

# JOURNAL OF INFORMATION SYSTEMS APPLIED RESEARCH

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# Rocky Relationships: Enterprise Resource Planning and Supply Chain Management

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## Abstract

In the past decade, supply chain management (SCM) and logistics leaders have increasingly looked to information technology tools to enhance performance. Implementation of enterprise resource planning (ERP) information systems has been the common choice for organizations to integrate enterprise-wide processes. ERPs have been advertised as an application that improves business processes and develops visibility across the organization. However, there is concern about the effectiveness of ERP capabilities in improving supply chain processes. This exploratory study examines perceptions regarding the success and effectiveness of ERP installations on supply chain management, with a focus on the post-implementation phase. Five main ideas emerged from this study: 1) ERP systems lack the functionality to effectively manage the entire supply chain. 2) There is a "black hole" in the supply chain, which ERP systems are currently unable to handle, that prevents organizations from achieving the transparency and improved logistics they desire. 3) Supply chain management is often given little consideration during the ERP implementation phase, leaving functionality gaps and supply chain inefficiencies. 4) The inability for ERP systems to effectively manage the supply chain is a source of frustration for supply chain management but has little impact on perceptions of ERP success at the organizational level. 5) The most successful implementations involve trust, communication, and collaboration between individuals involved in the implementation, including supply chain management.

**Keywords:** ERP, enterprise resource planning, SCM, supply chain management, post-implementation, IS Success

## 1. INTRODUCTION

As organizations adapt to changing environments, including globalization, economic variability, natural and human-aided disasters,

they have relied upon supply chain management strategies to improve delivery of products and services, reduce costs within the organization and improve overall business strategies (Gunasekaren, Patel, & Tirttiroglu, 2001). In the

past decade, supply chain and logistics leaders have increasingly looked to information technology tools to enhance performance (Fawcett, Wallin, Allred, Fawcett, & Magnan, 2011). Implementation of enterprise resource planning (ERP) information systems has been the common choice for organizations to integrate enterprise-wide processes (Soh, Kien, & Tay-Yap, 2000). ERPs have been advertised as an application that improves business processes and develops visibility across the organization (Gargeya & Brady, 2005).

Organizations use IT solutions such as Enterprise Resource Planning (ERP) systems to improve productivity (Sabherwal & Chan, 2001) and gain competitive advantage (Byrd & Turner, 2001). Information exchange is a key component for successful supply chains (Bartlett, Julien, & Baines, 2007; Cooper, Lambert, & Pagh, 1997; Derocher & Kilpatrick, 2000; Evans & Wurster, 1997; Forslund, 2007; Griffith & Myers, 2005; Myers & Cheung, 2008; Thatte, 2007). Sharing information in the supply chain greatly improves its performance (Bilek, 2010; Hsu, Kannan, Tan, & Leong, 2008). ERP installations are intended to reduce the challenge of managing multiple information systems and interfaces by introducing one continuous application that is continuously updated (Allen, 2011). This process is meant to provide supply chain visibility within an organization (Allen, 2011), improving knowledge integration. Proper knowledge integration connects functions within organizations to improve core competencies (Wadhwa, Saxena, & Chan, 2008). Research has found that an increase in knowledge integration within the organization increases knowledge sharing with supply chain partners (Wadhwa et al., 2008). Patnayakuni et al. (2006) found that collaborative exchange and integration of knowledge across phases of development has a positive influence on development performance. Myers and Cheung (2008) postulate that when buyers and suppliers share information, suppliers improve their ability to adapt to buyers' needs.

ERP systems attempt to reduce costs and increase efficiencies by integrating business processes and improving information access across an organization (Umble, Haft, & Umble, 2003). Similarly, effective supply chain management aims to increase margin by sharing information inter-organizationally (Chen, Yen, Rajkumar, & Tomochko, 2010). ERP systems

have the ability to improve information exchange but are traditionally intended to manage information within a single organization (Li, Chaudhry, & Zhao, 2006). Since supply chain management (SCM) consists of multiple organizations needing to work together as one organism, some would argue that ERP systems are insufficient for modern SCM (Akkermans, Bogerd, Yucesan, & van Wassenhove, 2003). One reason for the challenge is the lack of trust between organizations (Galaskiewicz, 2011). The multiple relationships within supply chain management to deliver supplies to manufacturers and deliver products to customers takes a substantial level of trust (Galaskiewicz, 2011). Trust can be a significant challenge in any ERP implementation (Gefen, 2004). Successful supply chain integration and long-term performance not only requires trust between parties in one organization but between supply chain partners in multiple organizations (Bowersox, Closs, & Stank, 2000; Dyer & Singh, 1998; Kwon & Suh, 2005; Vijayasathy, 2010). Sharing information between organizations and supply chain partners through ERPs not only requires trust but a high level of commitment between all parties involved (Gefen, 2004).

ERP systems impose standardized business practices that may conflict with existing supply chain processes. Research has found that ERP systems provide little improvement to the supply chain and often introduce new supply chain management issues (Akkermans et al., 2003). ERP systems have found to be lacking critical functionality and are inflexible to the ongoing changes in the supply chain (Akkermans et al., 2003). Additionally, the business process reengineering typically required to implement ERP systems introduces a variety of challenges (Lee et al., 2003; Robey et al., 2002). ERP installations potentially threaten an organization's ability to sustain a competitive advantage by introducing generic software that is used by competing organizations (Carr, 2003). According to the resource-based view of organizations, a firm's resources, which include knowledge, are a key determinant of organizational performance (Hofer & Schendel, 1978; Wernerfelt, 1984, 1995). A competitive advantage is gained by resources that are not easily replicated by another organization (Menor & Roth, 2008). Technology resources can offer competitive advantages only if they remain proprietary (Carr, 2003).

Organizations are left with this dichotomy where it appears illogical to replicate software in-house that can be purchased off-the-shelf and the challenge that this type of software with embedded best practices leaves the organization vulnerable. As Carr (2003, p. 11) mentions, "when a resource becomes essential to competition but inconsequential to strategy, the risks it creates become more important than the advantage it provides." Organizational procedures may be reengineered in order to match the "best practice" processes an ERP imposes. While in some cases this may be advantageous, "the best practices underlying the ERP system have a highly integrative nature and consequences of changes in one aspect may "ripple through" the organization in unforeseen and even unseen ways" (van Stijn & Wensley, 2005a, p. 11). Changing existing business practices to match ERP best practices is typically considered the best way to increase efficiencies, reduce costs, and improve competitive advantages (Yu, 1996, p. 613). However, ERP systems can be customized in order to resolve functionality gaps and provide organizations with a way to differentiate themselves from their competitors (Bearda & Sumner, 2004; Davenport, 1998).

The success of ERP implementations is often measured at implementation time, leaving post-implementation completely out of the equation. However, post-implementation is a critical phase that should be taken into consideration in order to fully evaluate the success of an ERP installation (Fryling, 2010; King & Burgess, 2006). In fact, it is not unusual for much of the business process improvement to occur during the post implementation phase (Willis & Willis-Brown, 2002). While research on ERP post-implementation is limited (Ifinedo & Nahar, 2006; Santhanam, Seligman, & Kang, 2007; Wagner & Newell, 2007), there has been an increased interest in recent years in examining post-implementation critical success factors (Bai & Mao, 2010; Ifinedo, Rapp, Ifinedo, & Sundberg, 2010) and total cost of ownership (Fryling, 2010). This manuscript examines the post-implementation effectiveness of ERP installations on supply chain management through semi-structured interviews.

## 2. METHODOLOGY

This study aims to gain dynamic insight as to the relationship between ERP systems and supply chain management, with a focus on the post-

implementation environment. The objectives of this study are to uncover the impact of ERP system implementations on supply chain processes and logistics as well as identify areas for future research. Primary questions to be addressed in this study are:

1. Are institutions meeting the objectives, goals and expectations of their ERP implementation?
2. Is supply chain management considered when setting the objectives, goals and expectations of the ERP implementation?
3. Has the ERP improved supply chain transparency?
4. Has the ERP improved supply chain functionality?
5. Has the ERP improved the logistics process?

Data were collected via interviews with eight representatives from six organizations in ERP post-implementation phase and a consultant with approximately 15 years of experience on ERP implementations and post-implementations at several major companies involving multiple ERP vendors. Interviews consisted of 12 open-ended questions related to the interview's experience with ERP systems and their impact on the supply chain (see Appendix A). Organization demographics (size, revenue, ERP vendor) were collected in the interviews (see Appendix B). All interviews took place between 2010 and 2011 and were conducted by the same interviewer to improve consistency between interviews. As needed, follow-up questions were solicited via the original interviewer.

## 3. RESPONSES

Overall interview responses indicated that institutions were struggling to meet the objectives, goals and expectations of their ERP implementation. Interviewee G explained that the ERP met their objectives for simple shipping but critical SCM functionality was lacking. Manual processes and external systems were needed to satisfy SCM needs. The company found that inbound and outbound logistics struggled and the ERP forced certain business practices that were not ideal for the organization. Company G reported that the ERP did not provide the transparency promised by the vendor and supply chain improvement was

only realized when a third party transportation management system (TMS) was implemented to supplement the functionality gaps in the ERP. While Organization F reported that the ERP did help with transparency, it simply was not designed to enhance inbound/outbound logistics.

While most of the interviewees acknowledged that the ERP implementation improved some business processes, the supply chain functionality was deficient. Organization A found that the ERP simply did not manage the entire supply chain, leaving significant functionality gaps and information "black holes". They were also frustrated by the time and cost associated with implementing the ERP. Respondent D explained that their organization had to hire consultants to fix issues discovered during implementation. Interviewee B saw the implementation as having both positive and negative implications. The company was able to eliminate its paper-based system so orders could be processed much more quickly. However, the respondent expressed concern regarding sacrificing people-oriented customer service for automation efficiency. Interviewee F stated he felt the organization simply did not meet the goals and objectives of the ERP implementation. The respondent stated that the applications did not adequately meet supply chain functions. Even after spending \$40 million dollars on the ERP project, there were major functionality gaps and the implementation occurred five years later than expected. Functionality workarounds were necessary and required hiring subject matter experts to customize the software. Nonetheless, the organization perceived the implementation as a success because the ERP did improve other processes.

Interviewees A, D, and G all reported that SCM was not adequately considered during the ERP procurement process. However, Interviewee E stated that their organization had good communication and collaboration regarding functionality gaps. It was understood and accepted from the beginning that the ERP system would need to be customized in order to meet their needs. It seems they were able to understand the functionality limitations upfront and set realistic expectations. Overall interviewees reported that SCM has little impact in determining ERP success at the organizational level. When respondents reported difficulties with SCM functionality, they still indicated that the organization viewed the implementation as successful. Even Company E, that reported the

most successful implementation experience, mentioned that ERP systems need to be able to adapt to changing technologies. Interviewee G echoed this by stating that the ERP inflexibility is a barrier to SCM success. Interviewee F added that "...the ERP does not perform warehouse functions well; it is very primitive." He felt that supply chain execution is a misnomer in ERP applications. Significant changes were required to adapt the ERP to critical functions such as the bill of lading.

Trust and user resistance was found to be a barrier to achieving transparency and taking advantage of the full functionality of the ERP system. Interviewee C stated that while the ERP did provide the organization with improved functionality and transparency, not all members of the organization were willing to use the software. In addition, the organization did not solicit consulting support from the vendor to improve the ERP functionality, which the interviewee felt would have beneficial to overall process improvement. Interviewee C also shared that administration seemed to lack trust in its workforce, giving very limited access to users of the system. Interviewee B felt that his organization did get improved functionality and transparency from the ERP but found that employees were unclear about why they needed to change their business practices and were left defending their existing methods for conducting business. Interviewee F stated that even after the ERP implementation employees continued to work in silos. He felt there is minimal collaboration between functional units and lack of focus on improving the supply chain process.

#### 4. DISCUSSION

ERP systems offer some operational efficiencies and help improve parts of the supply chain but fall short of effectively managing the entire supply chain network. There is a "black hole" in the supply chain when the merchandise is between companies, which ERPs are currently unable to handle. ERP systems were intended to manage the entire enterprise of one organization, not multiple organizations. A generic system lacks the ability to adequately manage this "black hole" because the relationship between each company is complex and unique. Additionally, ERP systems simply lack the agility to adapt to changes in SCM logistic processes or organizational changes. Organizations must rely on software vendors and consultants to modify and/or extend

capabilities as needed. There are potential long-term negative implications of implementing generic ERP systems, which warrant additional investigation. Can organizations maintain a sustainable competitive advantage fitting their business practices to the ERP's delivered blueprint best practice processes? Should customization of the software be an accepted and embraced part of the implementation process? What impact does customization versus business process reengineering have on ERP success? Does the inflexibility of ERP systems simply make them inadequate solutions for supply chain management? Will the inflexibility of ERP systems put companies at risk as they lack the agility to efficiently adjust to business model changes?

This research supports prior research on the importance of trust, communication, and collaboration between organizational departments in the evaluation and implementation of ERP systems. When supply chain management and functional representatives were not invited to interact directly with ERP vendors, trust and user expectation issues suffered. For the cases interviewed as part of this study, the supply chain seems to have little impact in determining ERP success at the organizational level. Even when respondents reported difficulties with SCM functionality, they indicated that the organization viewed the implementation as successful. While ERP systems provide some of the expected benefits, not all goals and objectives are met. Interview responses suggest that ERP improves some supply chain and logistics, but not all. Organizations were still left with functionality gaps, which required workarounds and additional software solutions.

One area for further research is the impact of SCM leadership in the ERP decision-making and implementation process. Many of the organizations interviewed acknowledged that SCM personnel were left out of the ERP evaluation and selection process. Would these companies have enjoyed a more successful implementation, particularly with supply chain functionality, had SCM employees been more heavily involved in project planning or is ERP software simply inadequate for SCM? One interviewee, who indicated their organization had ongoing communication and collaboration with the SCM staff during the pre-implementation stages, reported the most favorable post-implementation supply chain

management experience. Is this simply because the organization set more appropriate user expectations?

## 5. CONCLUSION

The results of the study indicate ERP installations improve some processes within the organization, but often supply chain functionality is lacking. The ERP does not provide functions that improve transportation and warehouse processes that are performed by supply chain partners. ERP processes do not have the flexibility to advance the organization's supply chain without high costs and long-term commitments to ERP vendors, third-party vendors, consultants, and software customizations. Applications such as transportation management systems (TMS) have been used as a solution for supply chain partners to exchange information with each other. Applications such as TMS provide transparency, but as with ERP they do not provide all the features needed to support the supply chain.

Organizations are spending a considerable amount of resources implementing ERP systems in an effort to improve efficiencies and reduce operational costs. This research provides practical information regarding the limitations of ERP for supply chain management and offers areas for future investigation. If organizations better understand both the benefits and limitations of ERP systems they may have a better experience and realize more organizational benefits. ERP vendors are setting unrealistic expectations regarding software capabilities in order to "make the sale", leaving customers frustrated. From this study we postulate that even with the shortcomings of ERP systems, customer frustration can be mitigated and post-implementation success can be elevated through proper preparation and training. Organizations which are better educated regarding ERP limitations and prepared to manage functionality gaps, experience a more successful implementation and enjoy an improved post-implementation environment.

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## Appendix A – Interview Questions

1. What is your position? Were you with the company when the ERP was implemented? If so, do you feel the ERP has been successful for the supply chain?
2. Describe the role the ERP has in the supply chain process of the organization?
3. What were your objectives, goals, and expectations in implementing the ERP? Follow up questions: functionality versus transparency – did they want both? Which is more important to your org? Which did you get?
4. Did you meet your objectives, goals, and expectations? If not, which objectives, goals, and objectives did you not meet? Why do you believe they were not met?
5. Is your organization able to use the ERP to complete all SCM tasks? If not, what workarounds have you established?
6. What has been the outcome of the implementation? Does your organization perceive the implementation as successful?
7. What is your definition of organization transparency?
8. Has the ERP provided transparency throughout the organization?
9. Did you think the ERP would provide the supply chain with improved efficiency? If so, did the ERP meet your expectations after it was successfully implemented?
10. Did you think the ERP would transform the supply chain into a process for the organization rather than a function? If so, did the ERP transform the supply chain from a functional capability into an efficient process in the organization? If not, why did it not meet your expectations?
11. Did the organization include the supply chain leadership in the ERP implementation process? If so, did this improve the transformation of the supply chain to a process within the organization rather than a function?
12. Was there interdepartmental communication and collaboration during implementation? Was there interdepartmental communication and collaboration after the ERP was successfully implemented within the organization?

## Appendix B – Interview Data Summary

| Interviewee | Corporation Type | Corporate Size  | ERP                     |
|-------------|------------------|-----------------|-------------------------|
| A           | Public           | 18,000-20,000   | SAP                     |
| B           | Private          | 8,000-10,000    | SAP                     |
| C           | Private          | 500             | Unknown (Organic)       |
| D           | Public           | 100,000-150,000 | SAP                     |
| E           | Private          | 10,0001+        | SAP, Oracle, JD Edwards |
| F           | Public           | 250,000-300,000 | SAP                     |
| G           | Public           | 40,000-50,000   | SAP                     |