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Understanding the link between organizational learning capability and ERP system usage: An empirical examination

Joseph Nwankpa [a,*], Yaman Roumani [b]

[a] Department of Computer Information Systems & Quantitative Methods, College of Business Administration, The University of Texas-Pan American, 1201 West University Drive, Edinburg, TX 78539-2999, United States
[b] Department of Computer Information Systems, College of Business, Eastern Michigan University, 473 Gary Owen Building Ypsilanti, MI 48197, United States

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ABSTRACT

Although significant research attention has been directed at understanding ERP system adoption and deployment, very little attention has been paid to understanding ERP system usage among these adopting firms. This paper seeks to fill this void. We examine the concept of organizational learning capability (OLC), defined by dimensions of managerial commitment, systems perspective, openness and experimentation and transfer and integration to understand how firms can appropriate ERP systems to capture their potential benefits. Specifically, we examine the impact of OLC on ERP systems usage. We also incorporate the concept of user satisfaction to argue that OLC has an indirect effect on user satisfaction as well as a direct effect on ERP system usage. The empirical results show that OLC has a positive effect on user satisfaction. Besides, managerial commitment was found to have a positive effect on both user satisfaction and ERP system usage. Finally, user satisfaction was found to be a strong predictor of ERP system usage.

1. Introduction

In today's volatile and competitive business environment, firms must be able to effectively capitalize on its existing IT infrastructure. As organizations continue to invest in ERP systems, expectations are that such systems would boost performance and generate value in an increasingly competitive and aggressive business environment. Many firms have been quite successful with their ERP implementation driving down cost, improving operational efficiency and organizational reaching changes (Hebert & Oppenheim, 2004; Jones, Zmud, & Thomas, 2008; Nwankpa et al., 2013; Thibodeau, 2004). The success of an ERP system is partially dependent on the extent of usage by end-users within the firm (Boudreau & Robey, 1999). The more the usage by the intended users at different levels in the company, the greater the likelihood that such a firm will gain competitive advantage which is one of the key goals of deploying an ERP system. Therein lies the problem where users can only effectively utilize the system if they have the required knowledge and skills or at least if they have an organizational structure that fosters learning and nurtures understanding of the ERP system. Studies have revealed that the major reason for limited usage of ERP systems is because end users have inadequate understanding of the system (Soh, Kien, & Tay-Yap, 2000). Poor understanding of ERP systems may cause users to create and reenact workarounds (Markus & Tanis, 2000). These workarounds can continue indefinitely thereby limiting effective ERP use and assimilation (Liang, Saraf, Hu, & Xue, 2007). For instance, Boudreau and Robey (2001) note how a state university continued to maintain a parallel shadow system and how users found it difficult to migrate to from the university's legacy system after ERP implementation. Given that ERP systems by nature are complex, it is therefore vital that organizations establish a framework that facilitates learning as users interact and use the system.

Most ERP adoption papers have acknowledged the problems with ERP system usage and have highlighted the importance of learning in the successful implementation of new technologies. Elbertsen, Benders, and Nijssen (2006) found that ERP system users tend to limit ERP use and typically use other information systems for discretionary task routines while Kwahk and Ahn (2010) argued that the inability of the global ERP packages to readily address specific functional needs of end-users limited its usage. Given that ERP system implementations create new learning curves, different employees' responsibility and requires new sets of skills (Amoako-Gyampah & Salam, 2004), promoting learning is essential for organizations. However, understanding how organizational learning capability influences ERP usage has been largely ignored. While it is important to investigate individual level factors related to ERP adoption, what is lacking in the literature is a description of

* Corresponding author. Tel.: +1 9566652801; fax: +1 9566653367.
E-mail addresses: nwankpajk@utpa.edu (J. Nwankpa), yroumani@emich.edu (Y. Roumani).

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organizational learning capability on ERP system usage. Organizational learning enhances the value of IT because such processes allow firms to capture and effectively disseminate knowledge (Tippins & Sohi, 2003). By applying organizational learning capability, firms are able to positively influence performance. While the system's configuration is generic and resides with the ERP vendor, the process of appropriating the knowledge and skills required to effectively utilize the system is unique and resides at the organizational level. It is the process that fosters effective assimilation and use of the system that is more important for firms as they attempt to gain the promises of the ERP system. Thus, by having an effective organizational learning capability, firms can facilitate effective utilization of their ERP systems.

Motivated by the increased diffusion of ERP systems and the lingering questions of why some firms appropriate ERP systems in a limited way, thus, limiting the potential benefits, we address the issue by understanding the implications of organizational learning capability on ERP system usage. In this paper, we develop a research model that seeks to answer the following research question: How does organizational learning capability impact ERP system usage and user satisfaction?

This article is organized as follows. We first review the background literature on organizational learning capability and ERP system usage. We then present the research model and the research hypotheses. Next, we report an empirical study based on data collected from US firms, followed by a presentation of the data analysis and the results. We conclude with a discussion of research findings and implications for theory and practice.

2. Theoretical background

2.1. Organizational learning capability

Organizational learning capability (OLC) is fundamental to a firm's innovation. It refers to the ability of an organization to implement the proper management practices, structure, procedures and policies that facilitate and foster learning (Goh, 2003). This ability enables the process of organizational learning. Organizations create such capability by putting in place factors that facilitate the organizational learning process or allow an organization to learn. OLC should be able to create, acquire, transfer and integrate new knowledge as well as modify existing behavior to reflect new knowledge with a view to improve performance (Jerez-Gomez, Cespedes-Lorente, & Valle-Cabrera, 2005). Learning is an important factor in an organization because it enables the creation and expansion of a sustainable competitive advantage. Indeed, learning can serve as a means of creating and developing wide range of organizational capabilities, thus driving firms to continuous improvement rather than focusing on specific types of knowledge (Goh, 2003; Schendel, 1996). Several studies have examined OLC and the conditions under which learning can be achieved. DiBella (1995) identified the normative perspective to learning which is based on collective activities between agents and communities that can only foster under key conditions. These conditions are created by conscious efforts by leaders within organizations (Goh, 2003). Wheelwright and Clark (1992) suggested that OLC allows for successful adaptation of new products and technological developments. Recently, Alegre and Chiva (2008) found that OLC positively influences product innovation performance.

Information Systems (IS) literature has pointed out the criticality of OLC for organizational innovation (Fang, Chang, & Chen, 2011; Hult, Hurley, & Knight, 2004; Robey, Ross, & Boudreau, 2002). Learning processes enable firms to utilize technical knowledge in a way that creates a higher absorptive capacity (Lichtenthaler, 2009). Embracing a new complex technology requires mastery of the technology as well as modifications of existing organizational practices and procedures (Attewell, 1992; Johnson & Rice, 1987). Without an efficient organizational learning capability, firms may not profit from "learning by using" which emerges as users gain understanding of the strengths and weaknesses of the ERP system. Learning facilitates the behavioral change that arguably fosters capacity absorption and usage leading to improved performance (Slater & Narver, 1995). Indeed, vendor-user knowledge gap can create a big obstacle for effective ERP system usage. Arguably, the know-how and knowledge required by users to capture the intent of the system developers cannot be taken for granted. Indeed, complex technologies such as ERP systems can lead to appropriation misalignment. Moreover, using the technology in ways expected by system designers and developers can present a big challenge for users.

OLC has been identified within the existing literature as a multidimensional construct with the various dimensions going toward its make up (Alegre & Chiva, 2008; Goh, 2003; Jerez-Gomez et al., 2005). Thus, an organization with a high learning capability should exhibit a high degree of learning in these key dimensions. Peddler, Burgoyne, and Boydell (1997) noted a set of actions that ensures learning capability. These actions include practices such as experimentation, continuous improvement, teamwork and group problem-solving. Recently, Chiva, Alegre, and Lapiedra (2007) developed an OLC measurement instrument that understands OLC as a multidimensional construct with the dimensions consisting of experimentation, risk taking, interrelation with the external environment, dialogue and participative decision making. Drawing from previous work by Jerez-Gomez et al. (2005), Goh (2003), we identified four key dimensions of OLC.

2.1.1. Managerial commitment

The first dimension refers to managerial commitment towards learning (Goh, 2003; William, 2001; Garvin, 1993). Managerial commitment is defined as the ability of firms to develop and enable support and leadership commitment to create and build knowledge within the organization (Akgun, Byrne, Lynn, & Keskin, 2007). Managers and top executives play a major role in developing and committing to a learning environment. Through commitment, management creates a climate where providing feedback, making constructive criticism and empowering employees to make decisions become part of the learning process (Goh, 1997). Also, having commitment towards learning means that management is willing to provide additional resources, acquire new options and implement the necessary changes to foster learning within the organization. This way, management can effectively build and support a learning environment which helps their organizations to survive and sustain itself. More importantly, management should champion the process and create a climate where leaders view failure as performance gaps that can be narrowed and closed through search for knowledge and learning.

2.1.2. Systems perspective

The second dimension is what Jerez-Gomez et al. (2005) refers to as systems perspective. It involves bringing everyone within an organization to a shared vision and a mutual identity. It also involves building relations and connecting members with each other through exchanging knowledge and information Akgun et al. (2007). In terms of learning, systems perspective denotes clarity of purpose where every employee has a mindset directed at learning. Systems perspective also implies that all the divisions within a firm, including employees, departments, teams and management have knowledge of how they can contribute to achieve the learning objective. If a shared vision is lacking within an organization, individual actions may not build the synergy needed to sustain the learning capability. Therefore, having a shared vision towards

learning within an organization means moving beyond the employee's individual goal towards a collective and shared vision (McGill, Slocum, & Lei, 1992).

2.1.3. Openness and experimentation

The third dimension refers to the degree to which an organization is open to new ideas and suggestions (Chiva et al., 2007). It involves creating a structure that encourages new ideas and embraces new innovations. Openness and experimentation has been identified as a critical dimension within the OLC literature (Nevis, DiBella, & Gould, 1995; Weick & Westley, 1996). Building a climate of openness and experimentation allows ideas to be renewed, expanded and constantly enhanced (Akgun et al., 2007). Typically, firms that favor openness and experimentation have the propensity to seek solutions and improve on their existing technological infrastructure. Thus, such firms are likely to have internal processes and procedures that encourage the creation and the use of new ideas and technologies for both current and future challenges. For an ERP system, implementation success can be contingent upon its adequate appropriation (Boudreau, 2003). Indeed, how well an end-user understands and exploits the capacity of a software such as an ERP system may be impacted by the firm's openness and experimentation.

2.1.4. Transfer and integration

The fourth dimension refers to the degree to which knowledge, ideas and innovations can spread internally through communication channels in an organization (Hamilton, 2005; Jerez-Gomez et al., 2005). The ability to disseminate new knowledge and ideas across departmental and functional boundaries is critical to any organizational success. Prior research suggests that firms who are better equipped in handling knowledge transfer are better able to gain competitive advantage (Hamilton, 2005; Tsai, 2002; Deshpande, 2012). Such transfer and integration can be achieved by creating communication networks, cross functional teams (Hamilton, 2005) and by sharing experience between organizational units (Darr, Argote, & Epple, 1995). There is a need for processes and procedures that foster the spread of knowledge and learning both at the individual level, departmental level and organizational level.

2.2. User satisfaction

User satisfaction is defined as the degree to which users believe that a system available to them meets their expectation (Ives & Olson, 1984). It describes the attitude and perception of an individual toward the system that he or she is using to perform a task. User satisfaction has gained popularity over the years as a key predictor of IS success and systems usage (Zviran, Pliskin, & Levin, 2005). Indeed, earlier studies used user satisfaction as a key proxy to IS success. For instance, Zmud (1978) pointed out three key factors of IS system success, namely user performance, MIS usage, and user satisfaction. More recently, various studies have used user satisfaction in determining ERP system implementation success (Somer, Nelson, & Karimi, 2003; Wu & Wang, 2007; Zviran et al., 2005). Arguably, if users are dissatisfied with a system, it is difficult to attain the desired degree of usage needed to achieve success. Factors such as relevance and accuracy of information provided by the system have been identified as key ingredients in user satisfaction (DeLone & McLean, 1992) while user satisfaction has been found to lead to increased system usage and task productivity (Etezadi-Amoli & Farhoomand, 1996).

Extant literature on user satisfaction indicates that it influences ERP systems success. For instance, Holsapple, Wang, and Wu (2006) used user satisfaction as a proxy for measuring ERP success and found that ERP user satisfaction was higher among management users than among non-management users on the ERP project team. Similarly, in their evaluation of end-user satisfaction with ERP systems, Somer et al. (2003) confirmed that ERP content and ERP format were the most important factors of user satisfaction while Calisir and Calisir (2004) suggested that perceived usefulness and learnability were key predictors of user satisfaction with ERP systems. In the context of developing a reliable and validated instrument for measuring ERP user satisfaction, Wu and Wang (2007) constructed an instrument for ERP user satisfaction and identified three key overlapping factors: ERP product, knowledge and involvement and contractor service.

2.3. ERP system usage

ERP system usage refers to the degree to which users use installed ERP functionalities (Burton-Jones & Gallivan, 2007; Jones et al., 2008; Venkatesh, Speier, & Morris, 2002). System usage has been identified as one of the critical factors that enhances benefits derivable from an ERP installation. Hence, system usage has been the most frequently used measure of IS success (Jonas & Björn, 2011). The more usage by the end-users, the more the firm will achieve competitive advantage as well as other goals of the ERP software implementation. Indeed, having successfully deployed a system does not ensure an automatic assimilation and use (Fichman & Kemerer, 1999). ERP implementation is a necessary but insufficient prerequisite for obtaining the value and benefits (Jonas & Björn, 2011). Such values and benefits can only be claimed through efficient utilization of the ERP system. Existing literature has investigated ERP system usage in a bid to understand how the system is assimilated into the organization. A study by Lin (2010) found that IS quality and top management support influenced ERP system usage through user perception of the usefulness and satisfaction with the system. Similarly, Chang, Cheung, Cheng, and Yeung (2008) identified system compatibility and social factors as important determinants of ERP system usage.

Problems with ERP system usage can result in failure to achieve the expected ERP benefits. Existing literature have identified factors affecting ERP system usage in post-implementation stage. For instance, Peterson, Gelman, and Cooke (2001) noted that a lack of understanding of the ERP system by users tend to affect system usage, while Nicolaou (2004) discussed how inadequate training, insufficient support for end-users, and the lack of communication of system objectives can negatively affect the ability of end-users to understand the newly adopted business processes which lead to poor system usage. Others have identified ineffective change management and the severity of the implementation mode as factors affecting system usage (Motwani, Mirchandani, Madan, & Gunasekaran, 2002). Problems with system usage can discourage ERP users from frequently using the system and can cause them to resist and refuse to use the system or find a way around using it (Boudreau & Robey, 2005).

3. Research model and hypotheses

Building on the background literature discussed above, we provide the research model underlying our study in Fig. 1. The specific hypotheses are discussed below.

3.1. Effect of organizational learning capability on user satisfaction

As discussed earlier, OLC is an important factor to a firm's innovation because of its ability to create sustainable conditions that inspire new knowledge and insight. OLC offers interesting implications on how users perceive the level of satisfaction associated with the system. Having conditions that foster learning within an organization can create positive attitude and perception of

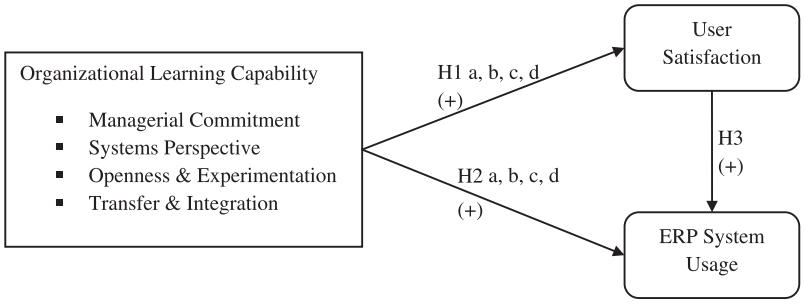

Fig. 1. Conceptual model of understanding the link between organizational learning capability and ERP system usage.

individuals towards the system. For instance, a study of firms implementing electronic document management system asserts that organizational learning does impact the user satisfaction of employees (Cho, 2007). OLC can provide stronger incentives for users who otherwise will grapple with the optimal way to apply the system for a specific task. Previous research supports the assertion that organizations with strong learning culture or capability generally have a more effective training programs supportive of IS implementation (Cho, 2007; Noe, 2002) and such effective training programs create higher user satisfaction (Cho, 2007). Arguably, well trained users feel more knowledgeable about the system and thus are more capable of navigating the system in a desirable manner leading to greater user satisfaction. Davis and Bostrom (1993) note that training can significantly increase usage, satisfaction and performance while Vermetten, Lodewijks, and Vermunt (2001) argue that learning orientation leads to persistent system use that eventually results in higher levels of user satisfaction. These dynamics indicate that organizations characterized with structures and capabilities which expose employees to new ideas and knowledge on the use of IS will be able to facilitate the internalization and assimilation of the information system. Such behavioral changes will lead to higher satisfaction in using the system and will enhance the overall individual efficiency (Cho, 2007). Indeed Bradford and Florin (2003) notes that after deployment of an ERP package, firms need to apply appropriate organizational learning to enhance the chances of realizing the system benefits. The satisfaction level will likely increase as employees get comfortable with the ERP package. Drawing on the above arguments, we thus propose the following hypotheses:

H1a. Managerial Commitment has a positive effect on user satisfaction.

H1b. Systems Perspective has a positive effect on user satisfaction.

H1c. Openness and Experimentation has a positive effect on user satisfaction.

H1d. Transfer and Integration has a positive effect on user satisfaction.

3.2. Effect of organizational learning capability on ERP system usage

The role of OLC as a means of achieving competitive advantage has received great attention (Hult, Hurley, Giunipero, & Nichols, 2000). Extant literature tried to use organizational learning to explain the role of technology and firm performance. For instance, Tippins and Sohi (2003) argued that organizational learning may be the missing link and mediator between the effects of IT competency on firm performance.

ERP system usage captures the extent to which users use installed ERP functionalities (Burton-Jones & Gallivan, 2007; Jones et al., 2008; Venkatesh et al., 2002). This usage can only take place if users are familiar with the system's configurations and functionalities. Employees faced with newly transformed processes created by ERP systems can be overwhelmed to the extent that they limit the use of the ERP system. For instance, employees that have perfected their routines with the firm's existing system are required not only to change how they perform their tasks, but also face a learning curve in assimilating new routines and associated business processes (Sarkis & Sundarraj, 2003). Current literature suggests that many organizations experience unfavorable reaction from end users after the deployment of an ERP system (Ross & Vitale, 2000; Saeed, Abdinnour, Lengnick-Hall, & Lengnick-Hall, 2010). In fact, a survey on ERP trends found that 75% of the firms experienced a productivity dip after the initial implementation of the ERP system (Cooke, Gelman, & Peterson, 2001; Saeed et al., 2010). Thus, the major obstacle to overcome after the system "goes live" is the dip in performance (Willis & Willis-Brown, 2002). Based on these observations, it can be argued that once an ERP system is implemented, firms need to have an organizational learning structure that users can leverage as they make the transition to the ERP system. Having a learning capability will enhance user's acceptance of the system as well as the ERP system usage. Furthermore, users will have positive feelings about the ERP system if the system is able to improve performance and facilitate task efficiency. Thus, it is likely that a greater organizational learning capability in a firm will offer users the support system needed to create, acquire and integrate new knowledge leading to greater usage of the ERP system. Hence, we state the following hypotheses:

H2a. Managerial Commitment has a positive effect on ERP system usage.

H2b. Systems Perspective has a positive effect on ERP system usage.

H2c. Openness & Experimentation has a positive effect on ERP system usage.

H2d. Transfer & Integration has a positive effect on ERP system usage.

3.3. Effect of User Satisfaction on ERP System Usage

User satisfaction has been studied within the IS literature as a surrogate for ascertaining a system's overall success. It is typically viewed as the user's attitude towards a technology (Wixom & Todd, 2005). While results have been mixed on its ability to predict IS success, studies have shown that the use of a system partially depends on the users' evaluation of how the system improves or facilitates the users' task performance (Bokhari, 2005). Indeed, the relationship between user satisfaction and system usage has been noted within the literature. As a system fulfills its expectations, user

satisfaction with the system will increase leading to a higher system usage, and conversely, if the system usage fails to meet user's expectation, satisfaction will decrease and therefore limiting further usage (Baroudi, Olson, & Ives, 1986). Moreover, it has been argued that the use of a system deployed in an organization is positively associated with user's perceived sense of satisfaction.

ERP system usage and user satisfaction are two constructs that can be related. The implementation of an ERP system typically triggers a transformation in processes as well as in system application. For instance, existing routines and inherent business processes are altered thus, requiring assimilation of new routines, business processes and functionalities. Such disruptions are usually coated with users' expectations that the ERP system will be able to meet their needs. As users utilize the system, we contend that a positive user experience will further reinforce increased ERP system usage. As users experiment and come to terms with the performance, benefits and functional superiority of an ERP system, there will be a corresponding increase in the ERP system usage. This leads to our third hypothesis:

H3. User satisfaction has a positive effect on ERP system usage.

3.4. Control variables

Firm size is often an important control variable as it is found to determine firm performance and innovativeness (Kim & Lee, 2010; Kimberly, 1976). Larger firms can benefit from economies of scale arising from available human capital and financial resources. In addition, the length of time an organization had implemented an ERP system as well as users experience with the ERP systems are also considered as important control variables. Therefore, the duration, measured by the length of time since the firm implemented the ERP system and length of time users have used the system were included as control variables when we tested the effect of OLC on user satisfaction and ERP system usage.

4. Method

4.1. Sample and study procedures

This study required inputs from end-users that use ERP systems in their firm's routine task, activities and business processes. For our sample, we first approached US firms that have implemented the SAP financial accounting module of an ERP system. In exchange for the promise of a report describing our findings, managers of each firm allowed us to survey one employee within the accounting department that used SAP for his or her routine task and activities. Data for the study was collected using an online survey, an approach that has been noted for its speed (Dillman, 2007), low cost (Weible & Wallance, 1998) and improved response quality (Paolo, Bonaminio, Gibson, Patridge, & Kallail, 2000).

After we collected information about each employee, we sent an email containing a request for participation along with a URL link to the web survey. Two reminders to participate were subsequently sent, and the survey closed 30 days after the initial invitation was e-mailed. Out of the 1500 users that we identified and obtained permission from their respective firms, 35 e-mails were returned as undeliverable for various reasons ranging from recipient out of office, user name not valid to recipient no longer with the firm. Of the remaining 1465 ERP system users contacted, 560 responded within our deadline, for an effective response rate of 38.22%. After eliminating incomplete responses, the final number of usable responses was 520 resulting in a usable responses rate of 35.49%.

Our respondents represented major industries including manufacturing (22.7%), construction (13.4%), service (26.7%), energy (11.8%), financial (8.1%), telecommunication service (6.3%) information technology (7%) and others (4%). In terms of firm size, 46% of responding firms reported a market capitalization between $500 million and $999 million, 23% between $1 billion and $4.9 billion, 12% between $5 billion or more and 19% with a market capitalization less than $500 million. These indicate that the sample is well represented in terms of industry and size.

4.2. Research method

Analysis and empirical validation of our hypotheses was done with partial least square (PLS) analysis. SmartPLS 2.0 (Ringle, Wende, & Will, 2005) software was used for the analysis. PLS is well suited for complex models involving latent variables. SmartPLS 2.0 performs bootstrapping analysis to assess the statistical significance of the loading and of the path coefficients (Ringle et al., 2005). Bootstrapping analysis is a non-parametric approach for estimating the precision of the PLS estimate. Bootstrapping analysis works by re-sampling the original data with replacement to obtain an estimate for each parameter in the PLS model (Chin, 1998, 2001).

4.3. Assessment of potential response bias and common method bias

To ensure that the responses in the sample are free from non-response bias, we split the sample into two groups based on the time when each response was completed. Using this approach, it was possible to determine statistically whether later respondents were significantly different from earlier respondents. The result did not show any significant differences between the two groups, indicating that non-response bias was not a significant issue that could confound the findings of this study.

Because the survey questionnaire was completed by a single respondent, it was important to assess the potential of common methods bias. Following Podsakoff and Organ (1986), we conducted the Harman's one-factor test on managerial commitment, systems perspective, openness & experimentation and transfer & integration. Results showed that the most covariance explained by one factor was 34.67%, suggesting that common method bias was not likely present in the study. In addition, we applied the Liang et al. (2007) procedure to test the common method bias in PLS. The results revealed that method loadings were insignificant and that indicators variances were considerably greater than their method variance. Thus, we concluded that the common method bias was not a serious threat to this study.

4.4. Measures

The measures were designed based on extensive review of related literature. In developing the measures, whenever possible, we adapted existing measures that had been used in previous literature. Hatch (2002) notes that existing studies can provide the foundation needed to design an instrument as it affords the ability to recognize gaps in the literature. However, we made modifications on these existing measures to fit the context of our study. Appendix A shows the relevant literature and the specific items for the five constructs. All items were assessed using a seven-point Likert-type scale.

4.5. Measurement model and construct validity

Confirmatory factor analysis (CFA) was conducted for all of the latent constructs (see Table 1). All item loadings were greater than .60 as recommended by Hair, Anderson, Tatham, and Black (1998).

Thus the items are representative of their respective constructs. Reliability, convergent validity, and discriminant validity of the measurement models were also assessed. Acceptable reliability or internal consistency is attained when the Cronbach's alpha and composite reliability are greater than 0.70 (Nunnally, 1978). As shown in Table 1, the composite reliabilities were all above 0.70; thus all measures have adequate level of reliability.

Convergent validity is achieved when scores of items used to measure a construct correlate with or are related to scores of other items that are designed to measure the same construct (Campbell & Fiske, 1959). Convergent validity can be assessed by measuring the reliability of survey items, composite reliability of constructs, average variance extracted (AVE) and factor analysis (Komiak & Benbasat, 2006). As shown in Table 2 all factor loadings were greater than 0.70 and the AVE of every latent variable in the research model was greater than 0.70 and they all loaded highly on their own latent variable.

Discriminant validity examines the extent to which a measure correlates with measures of constructs that are different from the construct the measure is intended to assess (Barclay, Higgins, & Thompson, 1995). This would imply that the construct does not share much variance with other constructs, but rather with its own measures. Discriminant validity of the measure is acceptable if the AVE of each construct is greater than the variance among all constructs (Chin, 1998) or if the AVE for each construct is greater than 0.50 and the square root of the AVE for a construct is greater than the correlation of that construct with other constructs (Fornell & Larcker, 1981). This is normally demonstrated by showing that the square root of an AVE is greater than the correlations among the construct and all other constructs in the model. The correlation matrix among all constructs is presented in Table 2. As shown in the table, the square root of an AVE of each construct is greater than the correlations between the construct and all other constructs. Thus, the measurements demonstrate satisfactory levels of discriminant validity.

5. Results

H1a–d examined the effect of organizational learning capacity on user satisfaction with H1a stating that managerial commitment has a positive effect on user satisfaction. The result shows a significant positive relationship between managerial commitment and user satisfaction. This hypothesis was supported ($\beta = .428$, $p < 0.01$). Similarly, H1b predicted that systems perspective has a positive effect on user satisfaction was also supported ($\beta = .199$, $p < 0.01$). H1c predicted that openness and experimentation has a positive effect on user satisfaction. This hypothesis was supported and found to be in the predicted direction ($\beta = .183$, $p < 0.01$). Similarly, H1d states that transfer and integration has a positive effect on user satisfaction. The result shows a path coefficient of 0.299 between transfer and integration and user satisfaction. This hypothesis was supported ($\beta = .299$, $p < 0.01$).

H2a–d predicted the effect of organizational learning capacity on ERP system usage with H2a stating that managerial commitment has a positive effect on ERP system usage. The result shows a significant positive relationship between managerial commitment and ERP system usage. This result was supported ($\beta = 0.334$, $p < 0.01$). H2b argued for the positive effect between systems perspective and ERP system usage. This result was not supported ($\beta = -0.019$, $p > 0.10$). H2c which predicted the effect of openness and experimentation on ERP system usage, was also not supported ($\beta = 0.036$, $p > 0.10$). Similarly, H2d predicted the effect of transfer and integration on ERP system usage. The result did not provide support for this hypothesis ($\beta = 0.151$, $p > 0.05$).

Finally, H3 stated that user satisfaction has a positive effect on ERP system usage. The result shows that user satisfaction has a significant positive effect on ERP system usage. This hypothesis was supported ($\beta = .342$, $p < 0.01$). Furthermore, assessment of the coefficient of determination (R^2) indicates that the hypothesized effect contribute substantially to the explanatory power of our research model. The R^2 scores for the dependent variables in the model were 61.7% for user satisfaction and 50.6% for ERP system usage. We summarize the results in Table 3 and Fig. 2.

Table 1
Item loading and cross-loadings.

	ESU	MC	OE	SP	TI	US
ESU1	**0.9543**	0.2284	0.3204	0.3867	0.3639	0.4466
ESU2	**0.9231**	0.3222	0.2312	0.2311	0.1278	0.1792
ESU3	**0.9134**	0.2312	0.2122	0.2111	0.1549	0.1894
MC1	0.3773	**0.8979**	0.4944	0.2271	0.2915	0.3508
MC2	0.3173	**0.9727**	0.3571	0.3032	0.2798	0.3197
MC3	0.3072	**0.9713**	0.3265	0.2697	0.2494	0.3961
MC4	0.3367	**0.9639**	0.2532	0.2487	0.2265	0.3765
OE1	0.3112	0.3061	**0.8612**	0.2264	0.2487	0.2243
OE2	0.4508	0.4671	**0.9256**	0.2516	0.4806	0.2522
OE3	0.435	0.5412	**0.8535**	0.2149	0.4796	0.2924
OE4	0.4446	0.1465	**0.9145**	0.3441	0.3227	0.2517
SP1	0.1263	0.2447	0.2469	**0.9120**	0.2459	0.3196
SP2	0.1235	0.2272	0.2227	**0.9298**	0.2643	0.2815
SP3	0.1845	0.2823	0.2889	**0.9742**	0.2387	0.2163
SP4	0.1876	0.2842	0.2891	**0.9746**	0.2453	0.2194
TI1	0.2792	0.2403	0.1748	0.1552	**0.8786**	0.2289
TI2	0.2607	0.3048	0.3532	0.2077	**0.9401**	0.2833
TI3	0.2246	0.2419	0.4856	0.2655	**0.9661**	0.2348
TI4	0.2227	0.2402	0.4895	0.2604	**0.9651**	0.2357
US1	0.1844	0.3897	0.3001	0.2592	0.3775	**0.8897**
US2	0.3185	0.3857	0.2448	0.3314	0.3136	**0.9472**
US3	0.2659	0.3479	0.2567	0.2916	0.3318	**0.9296**
US4	0.2565	0.2889	0.2801	0.2495	0.3842	**0.8866**

6. Discussion

Consistent with our hypotheses, our results indicated that managerial commitment has a significant effect on user satisfaction. One reason for this is that managerial commitment creates a process of institutionalization within the organization that fosters knowledge assimilation and use. Such a commitment enables the establishment of routines aimed at assisting users with navigating through the hurdles associated with a complex technology as an ERP system. In addition, managerial commitment was found to have a positive effect on ERP system usage. We believe that this result suggests the critical role of firm management in creating a climate within the firm that not only encourages ERP system usage but also facilitates the implementation process that train and educate users of the benefits of effectively using an ERP system. This result is consistent with the study which argues that core teams within an ERP implementing firm need to operate as forces that vigorously promote new knowledge against knowledge barriers that reside in the organizational memory (Robey et al., 2002).

Moreover, the results indicated a significant effect between systems perspective and user satisfaction. This is consistent with prior research which argues that systems perspective presents a common language and action by participants involved in the learning process, thus leading to increased satisfaction (Jerez-Gomez et al., 2005). Indeed, having a common identity and a shared vision can assist in developing relationships that are based on information exchange and shared ideas (Akgun et al., 2007). Contrary to our hypothesis, systems perspective did not have a significant effect on ERP system usage. The reason for this may be that even though users may perceive the organization as having a common

Table 2
Descriptive statistics, validity and reliability.

	Mean	SD	AVE	CR	α	ESU	MC	OE	SP	TI	US
ESU	4.3267	1.21	0.8942	0.9432	0.9234	**0.9335**					
MC	5.8159	1.14	0.9062	0.9748	0.9651	0.4284	**0.9519**				
OE	5.9036	1.09	0.7908	0.9379	0.9114	0.2204	0.2584	**0.8893**			
SP	5.4474	1.17	0.8988	0.9726	0.9622	0.2867	0.3963	0.2488	**0.9481**		
TI	5.6499	1.06	0.8801	0.967	0.9541	0.3639	0.3012	0.2545	0.3636	**0.9381**	
US	5.8461	1.19	0.8347	0.7466	0.9337	0.4466	0.4826	0.3554	0.4482	0.4957	**0.9136**

The bold values represent the square roots of the average variance extracted (AVE) of each latent construct.

Table 3
Summary of results.

Hypotheses	Independent variable	Effect	Dependent variable	Estimate	*t*-Value	Result
H1a	Managerial commitment	→	User Satisfaction	0.376	4.5586	Supported
H1b	Systems perspective	→	User Satisfaction	0.199	2.1329	Supported
H1c	Openness and experimentation	→	User Satisfaction	0.183	2.0687	Supported
H1d	Transfer and integration	→	User Satisfaction	0.299	3.6989	Supported
H2a	Managerial commitment	→	ERP System Usage	0.334	2.6271	Supported
H2b	Systems perspective	→	ERP System Usage	−0.019	0.1901	Rejected
H2c	Openness and experimentation	→	ERP System Usage	0.036	0.391	Rejected
H2d	Transfer and integration	→	ERP System Usage	0.151	1.406	Rejected
H3	User satisfaction	→	ERP System Usage	0.342	2.3399	Supported

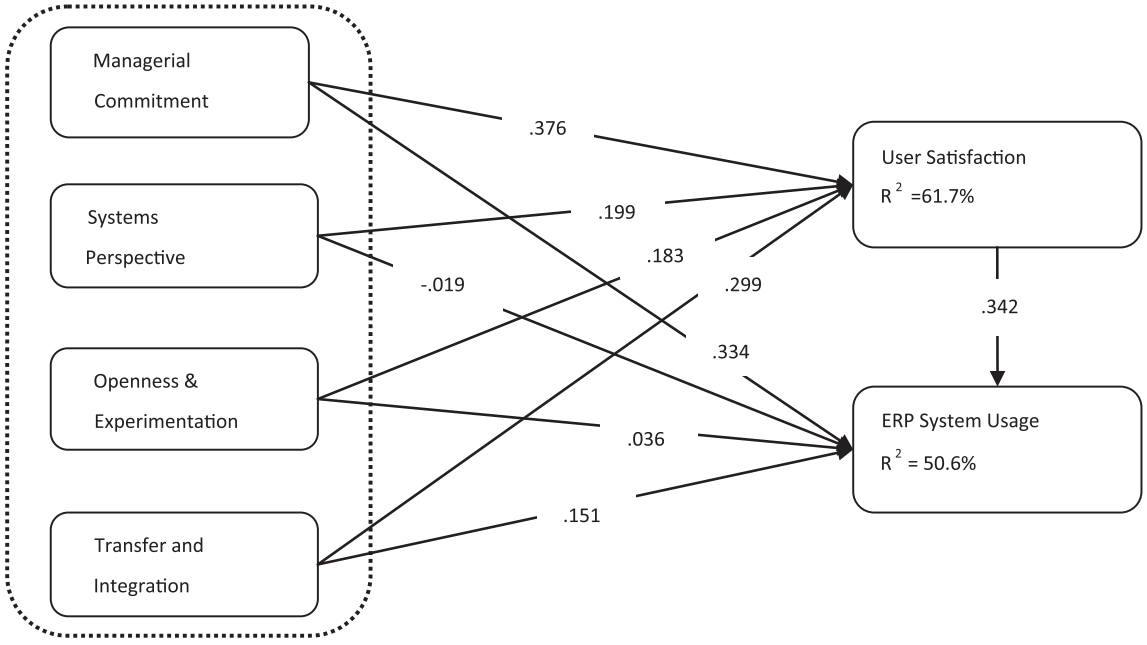

Fig. 2. Research model with results.

vision and goal, the needs and expectations of these ERP users may be unique and tailored to the specific task performance and responsibility.

Consistent with our hypothesis, our result indicated that openness and experimentation has a significant effect on user satisfaction. In fact, Jerez-Gomez et al. (2005) argue that openness and experimentation create an organizational climate that allows the questioning of existing knowledge thus allowing users to constantly renew, widen and improve organizational knowledge. When a firm creates a culture that inspires openness as well as the penchant for experimentation on new ideas, methods and existing procedures, ERP users may be more positioned to embrace and explore complex functionalities embedded in an ERP system. Through experimentations and openness, users can identify the optimal appropriation of the functionalities of an ERP system. Contrary to our hypothesis, openness and experimentation did not have a significant effect on ERP system usage. We believe that this lack of significance in the relationship between openness and experimentation and ERP system usage is an important finding because it seems to suggest that firms with a culture of openness may yet be hindered by the complexity associated with an ERP system. For instance, a user may have a mindset that encourages experimentation but may be hindered by their inability to fully comprehend an ERP system complexity.

Transfer and integration had a significant positive effect on user satisfaction. This result was expected because as organizations

establish formal and informal channels aimed at spreading the knowledge and skills required to use an ERP system, users may be better equipped to apply the ERP system to their individual tasks and job responsibilities. The availability of an established process of knowledge integration and transfer can positively enhance perceived satisfaction level of the ERP system user. Contrary to our hypothesis, transfer and integration did not have a significant effect on ERP system usage. One reason for this may be that the knowledge derived from the organization is inadequate for ERP system users as they seek to apply the system to their individual tasks. Indeed, ERP system users may have the necessary knowledge flow that makes them satisfied with how they apply the ERP system yet such knowledge flow may be inadequate to expand the increased ERP system usage.

Finally, user satisfaction had a significant positive effect on ERP system usage. Thus, as ERP users perceive higher level of satisfaction from the system, they are more likely to use the ERP system. This finding supports previous research which suggests that user satisfaction influences ERP system usage (Lin, 2010) as well as technology adoption literature, which argue that users' attitude toward a technology impacts how they embrace and use that technology (Baroudi et al., 1986; Wixom & Todd, 2005).

7. Theoretical and practical implications

This study makes key contributions to theory and practice. As pointed out earlier, although significant research attention has been directed at understanding ERP system adoption and deployment, very little attention has been paid to ERP system usage and factors that affect such usage. This is a significant gap in the literature because ERP system usage in part determines if and how firms realize the benefits and potentials of the ERP system. In this study, we attempted to fill this gap by examining the effects of organizational learning capability and user satisfaction on ERP system usage. Insight was provided as to the specific interplay between organizational learning capacity and user satisfaction as predictors of ERP system usage. The empirical results hold important implications for future research that seek to reconcile the influence of learning organizations on the usage of complex technologies such as an ERP system.

This study reveals key antecedents of user satisfaction that has been largely ignored by prior studies. Although prior research has demonstrated the importance of user satisfaction in technology adoption models, less is known about the antecedent especially as it relates to ERP system usage. The empirical evidence presented in this study directly supports the contention that user satisfaction is an important predictor of ERP system usage. Thus, this study can provide a revealing theoretical lens for further understanding of key antecedents and factors that drive user satisfaction and usage respectively in an ERP system environment.

This study should be of practical importance to managers and executives who are seeking to maximize the benefits and the potential of their ERP system. For managers and executives, the study reveals that the key to capture the full use of their firm's ERP system may reside in the ability to create a culture that fosters organizational learning. Based on this study, managers can understand that by nurturing a culture that fosters organizational learning, users may be better equipped to use the ERP system. In addition, practitioners should be aware of the key driver of user satisfaction within the ERP system environment. Thus, it may be more efficient for organizations to consider policies and organizational structures that advance user satisfaction.

8. Limitations

Although we believe that our study makes a number of contributions, like all other research studies, it too has some limitations. One of the limitations is that this study adopts a cross-sectional view of ERP system usage and makes no distinction between learning organizations and non-learning organizations. Such design may not adequately capture the interaction between the task routine and the knowledge and skills required to executive the task. Although, this study examines key variables using perceptual measures, we believe that prior history of the organization was controlled for and has been factored into these perceptions and thus, does not taint the findings. Future research might find it useful to measure these variables from multiple points in time. Thus, a longitudinal study may enrich the findings of our results as well as offer additional perspectives on the constructs.

Another limitation of this study is that the study is based on SAP (ERP system) users of the financial accounting modules, raising concerns about the generalizability to other ERP system modules. However, we believe that our study design is strengthened by the understanding that ERP systems are very similar applications, thus users are not limited by a specific application and use. In spite of the aforementioned limitations, we believe that our study has important implications for both research and practice.

9. Conclusions

The aim of this research was to study the implications of organizational learning capability on ERP system usage. The study attempted to find out if organizational learning capability and user satisfaction influence ERP system usage. The results from the empirical evidence showed that organization learning capacity positively influences user satisfaction. This means that firm management can increase user satisfaction among ERP system users by creating processes and structures that are capable of driving organizational learning among their users. In addition, the study found that user satisfaction is a key predictor of ERP system usage. This means that in a bid to increase ERP system usage in organizations, organizations must find an alignment between task routine and system configuration.

The results further show that managerial commitment can inspire usage among ERP system users. This is important because while earlier IS researches have shown that managerial commitment is important in the successful implementation of an ERP system, our study reveals that managerial commitment can indeed influence ERP system usage as well as user satisfaction. As managers grapple with changes associated with ERP implementation, demonstrating commitment can provide the panacea need to drive satisfaction and usage among ERP system users.

Appendix A

Measures and scales.

Construct	Item	Measure	Source
Managerial commitment	MC1	In this firm, employee learning capability is considered a key factor	Jerez-Gomez et al. (2005)
	MC2	The firm's management looks favorably on carrying out changes in any area to adapt and keep ahead of environmental conditions	
	MC3	In this firm, innovative ideas that work are rewarded	
	MC4	In this firm, employee learning is considered more of an investment	
Systems perspective	SP1	All trained employees have generalized knowledge regarding this firm's goals and objectives	Jerez-Gomez et al. (2005)
	SP2	All subunits that make up this firm (departments, sections, divisions work teams and individuals) are well aware of how they contribute to achieve the overall goals and objectives	
	SP3	All parts that make up my firm are interconnected working together in a coordinated manner	
Openness and experimentation	OE1	My firm promotes experimentation and innovative ideas as a way of improving business processes	Jerez-Gomez et al. (2005)
	OE2	My firm follows up on the activities of other firms within the sector and is willing to adopt those practices and techniques that it believes to be useful and interesting	
	OE3	Experience and ideas provided by external sources (advisors customers, training firms etc.) are considered important instruments for this firms learning	
	OE4	The culture of this firm encourages expression and opinions as well as suggestions regarding the procedures and methods for task performance	
Transfer and integration	TI1	Errors and failure are always discussed and analyzed in this firm at all levels	Jerez-Gomez et al. (2005)
	TI2	In this firm, there are processes and structures that offer employees the chance to talk about new ideas, programs and activities that might be useful to the firm	
	TI3	This firm encourages collaboration, team work and information dissemination	
	TI4	The firm has a mechanism that allows what has been learnt in past situation to remain valid and accessible to employees	
User satisfaction	US1	The ERP System provides the precise information needed for my job	Doll and Torkzadeh (1988)
	US2	I am satisfied with the information content provided by the ERP System	
	US3	The ERP System provides reports that seem to exactly match my needs	
	US4	The ERP System provides sufficient information	
ERP system usage	ESU1	I use the ERP system installed in my organization very intensively to support my	Schwarz (2003)
	ESU2	I use the ERP system installing in my organization very frequency to support my work	Schwarz (2003)
	ESU3	Overall, I use the ERP system a lot	Chang et al. (2008)

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