



## ERP system usage and benefit: A model of antecedents and outcomes



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### ABSTRACT

ERP system usage has been identified as a critical factor in attaining the benefit from an ERP installation. However, the specific antecedents of ERP usage and its impact on ERP benefit remains largely unknown. Drawing on absorption capacity theory, this study develops a theoretical model that examines the mediating effect of ERP system usage on ERP benefits. Similarly, the study also identifies the antecedents of ERP system usage. A model is tested using the responses of 157 ERP system end-users across the United States and the results suggest that ERP system usage is directly related ERP benefit. However, the relationship is moderated by the degree of knowledge integration mechanisms within the firm. Consistent with the proposed model, the results also reveal that technical resources, organizational fit and the extent of ERP implementation are key drivers of ERP system usage. The research findings advance our knowledge on how managers can enhance ERP usage and realize optimal ERP benefits.

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### 1. Introduction

ERP systems have drawn increasing attention within the last two decades as firms continue to seek ways to gain strategic and competitive advantage with these technologies. ERP systems are complex software packages that integrate information and business processes within and across functional areas of business (Davenport, 2000; Kalling, 2003). One area that continues to elude practitioners and researchers alike is how to realize the full benefits and value from an ERP investment. With huge amount of resources invested in the initial ERP deployment, firms are increasingly eager to translate this investment into an organizational success. However, studies have shown equivocal results for ERP implementing firms. On the one hand, some businesses have achieved operational efficiencies and other positive changes through ERP deployment. On the other hand, some companies are left to struggle with translating pre-deployment expectations into actual ERP success. One area that has come under scrutiny as a possible explanation to ERP success variances is the level of ERP usage among implementing firms. ERP implementing firms continue to grapple with low usage from ERP end-users. Poor ERP system usage has been linked to poor understanding of ERP systems causing firms maintaining parallel shadow systems and end-users to create workaround leading to delayed migration (Markus & Tanis, 2000).

Prior research has identified information system (IS) usage as a key predictor of technology adoption success (Leem & Kim, 2004). Although ERP system configuration is generic and resides for the most part with ERP vendors, the process of appropriating and using these packages can be influenced by organizational factors. Such factors if not adequately addressed are capable of limiting the use of ERP systems. A large body of ERP research literature has identified critical factors that foster successful ERP system implementation. However, understanding the conditions that can enhance optimal ERP system usage at the post-implementation phase has been largely ignored in the literature. This study is unaware of any theoretically grounded research that explains which antecedent and consequence factors of ERP system usage. As a result, it is unclear which managerial actions and interventions can best promote ERP usage and subsequently ERP benefits. To develop a deeper understanding of these varying outcomes of ERP system implementations, this study contends that those firms that facilitate ERP system usage after the initial ERP implementation are more likely to benefit from their ERP initiatives than firms that do not.

This study proposes a model that captures key antecedents and consequence of ERP system usage and then empirically tests the hypothesized model using data from a field survey of end-user in US firms that have implemented ERP systems. This study sets out to examine two central research questions that have not been adequately investigated in the ERP usage and benefit literature: (i) Is there a positive implication of ERP system usage on ERP benefit? And if yes, what are the antecedents of ERP system usage? (ii)

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Would ERP system usage impact on ERP benefit be contingent on the knowledge integration mechanisms? If so, how? The article contributes to the literature in a number of ways. First, it moves away from implementation-centric research on ERP systems to organizational internal factors, an important step in building collective knowledge in this line of inquiry. Second, this paper provides a theoretically based understanding and explanation of how organizations can enable or constrain the usage derivable from an ERP implementation. Finally, the study provides guidance for managers who grapple with ways to increase the usage and benefits of their existing ERP systems.

The paper is structured as follows. First, a review of relevant literature on ERP system usage, technical resources, organizational fit, Extent of ERP implementation and ERP benefit. Second, a development of the hypotheses about causal relationships between critical concepts is introduced. Next, a presentation of the research model and a description of the research method. Finally, the results of the empirical investigation are outlined as well as a discussion of the results and contributions to research and theory.

## 2. Theoretical background

### 2.1. Absorption capacity theory

Given that ERP systems are complex information systems yet capable of creating operational efficiency through business process and data integration (Trinh-Phuong, Molla, & Peszynski, 2012), organizations need to find ways to acquire, assimilate and exploit the system to meet the ever-changing and competitive business environment. Absorption capacity theory has been widely applied to explain how firms use and apply technological information (Gosain, Malhotra, & El Sawy, 2004; Park, Suh, & Yang, 2007). Absorption capacity theory suggests that firms who can recognize the value of new external information and knowledge, assimilate and use it toward achieving organizational objectives are more likely to be more innovative, flexible and productive (Cohen & Levinthal, 1990). The theory assumes that firms with higher capacity to absorb new knowledge will have a higher level of performance over firms with lower adsorption capacity. The perspective taken in this research is that ERP implementation is a valuable IT investment but requires certain organizational absorption capacities that can either enable or constrain the desired outcome of the ERP system. Thus, the ability of an organization to explore the richness of an ERP system may be hindered by factors such as technical resources, the degree of organizational fit between the ERP and organizational business functions as well as the extent of the initial ERP implementation. One of the tenets of absorption capacity theory is that organizations require a knowledge base to be able to absorb and apply new knowledge (Liang, Saraf, Hu, & Xue, 2007; Mowery, Oxley, & Silverman, 1996). Based on the theory, ERP usage is consequences of an organization's ability to recognize, identify and apply innovative applications. Therefore, absorption capacity theory can be used as the theoretical foundation for this research model, in which an organization's ability to achieve overall ERP benefit is contingent upon recognizing, exploring and using the installed ERP system.

### 2.2. ERP system usage

ERP system usage refers to how users employ the features of the system to perform a task (Burton-Jones & Gallivan, 2007; Nwankpa & Roumani, 2014a). System usage has been found to be a critical predictor of information system implementation success and thus for complex systems such as ERP systems, usage behavior needs to be deep and sophisticated for companies to

realize inherent benefits (Schwarz & Chin, 2007; Nwankpa & Roumani, 2014a). Typically, the higher the system usage by the end-user, the better the chances of firms' achieving ERP implementation goals and objectives. Prior studies have investigated the ERP system usage. For instance, social factors, compatibility and the belief of enhancement on end-users job responsibility have been found to positively influence ERP system usage (Chang, Cheung, Cheng, & Yeung, 2008). Similarly, Nwankpa and Roumani (2014a) found that managerial commitment and user satisfaction were key predictors of ERP system usage. ERP usage problems can undercut the potential benefit expected from the system and can also undermine users' ability to understand and adopt new business processes embedded within the ERP package. Usage problems have been attributed to inadequate training, insufficient support for end-users and severity of the implementation choice (Motwani, Mirchandani, Madan, & Gunasekaran, 2002; Nicolaou, 2004; Nwankpa & Roumani, 2014a). These problems are capable of discouraging users from continually using the system or in some cases can force users to initiate workarounds that may continue indefinitely, thus limiting the systems use. This paper investigates organizational factors such as technical resources, organizational fit, extent of ERP implementation as potential factors that can positively driver ERP system usage and overcome some of these issues.

### 2.3. ERP system benefit

Organizations invest in ERP systems to achieve important benefits. These benefits may come in the form of improved business productivity such as shortened lead time, lower cost and efficiency communication among functional boundaries (Nwankpa & Roumani, 2014b; Watson & Schneider, 1999). Yet these expected benefits are not always visible for ERP implementing companies. An examination of US manufacturing companies found that although ERP systems were very common within the industry, the system did not lead to significant reduction in operating expenses (Marbert, Soni, & Venkataramanan, 2000). In fact, ERP benefits can vary across industries and in many cases may depend on the implementing firms (Davenport, 2000). Prior literature has attempted to understand the drivers of ERP benefits. Shang and Seddon (2002) developed five dimensions of ERP benefits namely, operational, managerial, strategic, IT infrastructure and organizational and concluded that ERP benefit was a continuous process with benefits realized at different rate in different core processes. Similarly, Gattiker and Goodhue (2005) found that over all ERP benefit was mediated by intermediate benefits and that realizing intermediate benefits was a precondition to achieving overall ERP benefit. Chou and Chang (2008) reaffirmed the role of intermediate benefits as predictor of overall ERP benefit but also found that customization and organizational mechanisms were strong predictors of intermediate ERP benefits.

### 2.4. Technical resources

Technical resources refer to the technical capabilities that an organization possesses. It can be viewed as the competence of an organization to develop and maintain an information system. Such technical resources are in the form of the expertise of the information system group in building and maintaining the system, the system know-how of the end-users, and the quality of hardware, network application, and software applications deployed (Jennex, 2007). Thus, technical resources are important considerations for firms making adoption decisions as firms have to establish an alignment between the available technical resources and the adopting technology or innovation. Kuan and Chau (2001) identified technical specialists, and implementation tools and techniques

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