Understanding the Link Between Initial ERP Systems and ERP-Enabled Adoption

Joseph K. Nwankpa, The University of Texas Pan American, Edinburg, TX, USA
Yaman Roumani, Eastern Michigan University, Ypsilanti, MI, USA
Alan Brandyberry, Kent State University, Kent, OH, USA
Alfred Guiffrida, Kent State University, Kent, OH, USA
Michael Hu, Kent State University, Kent, OH, USA
Murali Shanker, Kent State University, Kent, OH, USA

ABSTRACT

ERP systems have been identified as platform technologies that permit the adoption of subsequent technologies that leverage the information integration created by an ERP system. Although significant research attention has been directed at ERP system adoption, very little attention has been paid to understanding ERP-enabled adoption, that is, adoptions that occur and are facilitated after the initial ERP system. This paper seeks to fill this void. Synthesizing existing works, the authors construct a model that examines the link between initial ERP system and ERP-enabled adoption. The results indicate that initial ERP system factors (Extent of ERP Implementation and Current System Performance) act as antecedences to organizational ease of use and relative advantage of subsequent technologies. Moreover, the authors’ findings implicate that organizational ease of use and relative advantage of subsequent technologies have a positive impact on ERP-enabled adoption. These results have important implications for ERP system evaluation and justification. First, the findings highlight the importance of recognizing the potential additions and inherent benefits created by an initial ERP system. Second, the findings also underscore the importance of considering ERP-enabled adoption of subsequent technologies.

Keywords: Enterprise Resource Planning (ERP) Systems, ERP-Enabled Adoption, Link, System Factors, Technology Adoption

1. INTRODUCTION

Within the last decade, the pace of ERP systems adoption has been rapid as businesses strive to streamline business processes and integrate hitherto disparate applications across functional areas of businesses into an integrated information system platform. The importance of ERP systems in modern business operation has been undeniable. In an era where integration of activities in the value chain is viewed as a solution to operational inefficiencies, ERP systems have emerged and embraced by firms as systems capable of solving organizations information processing needs. Stewart
et al. (2000) found that more than 60 percent of Fortune 500 companies had adopted ERP systems while a more recent study found that about 80 percent of Fortune 500 companies have deployed ERP systems (Kwahk & Lee 2008; Morris & Venkatesh, 2010). Similarly, in today’s competitive and aggressive corporate environment, firms are increasingly under pressure to maximize organizational resources. One area that has come under scrutiny is firms’ ability to maximize the values and benefits embedded in their existing technology infrastructure such as an ERP system. In fact, firm management ability to recognize these potential benefits created through ERP-enabled adoption is critical to the quest for process efficiency and decision making. Although prior literature have examined the adoption and decision making process of ERP systems, such studies have used rather dichotomous approach to adoption and decision making inquiry. For instance, Hunton et al. (2001) compared ERP adopters and non-adopters and found that adopters experienced improved corporate performance compared to non-adopters, while Buonanno et al. (2005) focused on identifying factors that lead adopters to implement ERP systems and factors that influence non-adopters’ decision not to implement ERP systems. Similarly, Lorca and Ardres (2011) examined early adopters and later adopters in an attempt to understand firm performance. The approach of such studies implicitly assumed that ERP adoption is a comprehensive “big bang” type adoption or that the adoption process ends with the ERP deployment. In other words, prior studies have adopted a rather static view, thus limiting its adequacy in explaining the adoption process that goes beyond the initial adoption decision. As a consequence, the adoption of ERP systems has been examined at a very macro level of analysis where firms are expected to implement a generic ERP system and research on ERP-enabled adoption has been largely ignored.

Hence, this study intends to bridge the gap found within the existing ERP adoption literature by examining ERP-enabled adoption. This paper adds to the theoretical development and further the existing literature by using the initial ERP system as a lens to examine ERP-enabled adoption. Moreover, this study also examines the factors that influence ERP-enabled adoptions. Given that an ERP system provides an integrated platform in a firm, this research studies how initial ERP system factors influence the perceived relative advantage as well as organizational ease of use of subsequent technologies being adopted.

The remainder of this paper proceeds as follows: First, we offer a review of relevant literature of ERP-enabled adoption and influencing factors. Next, we present our research model on ERP-enabled adoption and influencing factors, and then describe our research method. Finally, we outline the results of our empirical investigation and offer a discussion of implications, limitations and future research.

2. ERP-ENABLED ADOPTION

Technology enabled adoption allows firms to make strategic and positioning investment that supports and enhances initial adopted technologies (Fichman, 2004; Karimi et al., 2007; Karimi et al., 2009). In this paper, we define ERP-enabled adoption as adoptions that occur after the initial deployment of an ERP system which allows for the integration of subsequent technologies. These technologies include modules such as customer relationship management (CRM), supply chain planning, sales form automation and integrated e-commerce (McKie, 2001). ERP-enabled adoption attempts to leverage on the information superiority of an ERP system with additional software applications. Such adoption may include external systems that can extend functionalities such as connecting a website to an ERP system as well as improving visibility of information across a firms’ value chain.

The importance of ERP-enabled adoption lies in the fact that features in applications are rapidly evolving and for firms to remain competitive, they need to keep pace with technological leaps and innovations (Fichman, 2004; Liu et al., 2012). Firms that ignore
new and evolving applications can potentially limit the inherent benefits that such underlying technologies can offer. For instance, Liu et al. (2012) found that integrating CRM with exiting ERP applications rather than installing a CRM functional module contributed to increased business values. Nowadays, organizations view initial ERP system as laying the foundation for their base technology (Willis & Willis-Brown, 2002) and once this technology core is stabilized it provides an opportunity for a firm to be agile and responsive to emerging technological opportunities. Moreover, ERP-enabled adoptions are not restricted to modular systems or sub-component of the existing system. With the technology industry experiencing rapid rise in many function specific third party applications, firms are increasingly eager to leverage on these applications to sustain competitive advantages. ERP systems stimulate these additional adoptions by providing the platform necessary for subsequent adoptions of a variety of applications. For instance, SAP ERP 6.0 boasts of enhancement packages with more than 1400 business functions that allows a customer running SAP’s service-oriented architecture (SOA) framework to incrementally activate these functions as their business processes evolve (searchSAP.com). The adoption and deployment of CRM and electronic commerce capabilities are possible because of the foundation and base technology established by ERP systems (Beard & Sumner, 2004).

Willis and Willis-Brown (2002) argued that initial deployment of an ERP system is all about stabilizing the core technology which if adequately implemented can provide the foundation to add functionalities, extend the applications and integrate other applications. The paper notes that these actions subsequent to ERP deployment enable firms to achieve full values and benefits embedded in the system. For instance, add-ons such as a data warehouse, data mining, and CRM enable organizations to derive more value from an ERP systems ability to integrate organization information needs into a single database. As a result, organizations that extend their ERP systems beyond the core applications and capabilities are better positioned to optimize business processes, broaden the functionalities, and achieve higher return on investments in these systems. Indeed, the nature of ERP systems enables a series of post adoption activities such as modular additions, upgrades, add-ons and third party applications. These additional activities that occur after initial ERP adoption can contribute to investment values and create value-adding opportunities (Willis & Willis-Brown, 2002). Yet, the majority of these researches on ERP systems are focused on understanding drivers to successful adoption, change management issues surrounding ERP adoption and ERP system benefits (Schlichter & Kraemmergaard 2010).

By building on their ERP platforms and by reexamining how functionalities within an ERP platform can be effectively integrated with applications, organizations will continue to strive to satisfy and engage their customers and keep pace with technological leaps (Caldwell and Stein 1998). For example, in the ERP case examined by Taudes et al. (2000), the initial adoption of SAP R/3 lead to subsequent adoption of follow-on applications such as EDI workflows and e-commerce. In fact, ERP vendors are working hard to extend their product offerings (Willis and Willis-Brown 2002) and at the same time move toward a loosely coupled configuration for ERP systems to ensure ease of integration with add-ons and third party applications. Such firms view the initial ERP adoption as a gateway investment that provides the platform and the opportunity for adoption decisions. In fact firms are now integrating their ERP systems with supply chain management (SCM) systems, customer relationship management (CRM), product lifecycle management (PLM) and e-procurement in a bid to streamline and foster cooperation and collaboration across the entire value chain (Nah et al., 2004; Su & Yang 2010). However, these opportunities need to be identified and acted upon in order to achieve optimal value creation and system utilization. Thus, recognizing these opportunities without promptly taking the corresponding investment decisions could hinder the potential values. As Dierickx and Cool (1989) opines that organizations who choose to defer or ignore investment
opportunities in IT platform technologies may not lay claim to the same future benefit as timing of the investment is a key consideration in value maximization.

Moreover, the rapid demand for enterprise-wide new technologies and the level of complexities and uncertainties associated with these technologies have made a modular approach to technology adoption a dominant strategy in organizations as managers’ grapple with the best way to implement new and advanced software technologies. ERP-enabled adoption allows flexibility in managing the implementation process and in examining new ways that enhance the potential benefits (Fichman & Moses 1999; Su & Yang 2010). Indeed, firms may have the resources but still lack the necessary structure and process efficiency to engage in an all-at-once implementation. The complexities in these software platforms and the technologies embedded in the software can create initial implementation challenges for firms thus, making all-at-once implementation an unlikely strategy. Another reason for modular adoptions is the cost associated with the investment, especially in software investment with a high level of uncertainties. The amount of resources allocated to these types of investments is so huge and significant that improper implementation can lead to catastrophic results for organizations. Consequently, firms tend to apply a more conservative approach to implementation.

In order to understand the link between initial ERP system and ERP-enabled adoption, it is necessary to examine two concepts: (1) the effect of initial ERP system factors on the subsequent technology to be adopted (2) the effect of the subsequent technology on ERP-enabled adoption. In this study, we examine two important initial ERP system factors (extent of ERP implementation and current ERP system performance) and their impact on attributes of the subsequent technology (organizational ease of use and organizational relative advantage). We also test the impact of organizational ease of use and organizational relative advantage on ERP-enabled adoption.

3. INITIAL ERP SYSTEM FACTORS

3.1. Extent of ERP Implementation

The extent of ERP implementation defines the type of benefits derivable from an ERP system and specifies the degree to which an ERP system will change process integration and task coordination in the business unit of the organization (Karimi et al., 2007; Karimi et al., 2009; Markus et al., 2000). Karimi et al. (2009) noted that the extent of ERP implementation consists of functional scope, organizational scope and geographic scope. The study identified functional scope as the range of business functions within the ERP implementation, whereas the organizational scope refers to ERP reach within the organizational divisions, departments and units; geographic scope reflects the geographic spread of the system implementation. The extent of ERP implementation arises due to the divisibility characteristics of an ERP system. Thus, firms have a variety of strategies to consider during ERP implementation. The extent of the implementation guides firms on the appropriate deployment strategy. Depending on the firm’s intention, big bang deployment, phased rollout or mini big-bang (Mabert et al., 2000) may be deemed appropriate.

Prior studies have attempted to examine why some firms benefit more from ERP implementation than others (Karimi et al., 2007; Karimi et al., 2009; Ruivo et al., 2012) and the extent of ERP implementation has been identified by researchers as an important factor in ERP system benefit realization. For instance, Ranganathan and Brown (2006) suggested that ERP implementations with greater functional, organizational and geographic scope lead to higher shareholders’ returns. In this same light, Karimi et al. (2007) found that the extent of ERP implementation influences business process outcomes. The study argued that the extent of ERP implementation represents the platform and the initial condition necessary to facilitate higher business process outcomes. As firms implement an ERP system, a wide
range of options and potential innovations are made available depending on the reach and breadth of the system. According to Karimi et al. (2009), ERP implementation results improve a firm’s understanding and process awareness. Consequently, the knowledge gained through the implementation provides insights into subsequent adoption decisions. Thus, the greater the extent of ERP implementation, the more likely firms will learn from the deployment and leverage on the implementation to explore more growth opportunities.

Existing literature has identified the extent of ERP implementation as an important consideration in any ERP project decision making (Karimi et al., 2009; Ruivo et al., 2012). The extent of ERP implementation determines the benefits derivable from an ERP system, the degree of difficulty in project implementation, as well as the nature of process changes (Markus et al., 2000; Karimi et al., 2009). For instance, the extent of implementation will identify the business processes to be included in the implementation and business processes will, in turn, determine which ERP functionalities to be implemented (Markus et al., 2000). The greater the implementation and use of an ERP system, the more likely a firm is to develop unique capabilities from its technology platforms (Ruivo et al., 2012). Furthermore, ERP systems, as platform technologies, are capable of creating growth options and additional adoptions but such opportunities may be limited for firms with narrow ERP implementation (Fichman 2004). First, the platform or base technology necessary to support subsequent adoption may be lacking. Second, the knowledge and awareness acquired during the initial implementation may be limited to enable the firm to benefit more from the ERP system.

In an ERP environment, the degree of support and the opportunity created by the initial ERP deployment is typically a function of the extent of the implementation. Specific follow-up adoptions would be beneficial and valuable based on the organizational spread of the initial ERP implementation. For instance, an organization that implemented an accounting and material management module or a firm that implemented an ERP system at a single location may not lay claim to the same level of ERP-enabled adoption benefits associated with organizations with a greater extent of ERP implementation. Once a firm successfully deploys an ERP system, the next step will be to adopt specific technologies that will leverage on the information and business process integration that an ERP system offers. Thus, such applications tend to create wider benefits as opposed to when they are deployed in firms with a narrow scope of ERP implementation.

Arguably, the relative advantage of the specific application considered for adoption will be positively associated with the extent of ERP implementation. For instance, an organization with a stable and wider ERP system reach can achieve more compounding effect and synergy with a subsequent technology. The new technology will benefit from high level integration and information richness created by the initial ERP system. In this same light, the extent of ERP implementation can be associated with organizational ease of use. As organizations embrace the initial ERP deployment, users will get familiar with the software, thus subsequent technologies will have an increased ease of use since users are already familiar with such software. Thus, we propose the following hypotheses:

**H1:** The extent of ERP implementation positively influences organizational ease of use of subsequent technology.

**H2:** The extent of ERP implementation positively influences organizational relative advantage of subsequent technology.

### 3.2. Current System Performance

The performance of the underlying IT platform is a key driver in subsequent adoption and implementation decisions (McGrath 1997; Taudes et al., 2000). Indeed, these underlying technologies provide the base upon which to build and extend new applications. Swanson (1994) observed that an installed application system portfolio of the
IS unit provides the opportunity and foundation to add new applications and in some cases present preconditions for other innovative related applications. Trigeorgis (1993) moved a step further to argue that in some cases the adoption of subsequent applications are impossible if the initial core applications are lacking.

ERP system performance is defined as the degree of effectiveness and efficiency in business goals and objectives accomplishment by the ERP system (Leem & Kim 2004). ERP system performance deals with the effectiveness of the system in meeting the requirements of current business functions as well as anticipated future requirements. Ascertaining system performance requires an evaluation and assessment of the systems behavior to determine and identify the associated time and resource used in accomplishing expected organizational tasks (Jiang et al., 2003). Hence, for ERP-enabled adoptions to take place, the underlying based technology will need to be stable and operating at an acceptable level of performance (Willis & Willis-Brown 2002). If the base and underlying core of the ERP platform is not functioning at an acceptable level, firms’ ability to build on the existing system becomes very challenging leading to difficulty in attaining desired results. Firms are hesitant to extend applications or functionalities when the current system is unstable. For instance, several studies have identified stabilization of ERP system as a pre-condition to implementing post-ERP applications (Caldwell & Stein 1998; Willis & Willis-Brown 2002) while arguing on the need for a thorough audit and assessment of the ERP system. The assessment is usually performed to identify inherent flaws, irregularities and discrepancies that may affect the ability of a new application to function smoothly with the base ERP system. According to Willis and Willis-Brown (2002), by stabilizing the core ERP system, organizations are able to successfully leverage the integrated database structure and build onto an ERP platform with add-ons such as supply chain management systems, data mining applications and a variety of customer-focused applications.

Getting an ERP system to an acceptable level of performance is critical because there is usually a gap between the ERP generic functionality and the specific organizational requirement (Hong & Kim 2002). Thus, for an ERP system performance to meet the firm’s expectation, these gaps and discrepancies need to be adequately addressed. The problem is further exacerbated by the complex nature of ERP systems. A mismatch between a firm’s business process and the ERP functionality can significantly hinder system performance (Soh et al., 2000) as well as the capacity to add subsequent applications (Liu et al., 2012). In fact, Soh et al. (2000) argue that such misfits arise due to organizational process and procedural differences that are usually not accounted for in the pre-designed process configuration of ERP systems. Given that firm-specific requirements influence module functionalities (Soh et al., 2000) and system performance in general, the adoption of additional specific technologies will be affected by how well the current system is performing. Hence, we contend that current system performance will impact the relative advantage of subsequent technology since managers will perceive that the value and relative advantage of the subsequent technology will be limited by the performance of the platform technology. In the same light, current system performance will influence organizational ease of use as users will have a positive mindset towards using a subsequent technology if they have already established a positive experience with the initial ERP system. Thus, we propose the following hypotheses:

**H3:** Current system performance positively influences organizational ease of use of subsequent technology.

**H4:** Current system performance positively influences organizational relative advantage of subsequent technology.
4. SUBSEQUENT TECHNOLOGY

4.1. Organizational Ease of Use

Organizational ease of use refers to the degree to which an organization perceives a system to be free from effort. Davis (1989) introduced ease of use as one of the two user-related beliefs that drive individual disposition or intention towards the use of a technology. Studies have shown that when innovations are easy to use, system usage and performance can be achieved (Moore & Benbasat 1991; Rogers 2003). Ease of use is thus attributable to the process of using the system. Prior research on innovation and adoption has observed the characteristics of the innovation as perceived by the adopting business influence adoption decisions (Rogers 1995; Thong 1999). For instance, Rogers (2003) suggested that complexity -which refers to the degree to which an innovation is perceived as difficult to use -has a negative impact on firm’s adoption decisions. Indeed, adopting a technology that requires a great deal of effort during the trial period can be very challenging as the desire to interact with the technology will diminish regardless of its benefits (Templeton & Byrd 2003).

The relationship between ease of use and relative advantage has been widely established in the literature (Templeton & Byrd 2003). Kanter (2000) noted that relative advantage represents a fundamental foundation and base for developing ease of use while Carroll and Philip (1993) argued that relative advantage can be operationalized to include ease of use among other user perception variables. Moore and Benbasat (1991) argued that the “usefulness” construct, as identified by Davis (1989), was not indeed different from relative advantage. Thus, ease of use is expected to have a positive correlation with relative advantage as theorized by the technology acceptance model (TAM). Several studies that have replicated the TAM model have consistently found a positive correlation between ease of use and usefulness (Barnett et al., 2006).

Organizational ease of use is increasingly becoming a dominant decision factor for firms adopting ERP systems. One reason for this is because firms translate organizational ease of use into easier implementation as well as easier training and support (Gupta 2000). Verville and Halington (2002) investigated the decision process of selecting an ERP system and found that companies were interested in issues ranging from the ability of the software to integrate with other applications to the ease of implementation and use. Organizational ease of use has been demonstrated in previous studies to influence technology adoption decision (Davis 1989), therefore it’s reasonable to assume that organizational ease of use is also a deciding factor for ERP-enabled adoptions. However, since ERP-enabled adoptions will be implemented on existing systems, organizational ease of use becomes a more dominant decision factor for the following reasons. First, in order to maintain the ease of use of the initial ERP system, organizations have to ensure the ease of use of any subsequent technologies. Moreover, organizational beliefs in ERP-enabled adoptions will be formed based on past experiences of the initial ERP system, so it is crucial for organizations to uphold the same beliefs. Second, integrating subsequent technologies can increase system complexity, therefore, ensuring organizational ease of use of subsequent technologies can decrease complexity of the system. Thus, we propose the following hypotheses:

**H5:** Organizational ease of use positively influences organizational relative advantage of subsequent technology.

**H6:** Organizational ease of use positively influences ERP-enabled adoption.

4.2. Organizational Relative Advantage

Relative advantage refers to the degree to which a technology or a system is perceived as being better than the one being replaced (Rogers 2003). Thus, potential users will not consider
adopting an innovation if they do not see any relative advantage of doing so. According to Moore and Benbasat (1991), relative advantage is an important determinant of innovation diffusion because it captures the sum of values as perceived by intended users of the innovation. From an organizational perspective, firm management is interested in the relative advantage that a specific ERP-enabled adoption will bring to the firm. ERP-enabled adoptions allow firms to expand their current systems by integrating add-ons, modules, and external systems. Such changes can expand initial ERP systems beyond their core, add new functionalities and offer additional value-added options.

The relative advantage of ERP-enabled adoptions involves the potential benefits versus cost. An initial investment in a platform technology such as an ERP system provides the ability to exercise future deployment and growth opportunities embedded in the technology. These future opportunities are valuable options because it allows firms to build onto the initial investment and make additional IT investment that may not have been possible without the initial investment (McGrath & Nerkar 2004; Tallon et al., 2002). However, in making these decisions, managers may need to evaluate the relative advantage of the technology so as to establish the benefits that are associated with that adoption. Thus, the relative advantage of the ERP-enabled adoptions will depend on how well the initial investment will facilitate and enable such technologies with greater relative advantage to be implemented.

According to Taudes et al. (2000), the value of a software platform lies in the options it creates to build applications. Thus, the embedded options of an initial investment will be high if the investment enables several applications with relative advantage to be built on the platform. Exercising these options and building upon the platform is a function of how well the intended technology will supersede the existing one. Taudes et al. (2000) argued that IS functions present in the software platform can be used as a proxy for evaluating the potential growth options of the initial investment. Thus, we propose the following hypothesis:

**H7:** Organizational relative advantage positively influences ERP-enabled adoption.

5. RESEARCH MODEL

The research model is shown in Figure 1. We operationalize the framework by proposing a research model that captures ERP-enabled adoption. Based on the review of existing literature (e.g., Karimi et al., 2007; Karimi et al., 2009; Willis & Willis-Brown 2002), we hypothesize that initial ERP system factors (extent of ERP implementation and current ERP system performance) are most likely to influence subsequent technology factors (organizational ease of use and organizational relative advantage).

---

*Figure 1. Research model*
Furthermore, we hypothesize that organizational ease of use and organizational relative advantage of a subsequent technology will influence ERP-enabled adoption.

6. RESEARCH METHODOLOGY

6.1. Participants and Procedure

In order to validate the research model, we conducted a questionnaire-based quantitative field study. The subjects of our empirical study were chief information officers (CIO), vice presidents in charge of IT and IT executive directors of US firms that have implemented ERP systems. A survey instrument was developed to collect the quantitative data required for model and hypothesis testing. In addition, a pilot test was undertaken to further refine the instrument. A version of the questionnaire was administered to a random sample of 200 Management Information System (MIS) directors. The results from the pilot study lead to modifications of the wording and further refinement of the survey instrument. The preliminary factor analysis revealed that the scale items displayed the same psychometric properties. Thus, no item was removed from the scale based on the preliminary factor analysis.

We administrated the finalized survey to a large random sample of MIS directors. Dun and Bradstreet’s Million Dollar database (Cooper et al., 2000; Ray et al., 2005; Tiwana et al., 2006) – a directory of executives was used to identify a random sample of MIS directors. This database provides contact information of executives in various positions in firms in the United States. In choosing the sampling frame, we ensured that the executive selected for each firm had Chief Information Officer (CIO) designation. In instances where a CIO designation was not available, we selected executives with positions such as a Vice President of IT Operations or any other designation that suggested that such an executive was in charge of the IT unit. The random sampling ensured that each member of the population had equal opportunity of being selected in the sample (Dillman 2007).

In addition, our online survey was strictly controlled and made accessible only to intended respondents. First, our survey was accessible only through an invitation. Second, each respondent was required to provide his or her designation in the company and key company characteristics to help us verify the accuracy of the responses. Third, respondents were automatically taken to subsections of the survey based on their answers to introductory questions. These questions also ensured that participants had adopted an ERP system and had adopted an additional technology made possible by the initial ERP deployment.

6.2. Instrument Development

Appendix A provides the list of scales and their original sources. Whenever possible, we used previously validated scales and adapted them in the context of ERP-enabled adoption. In developing the measures, a procedure by Churchill (1979) was followed for developing better measures and removing items that did not perform. We examined measurement invariance of each scale to determine whether the measurement items varied across treatments with the intention of removing items violating measurement invariance conditions. Furthermore, Hatch (2002) argues that existing studies can provide the foundation needed to design an instrument as it allows researchers to recognize gaps in the literature. In some cases, we made modifications on existing measures to fit the constructs and dimensions of our research model.

We conducted a series of expert reviews on the instrument items to ensure their relevancy, completeness and validity. This involved interview sessions with IT professionals knowledgeable in ERP adoption as well as doctoral students in a large public university with research interest in IT adoption. The group was asked to examine whether the items were indeed representing the constructs under study as well as to comment on the wording of the measurement items. Such expert reviews are necessary to help establish the content validity of the constructs being measured (Rungtusanatham, 1998; Li et al., 2011). Based on initial
comments, some modifications were made on the instrument to enhance clarity.

6.3. Sample

On behalf of the authors, 4337 potential MIS executives were invited to respond to the survey through email with a URL link to the web survey from December 2011 until February 2012. A total of 575 responses were returned resulting in an estimated response rate of 13.26 percent. However, 29 respondents were discarded due to incomplete questionnaire while additional 27 responses were unusable. In most cases unusable responses were the result of respondents indicating that they do not have an ERP system. Thus, the final number of usable responses was 519. The distribution of the responses based on industry segment was consistent with those of United States public traded companies. Such consistency indicated that our sample was unbiased. We conducted a t-test to compare our sample distribution and industry segmentation of publicly traded companies based on Global Industry Classification Standard (GICS) which consists of 10 sectors and 24 Industry groups. The result did not reveal any statistical significance (Chi-square 10.450, p< 0.235). This broad representation of industries improves the generalizability of the study’s findings (see Tables 1 and 2).

7. ANALYSIS AND RESULTS

Analysis and empirical validation of our hypotheses was done with partial least square (PLS) analysis. PLS was selected because it enables specification and testing of path models with latent constructs. PLS is well suited for complex models involving latent variables. In addition, PLS does not require any assumptions of multivariate normality (Chin, Marcolin & Newsted, 2003) and it works well with small to medium data points (Chin 1998). PLS deals with measurement errors in exogenous variables better than other methods, such as multivariate regression (Chin, 1998). SmartPLS 2.0 (Ringle et al., 2005) software was used for the analysis. 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. Consistent with prior research using PLS models, we analyzed our model in two stages (e.g., Hulland 1999; Chin 2001; Gefen & Straub 2005). The first stage involved “the assessment of the reliability and validity of the measurement model” and the second stage involved “the assessment of the structural model” (Hulland, 1999, p. 198).

Table 1. Industry distribution of the sample

<table>
<thead>
<tr>
<th>Industry</th>
<th>Total Number of Firms</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>73</td>
<td>14%</td>
</tr>
<tr>
<td>Education</td>
<td>5</td>
<td>1%</td>
</tr>
<tr>
<td>Finance Insurance and Real Estate</td>
<td>36</td>
<td>7%</td>
</tr>
<tr>
<td>Information Technology</td>
<td>36</td>
<td>7%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>125</td>
<td>24%</td>
</tr>
<tr>
<td>Retail</td>
<td>78</td>
<td>15%</td>
</tr>
<tr>
<td>Service</td>
<td>145</td>
<td>28%</td>
</tr>
<tr>
<td>Telecommunication</td>
<td>21</td>
<td>4%</td>
</tr>
<tr>
<td>Total</td>
<td>519</td>
<td>100%</td>
</tr>
</tbody>
</table>
7.1. Test for Non-Response Bias and Common Method Bias

To test for non-response bias, we followed the wave analysis proposed by Armstrong and Overton (1977). We compared early respondents and late respondents (Calantone et al., 2003; Lambert and Harrington 1990). Typically, late respondents’ answers tend to be in line with the non-respondents and are different from early respondents (Armstrong & Overton 1977). A t-test was conducted to compare the means of these two groups in order to test for significant differences between the two. The result did not find any significant differences in the mean responses between late respondents (i.e., last 25%) and the rest of the respondents.

Furthermore, several procedures were used to mitigate the effect of common method bias. Podsakoff et al. (2003) provide guidance to reduce common source of this bias. The two key ones are to ensure anonymity in survey administration and to improve measurement items for the constructs. First, anonymity was maintained in the questionnaire and respondents were asked to be as honest as possible while reassuring them that there is no right or wrong answer (Podsakoff et al., 2003). Second, the pilot test improved the scale items by removing vague concepts, ambiguous and unfamiliar terms, as well as double-barreled questions (Podsakoff et al., 2003). Also in measuring some of the study constructs, we relied on previously tested scales. Well tested and validated scales help to reduce item ambiguity, as recommendation by Podsakoff et al. (2003). Third, counterbalancing the question order was also used to control for priming effect and other item-context induced mood state (Podsakoff et al., 2003). We conducted Harman’s single-factor test to assess potential common method bias (Sharma et al., 2009; Podsakoff et al., 2003) and the test revealed no significant evidence of common method bias. Finally, we followed the Liang et al. (2007) approach to test the common method bias in PLS. The results indicated that method loadings were not significant and indicators substantive variances were substantially greater than their method variances. Therefore, we concluded that the common method bias is not a serious threat.

7.2. Measurement Model and Construct Validity

Confirmatory factor analysis (CFA) was conducted for all of the latent constructs (Table 3). 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 4, the composite reliabilities were all above 0.70; thus all measures have adequate levels 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 and Fiske, 1959).

<table>
<thead>
<tr>
<th>Market Capitalization</th>
<th>Number of Firms</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Than $500 Million</td>
<td>99</td>
<td>19%</td>
</tr>
<tr>
<td>$500 to $999 Million</td>
<td>239</td>
<td>46%</td>
</tr>
<tr>
<td>$1 Billion to $4.9 Billion</td>
<td>119</td>
<td>23%</td>
</tr>
<tr>
<td>$5 Billion to $9.9 Billion</td>
<td>31</td>
<td>6%</td>
</tr>
<tr>
<td>$10 Billion or More</td>
<td>31</td>
<td>6%</td>
</tr>
</tbody>
</table>

Table 2. Company size by market capitalization
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 4, 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 et al., 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 between the construct and all other constructs in the model. The correlation matrix among all constructs is presented in Table 4. As shown in the table, the square root of an AVE is greater than the correlations between the construct and all other constructs. Thus, the measurements demonstrate satisfactory levels of discriminant validity.

### Table 3. Item loading and cross-loadings

<table>
<thead>
<tr>
<th></th>
<th>EEA</th>
<th>CSP</th>
<th>EXT</th>
<th>OEU</th>
<th>ORA</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEA</td>
<td>1.0000</td>
<td>0.5943</td>
<td>0.5003</td>
<td>0.6643</td>
<td>0.6338</td>
</tr>
<tr>
<td>CSP1</td>
<td>0.5073</td>
<td>0.9098</td>
<td>0.5549</td>
<td>0.5312</td>
<td>0.5151</td>
</tr>
<tr>
<td>CSP2</td>
<td>0.6111</td>
<td>0.9507</td>
<td>0.6079</td>
<td>0.5840</td>
<td>0.5426</td>
</tr>
<tr>
<td>CSP3</td>
<td>0.5527</td>
<td>0.9368</td>
<td>0.6616</td>
<td>0.5350</td>
<td>0.4618</td>
</tr>
<tr>
<td>EXT1</td>
<td>0.4618</td>
<td>0.5852</td>
<td></td>
<td>0.9326</td>
<td>0.4224</td>
</tr>
<tr>
<td>EXT2</td>
<td>0.4386</td>
<td>0.6297</td>
<td>0.9422</td>
<td>0.6847</td>
<td>0.4218</td>
</tr>
<tr>
<td>EXT3</td>
<td>0.5062</td>
<td>0.6271</td>
<td></td>
<td>0.9521</td>
<td>0.5195</td>
</tr>
<tr>
<td>OEU1</td>
<td>0.6033</td>
<td>0.5872</td>
<td>0.6579</td>
<td>0.8833</td>
<td>0.6342</td>
</tr>
<tr>
<td>OEU2</td>
<td>0.6329</td>
<td>0.5225</td>
<td>0.5325</td>
<td>0.9448</td>
<td>0.6094</td>
</tr>
<tr>
<td>OEU3</td>
<td>0.6027</td>
<td>0.5399</td>
<td>0.6968</td>
<td>0.9282</td>
<td>0.6157</td>
</tr>
<tr>
<td>OEU4</td>
<td>0.5894</td>
<td>0.6843</td>
<td>0.6485</td>
<td>0.8888</td>
<td>0.4389</td>
</tr>
<tr>
<td>OEU5</td>
<td>0.5879</td>
<td>0.8081</td>
<td>0.6984</td>
<td>0.9026</td>
<td>0.5857</td>
</tr>
<tr>
<td>OEU6</td>
<td>0.6721</td>
<td>0.6922</td>
<td>0.5109</td>
<td>0.9201</td>
<td>0.5922</td>
</tr>
<tr>
<td>OEU7</td>
<td>0.5686</td>
<td>0.7369</td>
<td>0.6928</td>
<td>0.9267</td>
<td>0.6275</td>
</tr>
<tr>
<td>OEU8</td>
<td>0.5762</td>
<td>0.6817</td>
<td>0.6347</td>
<td>0.8856</td>
<td>0.4552</td>
</tr>
<tr>
<td>ORA1</td>
<td>0.5531</td>
<td>0.4742</td>
<td>0.3649</td>
<td>0.5479</td>
<td>0.8895</td>
</tr>
<tr>
<td>ORA2</td>
<td>0.6183</td>
<td>0.5111</td>
<td>0.4550</td>
<td>0.5929</td>
<td>0.9537</td>
</tr>
<tr>
<td>ORA3</td>
<td>0.5972</td>
<td>0.5312</td>
<td>0.4558</td>
<td>0.6219</td>
<td>0.9534</td>
</tr>
<tr>
<td>ORA4</td>
<td>0.5664</td>
<td>0.4893</td>
<td>0.3984</td>
<td>0.5628</td>
<td>0.9281</td>
</tr>
<tr>
<td>ORA5</td>
<td>0.6191</td>
<td>0.5148</td>
<td>0.4705</td>
<td>0.6017</td>
<td>0.9408</td>
</tr>
<tr>
<td>ORA6</td>
<td>0.6044</td>
<td>0.5450</td>
<td>0.4337</td>
<td>0.6052</td>
<td>0.9366</td>
</tr>
<tr>
<td>ORA7</td>
<td>0.5849</td>
<td>0.4921</td>
<td>0.4118</td>
<td>0.5778</td>
<td>0.9393</td>
</tr>
</tbody>
</table>
7.3. Structural Model Testing

We performed an analysis of the full model in Figure 1 using PLS and the results are presented in Table 5 and Figure 2. Both initial ERP system factors, extent of ERP implementation and current system performance, were significant determinants of organizational ease of use of subsequent technology, thus supporting H1 (β = 0.39, p < 0.01) and H3 (β = 0.54, p < 0.01). Contrary to H2, extent of ERP implementation was not significant in predicting organizational relative advantage of a subsequent technology (β = -0.04, p > 0.10). Also, H4, current system performance was not significant in predicting organizational relative advantage (β = 0.11, p > 0.10). This suggests that managers make distinctions between the platform such as the initial ERP system and the subsequent technology being adopted. It is possible that managers are using the additional technology to address the functional limitations of the initial ERP system. Again it appears that firms place greater importance on the features and usability of the additional technology being adopted as opposed to the current ERP system performance.

H5 received support (β = 0.57, p < 0.01). The study found a strong positive and significant relationship between organizational ease of use and organizational relative advantage. Indeed, our empirical results reinforce the findings of the IS adoption literature (Roger 2003; Kanter 2000; Templeton and Byrd 2003) which notes that ease of use correlates with relative advantage. It appears that firm’s management understands that an adopted technology may encounter implementation challenges and assimilation barriers if users believe that such technology will be difficult to use. Similarly, both organizational ease of use and organizational relative advantage were significant determinants of ERP-enabled adoption, thus supporting H6 (β = 0.43, p < 0.01) and H7 (β = 0.35, p < 0.01).

8. DISCUSSION

The growing popularity of ERP systems as software solutions capable of integrating business processes across functional areas of an organization has propelled its adoption and use to the front stage. While ERP implementation and its adoption have been examined by many, it is equally important to develop a deep understanding of the impact of the initial ERP system on ERP-enabled adoption. This study represents a step toward that goal. In general, the results support five of the seven hypotheses (see Table 4 and 5). We posited that the extent of ERP implementation will lead to organizational ease of use and organizational relative advantage were significant determinants of ERP-enabled adoption, thus supporting H6 (β = 0.43, p < 0.01) and H7 (β = 0.35, p < 0.01).

Table 4. Descriptive statistics and correlations

<table>
<thead>
<tr>
<th>Construct</th>
<th>Mean</th>
<th>SD</th>
<th>AVE</th>
<th>CR</th>
<th>EEA</th>
<th>CSP</th>
<th>EXT</th>
<th>OEU</th>
<th>ORA</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERP-enabled Adoption</td>
<td>86.14</td>
<td>1.07</td>
<td>1</td>
<td>1.00</td>
<td>1</td>
<td>0.9326</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current System Performance</td>
<td>5.66</td>
<td>1.14</td>
<td>0.8697</td>
<td>0.9524</td>
<td>0.5943</td>
<td>0.9326</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extent of ERP Implementation</td>
<td>5.44</td>
<td>1.09</td>
<td>0.8880</td>
<td>0.9597</td>
<td>0.5003</td>
<td>0.6514</td>
<td>0.9423</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organizational Ease of Use</td>
<td>5.84</td>
<td>1.11</td>
<td>0.8286</td>
<td>0.9748</td>
<td>0.6643</td>
<td>0.8051</td>
<td>0.7526</td>
<td>0.9103</td>
<td></td>
</tr>
<tr>
<td>Organizational Relative Advantage</td>
<td>5.78</td>
<td>1.08</td>
<td>0.8737</td>
<td>0.9798</td>
<td>0.6338</td>
<td>0.5443</td>
<td>0.4581</td>
<td>0.6300</td>
<td>0.9347</td>
</tr>
</tbody>
</table>

Square root of Average Variance Extracted (AVE) is shown in bold. Note: SD: standard deviation; CR: composite reliability.
not show support for organizational relative advantage of subsequent technology, it is not surprising that it is a strong predictor of organizational ease of use. This is because while the techno-centric features of each technology may differ significantly between the initial ERP system and subsequent technology, the same cannot be said of employees’ behavioral attitude towards additional technologies. Thus, firms tend to view organizational acceptance of the initial ERP system as a key indicator of the usability of subsequent technologies. Thus, decisions will be based on how comfortable the organization is with the current ERP platform. Similarly, there is significant support for current system performance of the initial ERP system in predicting organizational ease of use of subsequent technology. This result was expected as organizations will have a positive mindset toward adopting and using a similar technology if they have already established a positive experience with the current ERP system. Users within an organization can be overwhelmed by disruptive changes created by additional technologies. Once an organization gets used to the system, decision makers are more likely to perceive any additional application that is similar to the current ERP system as easy to use. However, current system performance did not play a significant role in determining the relative advantage of subsequent technology. This finding is very revealing because it appears to suggest that managers make distinctions between the platform such as the initial ERP System and the subsequent technology. It is possible that managers are

Table 5. Summary of results/hypothesis testing

<table>
<thead>
<tr>
<th>Hyp.</th>
<th>Path</th>
<th>T-Statistics</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Extent of ERP Implementation → Organizational Ease of Use</td>
<td>***9.141</td>
<td>Supported</td>
</tr>
<tr>
<td>H2</td>
<td>Extent of ERP Implementation → Organizational Relative Advantage</td>
<td>0.9791</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H3</td>
<td>Current System Performance → Organizational Ease of Use</td>
<td>***14.1552</td>
<td>Supported</td>
</tr>
<tr>
<td>H4</td>
<td>Current System Performance → Organizational Relative Advantage</td>
<td>1.5402</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H5</td>
<td>Organizational Ease of Use → Organizational Relative Advantage</td>
<td>***8.8546</td>
<td>Supported</td>
</tr>
<tr>
<td>H6</td>
<td>Organizational Ease of Use → ERP-enabled Adoption</td>
<td>***7.0712</td>
<td>Supported</td>
</tr>
<tr>
<td>H7</td>
<td>Organizational Relative Advantage → ERP-enabled Adoption</td>
<td>***5.7527</td>
<td>Supported</td>
</tr>
</tbody>
</table>

Figure 2. Research model with results (*** p <0.001; n.s = not significant)
using the additional technology to address the functional limitations of the current ERP system. Also it appears that firms place greater importance on the features and usability of the subsequent technology as opposed to the initial ERP system performance. The reason could be that firms are using the additional technology deployed to serve a specific business need that may not significantly overlap with the current ERP platform. In such situation, the performance of the initial ERP system may have little to do with the performance of the potential subsequent technology. Although existing studies have shown that having a stable ERP platform is desirable (Taudes et al., 2000; McGrath 1997; Willis & Willis-Brown 2002), it is still unclear whether the state of the ERP system can create crossover effects on function centric applications such as data warehouse applications and data mining applications.

Moreover, the results found that organizational ease of use had a positive influence on organizational relative advantage of subsequent technology. Indeed, our empirical results reinforce the findings of IS adoption literature (Roger 1983; Kanter 2000; Templeton & Byrd 2003) which notes that ease of use correlates with relative advantage. It appears the firm management understands that a subsequent technology may encounter implementation challenges and assimilation barriers if users believe that such technology will be difficult to use. Similarly, we found that organizational ease of use of subsequent technology had a positive influence on ERP-enabled adoption. This result is consistent with the IS literature, which suggests that characteristics of the innovation as well as the complexity affects firms adoption decisions (Roger 1983; Moore & Benbasat 1991; Templeton & Byrd 2003). Firms recognize that organizational ease of use can translate to easier implementation of the subsequent technology being adopted. Further, while past research in organizational ease of use has shown that it influences adoption decisions, this result indicates that in the context of ERP-enabled adoption, organizational ease of use remains a strong predictor of adoption decisions. This finding is particularly interesting because it reaffirms organizational ease of use as a strong predictor of adoption. Thus, decision makers within the firm need to create favorable climate that foster organizational ease of use of the subsequent technology in order to meet the adoption goals as well as to attain the desired technology benefits and expectations.

Regarding organizational relative advantage of subsequent technology, the study found it to be a strong predictor of ERP-enabled adoption. This result is consistent with Moore and Benbasat (1991), who argue that relative advantage is an important predictor of innovation diffusion because it captures the sum values as perceived by intended user. Further, this study validates the findings of some recent work (e.g., Jeon, Han & Lee, 2006, Li et al., 2011) that have identified organizational relative advantage as a strong determinant of adoption decisions. Given that firms are increasingly seeking out technologies that can help create competitive advantage, it is not surprising that organizational relative advantage is reinforced as a strong predictor of ERP-enabled adoption.

8.1. Implications for Research

The investigation of technology adoption has been widely explored within the IS literature. Results from this research contribute to this body of knowledge in several key areas. First, this research addresses a key theoretical gap in the adoption literature by integrating adoption decisions that go beyond the initial ERP system. Insight was provided as to the specific interplay between initial ERP system factors and attributes of the subsequent technology as predictors of ERP-enabled adoption. These results hold important implications for future research that seek to reconcile the influence of IT platform on subsequent technologies.

To our knowledge this study is one of the first to empirically test post-ERP adoption decisions from a platform technology perspective. As discussed earlier, prior adoption research has either examined organizational adoption from as a statics process where the adopting
technology is viewed in isolation, thus limiting our understanding of the process. The empirical evidence presented in this study directly supports the contention that understanding the platform role of an ERP system can be useful when faced with investment decisions with a high level of uncertainty. Given this assertion, this study can provide a revealing theoretical lens for further understanding of ERP-enabled adoption.

Third, this study reveals key antecedents of organizational ease of use and organizational relative advantage that have been largely ignored by prior studies. Although prior IS research has illustrated the role of organizational ease of use and relative advantage in the adoption of technology (Kanter 2000; Templeton & Byrd 2003; Li et al., 2011), relatively less is known about the antecedent of these variable especially when dealing with adoption decisions that go beyond the initial ERP system. Based on the empirical evidence gathered from this study, key predictors of organizational ease of use and organizational relative advantage can be clearly identified.

8.2. Implication for Practice

This study should be of practical value to managers and executives who are seeking to maximize the benefits of their ERP systems. Our findings suggest that the key to capturing the full benefits of firm’s ERP system may reside in the ability to implement technologies that leverage the ERP system. In terms of ensuring easier deployment and implementation of subsequent ERP-enabled adoption, managers and executives need to ensure that the initial ERP system attains a degree of stability prior to additional adoptions. Such stability will create favorable conditions in terms of perceived organizational ease of use that facilitates deployment of the subsequent technology.

Furthermore, the depth and breadth of the initial ERP system can create a foundation for beneficial adoption decisions. Managers and executives must make strategic decisions in determining the extent of the initial ERP implementation. This is vital because the process efficiency and experience gained from the initial implementation may be useful in erasing the perceived disruptions associated with the subsequent technologies. Additionally, practitioners should be aware of the effect of key antecedents of organizational ease of use and organizational relative advantage of a subsequent technology. Currently, many project leaders grapple with implementation challenges and how additional technologies may influence existing IT infrastructure. Thus, it may be more efficient for organizations to consider policies and structures that foster ERP performance prior to subsequent technologies.

8.3. Limitations

Although we believe that this study makes a number of contributions, like all other studies, it has certain limitations. One of the limitations is that this study adopts a cross-sectional view of ERP-enabled adoption and makes no distinction between innovative organizations and non-innovative organizations. Such design may not adequately capture the interactions between real options and organizational adoptions over time. Although, this study examines key adoption characteristics using perceptual measures, we believe that prior history of the organization has been factored into these perceptions and thus, does not taint the findings.

Another limitation of this study is that it employed an online survey method for its data collection. The natural limitation is that this survey method eliminates potential participants whose email accounts cannot be identified. However, the survey for this study was conducted using a database of Management Information System (MIS) directors of firms within the United States. This database has been previously used within the IS literature (Cooper et al., 2000; Ray et al., 2004; Tiwana et al., 2006). Furthermore, the targeted respondents of the survey are MIS executives who are significant members of their respective firm management team, thus their contact information was easily verifiable. Therefore, we believe that this limitation should not significantly bias the sample.
8.4. Directions for Future Research

The results from this research hold important implications for future research that seeks to recognize the benefit gaps associated with ERP adopting firms. First, ERP systems have been explored within the IS literature (Taudes et al., 2000; Fichman 2004; Wu et al., 2008). While the current study goes a step further to indicate that ERP systems have adoption implications that transcend the initial adoption, there is need to examine how the interplay between real options and technology uncertainties can help managers implement ERP systems more successfully. In addition, future research should consider how ERP-enabled adoption succeeds or fails over time as firms attempt to address uncertainties associated with these adoption decisions. Second, all major constructs were measured by respondents’ perceptions, which are subjective. Although respondents were asked to respond with a specific adopting technology in mind, there is no guarantee that respondents filled the questionnaire with such a mindset. Hence, future research should measure these variables from multiple sources as well as collect data from multiple points of time. A longitudinal study may enrich the findings of this result as well as offer additional perspectives on the variables. Finally, formal real options analysis can be applied to other IT platform technologies as well as to different adoption models and contexts.

REFERENCES


---

Copyright © 2013, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.


Joseph K. Nwankpa is an assistant professor of Computer Information Systems and Quantitative Methods at The University of Texas - Pan American. He holds a PhD from Kent State University in Information Systems. His primary research focuses on ERP systems, Knowledge Management Systems, IT adoption, IT Audit and Accounting Information Systems. His research has appeared in Information Resources Management Journal and national conferences including INFORMS, AMCIS and DSI.
Yaman Roumani received his M.S. degree in Computer Science from Temple University and a Ph.D. degree in Information Systems from Kent State University. He is an assistant professor in the Department of Computer Information Systems in the School of Business at Eastern Michigan University. His current research interests include software security and vulnerabilities and the theory and application of open source, social media and ERP systems. Roumani’s research has been published in numerous conference proceedings including AMCIS, DSI, MWDSI and WDSI. He recently published a book chapter in Developing Business Strategies and Identifying Risk Factors in Modern Organizations.

Alan A. Brandyberry is an Associate Professor of Information Systems in the Department of Management and Information Systems at Kent State University. His research interests include the adoption and diffusion of technological innovations with a focus on the development of next generation research models and methods, modeling and simulation using artificial intelligence techniques, and behavioral research concerning human/technology interactions. His work has appeared in Journal of the Association for Information Systems, Decision Sciences, The European Journal of Operational Research, The International Journal of Operational Research, The DATA BASE for Advances in Information Systems, and others.

Alfred L. Guiffrida is an Associate Professor of Management in the Department of Management and Information Systems at Kent State University. He holds his Ph.D., M.S. and B.S. degrees all in Industrial Engineering from the University at Buffalo (SUNY) and an MBA in Management Science from Virginia Tech. His research interests are in the areas of operations and supply chain management. He has published in the European Journal of Operational Research, International Journal of Integrated Supply Management, International Journal of Production Economics, International Journal of Production Research, and International Transactions in Operations Research.

Michael Y. Hu is Emeritus Bridgestone Professor in International Business, Kent State University. He earned his PhD from the University of Minnesota. He has published over 150 articles in academic journals including Decision Support Systems, Decision Sciences, European Journal of Operational Research, Journal of Marketing Research, Journal of International Business Studies, among many others. He won the Distinguished Teaching Award in 1994 and the Distinguished Scholar Award in 2003 from the Kent State University.

Murali Shanker is a professor in the department of Management and Information Systems. His research interests lie in the areas of Simulation, Open Source, Artificial Neural Networks, and more recently, in the connection between meditation and ethics.
### APPENDIX

#### Table 6. Measurement items

<table>
<thead>
<tr>
<th>Construct Name</th>
<th>Item Code</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current System Performance</strong></td>
<td>CSP1</td>
<td>At the time of considering the adoption of this additional technology or capability, our ERP system performance was at a level that was considered successful (Developed).</td>
</tr>
<tr>
<td></td>
<td>CSP2</td>
<td>Our ERP system was not performing to our satisfaction (Developed).</td>
</tr>
<tr>
<td></td>
<td>CSP3</td>
<td>Our ERP system was a success in terms of performance (Based on Kull &amp; Narasimhan 2010).</td>
</tr>
<tr>
<td><strong>Extent of ERP implementation</strong></td>
<td>EXT1</td>
<td>Functional scope of implementation of your selected ERP System: Accounting/Finance, Manufacturing, Planning/Scheduling, Human Resources, Sales/Distribution, Logistics/Inventory Control, Other (please specify) (Based on Karimi et al., 2007).</td>
</tr>
<tr>
<td></td>
<td>EXT2</td>
<td>Scope of implementation of your selected ERP: Department/Division, Multiple departments/Divisions, Entire company, Multiple companies, Other (please specify). (Based on Karimi et al., 2007).</td>
</tr>
<tr>
<td></td>
<td>EXT3</td>
<td>Geographical extent of implementation: Single site, Multiple sites, National, Global. (Based on Karimi et al., 2007).</td>
</tr>
<tr>
<td><strong>Organizational Relative Advantage</strong></td>
<td>ORA1</td>
<td>At the time of considering the adoption of this additional technology or capability, we concluded that: The adoption of this additional technology or capability would be advantageous to the organization (Based on Moore &amp; Benbasat 1991). The adoption of this additional technology or capability would increase productivity (Based on Moore &amp; Benbasat 1991). The adoption of this additional technology or capability would improve the quality of work (Based on Moore &amp; Benbasat 1991). The adoption of this additional technology or capability would allow us to accomplish tasks more quickly (Developed). The adoption of this additional technology or capability would make our organization more competitive (Developed). The adoption of this additional technology or capability would make our organization more efficient (Developed). The adoption of this additional technology or capability would improve our organizational decision-making (Developed).</td>
</tr>
<tr>
<td></td>
<td>ORA2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ORA3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ORA4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ORA5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ORA6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ORA7</td>
<td></td>
</tr>
<tr>
<td><strong>Organizational Ease of Use ERP-enabled Adoption</strong></td>
<td>OEU1</td>
<td>At the time of considering the adoption of this additional technology or capability, we concluded that: This additional technology or capability was clear and understandable (Based on Venkatesh 2000). Utilizing this additional technology or capability would not require a lot of mental effort (Based on Venkatesh 2000). This additional technology or capability would be easy to use (Based on Venkatesh 2000). It would be easy to get this additional technology or capability to do what it is intended to do (Based on Venkatesh 2000). It would be easy for our organization to implement this additional technology or capacity (Developed). It would be easy for our organization to maintain this additional technology or capability (Developed). It would be easy for our organization to train users (Developed). It would be easy for our organization to support this additional technology or capacity (Developed). If your organization has adopted this subsequent technology, please provide your best estimate of the percentage of adoption (percentage of tasks or processes that the technology could be used for that has been implemented at this point of time) (Grover &amp; Goslar 1993).</td>
</tr>
<tr>
<td></td>
<td>OEU2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OEU3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OEU4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OEU5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OEU6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OEU7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OEU8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EEA</td>
<td></td>
</tr>
</tbody>
</table>