EMR in healthcare organizations. At a more detailed level, path analysis offers insights into specific institutional pressure effects, revealing partial support for the research hypotheses (Table 3). Specifically, the influence of normative pressures and mimetic pressure on top management participation were consistent with previous research, while the lack of significant relationships with other institutional pressures makes it different from the previous research as the healthcare context is different from technology adoption in other industries. ACAP appears to enhance top management beliefs and participation in higher levels of EMR adoption.

5.2 Post-hoc Power Analysis

As a result of the analysis, the paths from IP to LOAD and TMBE to TMPR were found to be non-significant. It is strongly recommended when non-significant paths are found to complete a post-hoc power analysis. The post-hoc analysis provides evidence that there is enough statistical power in the sample size to support the validity of the non-significant finding. The analysis requires that the R-squared associated with the dependent variable be supplied in conjunction with the number of predictors and the level of significance (Lowry and Gaskin 2014). For this examination the R-squared associated with LOAD is 0.347 and TMPR is 0.475. The number of predictors in the model is 7 (accounting for the second order factor). The level of significance was specified as 0.05. The resulting calculation demonstrated a statistical power exceeding 0.95 for both non-significant paths. The statistical power finding exceeds the minimum value of 0.8 required to demonstrate the sample size provides the necessary statistical power (Lowry and Gaskin 2014). Therefore, the sample size is sufficient to support the detection of significant and non-significant effects within the model (Lowry and Gaskin 2014).

5.3 Mediation Effects

We used the bootstrapping method based on 5000 iterations recommended by Preacher and Hayes (2008) and illustrated by Koufteros et al. (2014). The bootstrapping procedures via AMOS 21.0 provided the upper and lower levels at 95% confidence intervals and the associated *p* value for each path. If zero is included in the confidence interval, it indicates the absence of a mediating effect

Table 3 Research Hypothesis Results from Path Analysis

	Hypothesis	Support
H1a	Higher levels of ACAP lead to a stronger top management beliefs about the benefits of EMR adoption.	Supported $p < 0.01$
H1b	Higher levels of ACAP lead to a higher top management participation in EMR adoption process within the healthcare organization.	Supported $p < 0.01$
H2a	Higher levels of top management belief lead to a higher extent of top management participation for EMR adoption process within the healthcare organization.	Supported $p < 0.05$
H2b	Top management belief mediates the relationship between absorptive capacity and higher levels of top management participation for EMR adoption within the healthcare organization.	Not supported
H3	Higher levels of top management participation in the EMR adoption process lead to higher extent of EMR adoption within the healthcare organization	Supported $p < 0.01$
H4a	Higher levels of mimetic pressures lead to higher levels of top management participation in the EMR adoption process.	Supported $p < 0.01$
H4b	Higher levels of mimetic pressures lead to a higher extent of EMR adoption within the healthcare organization.	Not supported
H5a	Higher levels of coercive pressures lead to higher levels of top management participation in the EMR adoption process.	Not supported
H5b	Higher levels of coercive pressure lead to higher extent of EMR adoption within the healthcare organization	Not supported
H6a	Higher levels of normative pressures lead to higher levels of top management participation in the EMR adoption process.	Supported $p < 0.05$
H6b	Higher levels of normative pressures lead to stronger top management beliefs about the benefits of EMR adoption.	Not supported

(Jackson et al. 2016). Table 4 provides the total and indirect effect details along with their *p* values for the study. According to Baron and Kenny (1986), no mediation exists when the indirect effects are not significant and hence our findings indicate that TMB does not mediate the relationship between ACAP and TMP (rejecting H2b).

6 Discussion

By elaborating our conceptual model in terms of two top management constructs, three distinct isomorphic pressures and the absorptive capacity, we offer a rich set of results. Contrary to previous research, our study finds no significant

Table 4 Bootstrap Confidence Intervals for the Total and Indirect Effects

Paths	Lower Value	Upper value	Conclusion
H2b: TMB mediates ACAP ➔ TMP			No mediation
Total Effect:			
ACAP ➔ TMP	.451	.775**	
Indirect Effect:			
ACAP ➔ TMB	.174	.673**	
TMB ➔ TMP	−.046	$.408^{ns}$	

ns: not statistically significant, *p < .05, ***p* < .01

relationship for mimetic pressure with the level of technology adoption but mimetic pressure has a significant relationship with top management participation related to higher levels of EMR adoption in U.S. healthcare organizations (Teo et al. 2003b) (H4a and H4b). This suggests that mimetic pressure may have a role in influencing the frequency of technology adoption in hospitals by influencing top management participation about the benefits of higher levels of EMR adoption in U.S. healthcare organizations.

The insignificant relationship found between mimetic pressure and level of EMR adoption may be industry specific. The healthcare industry is complex with limited availability of information about different levels of adoption. Without proper documentation of benefits from EMR adoption and evidence that higher levels of EMR adoption lead to better organizational performance, mimicking 'level of adoption' may be not possible. This is based on the logic that lack of understanding of the application of the technology is the main impediment for effective adoption. Mimetic behavior occurs mainly when peer organizations perceived to be successful can attribute success to certain behaviors or actions, resulting in the "bandwagon effect" (Hu and Huang 2006; Tingling and Parent 2002). Thus, mimicking higher levels of EMR adoption is only possible when adequate information is available on the behavior and successful outcomes.

Coercive pressure, in this case arising mainly from governmental regulations and industry associations, may influence how many healthcare organizations adopt EMR, but does not seem to influence adoption levels nor play a significant role in top management participation for higher levels of EMR adoption. This may stem from the fact that top management will only promote higher levels of EMR adoption when there is clear evidence that this will result in higher economic benefits.

Logically, industry norms for EMR adoption should influence top management beliefs associated with benefits from higher adoption levels. However, our findings indicate that normative pressure demonstrated no influence on top management beliefs towards adopting higher levels of EMR in U.S. healthcare organizations (H6a). This is different from the findings from Hu et al. (2006) that the normative forces do shape top management beliefs about what practices and technologies to adopt. Conversely, normative pressures were found in our study to influence top management participation which then directly influence the level of EMR adoption (H6b). This finding is consistent with the argument by Liang et al. (2007) that normative pressures affects top management participation since "norms carry with them accepted practices pre-evaluated within the organizational field without needing further cognitive effort on the part of top management" (p. 74). This may stem from incentives in the stimulus law or from governmental regulations requiring a base level of EMR adoption associated with the "meaningful use" standard. Also, it conforms to the study by Karahanna et al. (1999) that "potential adopter intention to adopt is solely determined by normative pressures" (p. 183). Thus, there is an indirect effect of normative pressure on the level of adoption through top management participation but no direct role of normative pressure on the level of adoption.

Our study reveals the role of absorptive capacity in enhancing top management beliefs about the benefits from adopting different levels of EMR adoption in healthcare organizations. The results indicate that organizations differing in their absorptive capacity will likely demonstrate differences in what top management believes about the value created from increases in the levels of EMR adoption. Additionally, ACAP of the firm also impacts the degree of top management participation which results in different levels of EMR adoption. A possible explanation for this result is that top management commitment enhances usefulness beliefs (Lewis et al. 2003) about the technology and therefore may lead to higher levels of EMR adoption in U.S. healthcare organizations. Further, ACAP is largely a function of firm's prior related knowledge (Cohen and Levinthal 1990) therefore, top management may have a better understanding about the value of the technology and its commercial application which can subsequently lead to a positive influence on top management beliefs and increased participation.

Our study also confirms the acquisition, assimilation, and exploitation dimensions of absorptive capacity as reconceptualized by Zahra and George (2002). As a firm's ACAP increases, so too does the firm's capability to identify and acquire external technology. Increases in ACAP also positively influence top management beliefs about the benefits not only about adopting technology but also increased levels of adoption, which in this case is EMR. As a result, increased ACAP generates higher levels of technology adoption support from top management due to prior demonstrations of technology assimilation and exploitation. This mainly arises from increased comprehension and further ability to harvest and incorporate the technology into the operation (Zahra and George 2002).

Our study suggests that increased ACAP is also associated with increased likelihood of successful technology adoptions, such as EMR, including increased levels of adoption, producing better value for the organization. These findings contribute to the extant literature on business unit strategy, given that better levels of EMR adoption and subsequent value creation is one of the most important objectives for healthcare organizations. This finding is interesting, given that previous research has focused on the direct effect of network structure existing in organizations to explain business outcomes and value creations, without addressing the internal influences such as top management beliefs and top management participation (Tsai and Ghoshal 1998).

Our research shows the direct effect of ACAP on top management beliefs and top management participation and how it results in higher levels of EMR adoption. A healthcare organization may be required to adopt EMR through governmental regulation, but may not have sufficient capacity to successfully adopt the technology and therefore reap little to no benefit.

Hence, increasing ACAP results and increased top management beliefs about the benefits of the technology and thereby their participation in the technological adoption, results in increased levels of technological adoption. Further, these findings suggest that organizations need to continue to invest in abilities to value, assimilate, and apply information which increase a firms ACAP in order to be able to support increased levels of technology adoption, leading to increased firm benefit.

7 Practical Implications, Limitations, Future Research and Conclusions

7.1 Practical Implications

Our study makes several contributions which benefit the practitioner. The beliefs and participation in technology adoption of healthcare managers, who are often comprised of hospital administrators, physicians, nurses, and faculty, depend upon prior assimilation, transformation, internalization, and exploitation of technology which is not typically considered as a key element in the delivery of healthcare. Therefore, perhaps more so than in any other environment, ACAP becomes a seminal factor in determining the level to which technology will be adopted within a healthcare facility. Further, healthcare firms (university affiliated health systems, medical centers, hospitals, or nursing homes) have a limited capacity to actively promote technology adoption due in part to the constraints on human capital which must maintain its focus on delivering quality healthcare. Therefore, ACAP exerts an external influence on the beliefs, participation, and confidence of leadership in the healthcare organization to engage in the adoption of new technology such as EMR. Additionally, although healthcare providers and their organizations may be required to adopt certain technologies due to coercive pressure such as governmental regulation, the level of technology adoption is significantly influenced by other mimetic and normative pressures. Further, the availability of many healthcare associations and affiliations offer a conducive environment in which technology, its adoption, benefits, and pitfalls can be discussed.

7.2 Limitations

This study examines absorptive capacity and its influence on the level at which companies adopt new technologies, specifically EMR. Towards that end, the study utilized a cross-sectional data approach using an online survey methodology. While this approach is appropriate and meaningful in this context, it does have some limitations which impact generalization. First, the sample provided a broad cross section of the medical community, both in size and type of organization as well as range of participant positions within the organization. However, the broad sample does not contain enough depth to allow for meaningful control by organization type or size. Second, with the use of cross-sectional data, we are limited in providing trending data which may be relevant to the changing medical landscape. However, we believe that this study does set an important baseline for understanding behavior within medical organizations. Finally, the online methodology may have some inherent limitations. Research has noted that online surveys often under-represent minorities such as African Americans and Hispanics, while over-representing Caucasian and Asian populations (Zickuhr 2013). As with all research there are some limitations, however the limitations noted here do not significantly impact the contribution of this research.

7.3 Future Research

Future research may examine top management participation through secondary measures such as resource allocation, incentive alignment, or again directly from top managers. It is possible that there are other elements at work with top management which are not perceived by operational employees and future studies could extend the current model with direct data collection from senior managers to further deepen our knowledge on different levels of EMR adoption. The lack of influence demonstrated by coercive pressure in our study is another source of future research. Some technologies may be better understood by healthcare organizations which would lend themselves to coercive pressure. Examining coercive pressures influence on other technologies could provide clarity to its role in technological adoption. Future research may also examine other industries which are subject to the extraordinary influence of government regulation, particularly related to technology adoption, to test for the similarity of the relationships found here. This study could also benefit from an examination which allows for control variables such as organization size, age, and context (urban, sub-urban, rural), as well as for profit, not for profit, and/or religious affiliation.

7.4 Conclusions

This study investigates how ACAP impacts top management beliefs and participation and how it influences the level of technology in a healthcare environment, particularly EMR adoption. The healthcare industry was chosen for its broad and unique set of ‘level of adoption of technology’ issues. The results demonstrate the indirect effects of ACAP on different levels of adoption of EMR, supporting findings on ACAP and better performance outcomes, and further disclosing the role of top management beliefs and participation in achieving higher levels of EMR adoption.

In our research, we find there is no significant relationship between coercive pressure and top management participation in EMR adoption. It could be a perception issue with the survey respondents in that operational employees may not perceive that coercive pressures have any role in top management participation or in higher level of EMR adoption in U.S. healthcare organizations. Also, our measure of top management beliefs may not fully capture the active top management beliefs because the operational employees were responding about the beliefs of their senior management. Future research may seek to capture top management beliefs directly as opposed to through operational employees.

Our theoretical framework reconciles the independent contributions of two well-established streams in the literature: the role of ACAP on top management beliefs and participation and its subsequent impact on different levels of EMR adoption and the effect of institutional pressures on level of EMR adoption. We attempt to explicate how top management mediates the influence of absorptive capacity on different levels of EMR adoption. Analysis based on 147 healthcare employees currently working in U.S. healthcare organizations supports the hypothesized relationship between absorptive capacity and top management beliefs and participation and subsequent level of adoption of EMR in U.S. healthcare organizations.

Arguably, most organizations will pursue higher levels of adoption only when performance improvement outcomes are measurable and attainable. That may be one of the reasons why external influences in the form of institutional pressures were not significant. None of the external institutional pressures directly influenced the level of EMR adoption in U.S. healthcare organizations. However, normative pressure indirectly influenced level of adoption through their influence on top management participation and top management beliefs. Additional extent of adoption of EMR research is needed to provide better guidance and expectations for the healthcare industry, helping them to understand what to expect in terms of performance from various levels of EMR adoption and how to best align the available resources to achieve higher level of adoption of EMR.

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Appendix 1

Table 5 Questionnaire Scale items

Constructs (CR, AVE)	Mean	SD	Item Measures (factor loadings)
Absorptive capacity (ACAP) (0.74, 0.45)			
It is well known who can help solve problem associated with the EMR usage ACAP 1	5.36	1.40	0.682
Our company can provide adequate technical support for the use of EMR	5.53	1.23	0.879
Our company provides EMR training opportunities to employees on a regular basis	5.23	1.49	0.773
Level of adoption (LOA) (0.67, 0.52)			
Relative to the potential of EMR adoption for our business, our EMR implementation is extensive	5.70	0.98	0.866
EMR adoption has substantially changed our business processes	5.89	1.02	0.777
EMR has had a limited impact on our business operations ®	5.46	1.41	0.529
Institutional pressures (0.86, 0.45)			
Mimetic Pressure (MP)			
Having a state of the art EMR confers status for our business unit with our stakeholders	5.60	1.27	0.744
Our competitors have greatly benefitted from adopting EMR in their organizations	5.61	1.34	0.643
Our competitors who adopted EMR are favorably perceived by their customers	5.34	1.36	0.667
Normative pressure (NP)			
Our firms competitors have adopted EMR to a large extend in their organizations	5.78	1.29	0.899
Government promotion of EMR highly influences the adoption and usage of EMR in our organization	4.88	1.62	0.625
Our firms payers and collaborators have NOT adopted EMR to a large extend in their organizations®	5.25	1.36	0.562
Coercive Pressure (CP)			
The competitive conditions require our firm to use EMR	5.98	0.92	0.723
The governmental regulations require our firm to use EMR	5.56	1.28	0.636

Table 5 (continued)

Constructs (CR, AVE)	Mean	SD	Item Measures (factor loadings)
Our customers did not influence the implementation of EMR in our organization ®	5.55	1.36	0.273
Top Management beliefs(TMB) (0.91, 0.82)			
The senior management of our firm believes that EMR adoption has the potential to provide significant business benefits to the firm	6.12	1.11	0.869
The senior management of our firm believes that EMR adoption will create a significant competitive arena for firms	5.87	1.23	0..908
The senior management of our firm believes that EMR adoption is NOT necessary to conduct business activities ®	5.91	1.22	0.614
Top Management participation (TMP) (0.93, 0.81)			
The senior management of our firm actively articulates a vision for the organizational use of EMR	5.78	1.14	0.881
The senior management of our firm actively formulates a strategy for the organizational use of EMR	5.74	1.15	0.997
The senior management of our firm actively establishes goals and standards to monitor the EMR implementation	5.74	1.30	0.881

® represents reverse coded items

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