https://doi.org/10.48009/2_iis_2017_39-47

Issues in Information Systems
Volume 18, Issue 2, pp. 39-47, 2017

ENTERPRISE RESOURCE PLANNING VENDOR SELECTION: A CASE STUDY

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ABSTRACT

The landscape for Enterprise Resource Planning software vendors has changed over the years. There are a growing number of vendors who cater to the needs of small, medium, and large sized companies. Amidst this backdrop, the selection of an appropriate vendor is becoming a complex decision for small to medium enterprises (SME). While there is a plethora of factors in literature to help successful vendor selection, it is impossible for organizations to use all those factors for an effective solution to their enterprise problems. We examine the influence of key factors of ERP implementation on the vendor selection process. Using a case study, we include factors from the current literature that impact implementation success of ERP to describe the ERP decision-making process.

Keywords: ERP, Vendor selection, Technology, Change Management, Case Study

INTRODUCTION

An Enterprise Resource Planning (ERP) system integrates information flow from employees across the organization itself, customers, and suppliers. The system employs a common database that updates all information within the system to be shared with all responsible parties. ERP systems are customizable business software that help organizations to automate and integrate all business processes and legacy systems, share data, and disseminate information in a real-time environment. Organizations utilize ERP systems to integrate their business processes and maintain competitive advantage. ERP systems integrate all departments and business units by processing common business practices and maintaining a single repository of data and information. In light of the significant potential benefits of adopting ERP software, firms invest heavily to implement such systems. The implementations of such mammoth systems are capital intensive and require heavy investments by firms (Ranjan, Jha, & Pal, 2016). However, many firms have reported huge hidden costs during implementation and use of ERP systems. Soh & Sia, (2004) reported that although many companies have attained considerable benefits, others have accepted minimum gains and some have even abandoned their ERP implementation completely. Investments in terms of money, resources, quality, scope, and time pose some level of associated risks. However, recent research posits that such traditional factors are not the only criteria for project success. Mir and Pinnington (2014) suggest including factors that impact stakeholder requirements as well. Due to the large investment required and its associated risks, the selection of a vendor and its technology that aligns to the goals of a firm is of vital importance. A sound vendor selection methodology is suggested by various researchers (Ratkevicius, Ratkevicius, & Skyrius, 2012, Saroukhani, et al., 2008). By planning the acquisition of an ERP system thoroughly, firms can significantly increase the prospect to identify the ERP software vendor that genuinely meets their requirements.

The goal of this study is to examine managerial, technology, and economic aspects in the introduction of a new ERP system at a company in the Midwest of the United States. We examine the constraints that are to be addressed in the firm and draw conclusions of its requirements. Managerial issues pertaining to change management are explored. Technology requirements to integrate with existing systems are considered. The economic factors include impacts of current and future partnerships. The requirements of the company's major customers were found to be important for the firm and this case study addresses those needs in the selection process. Major customers influence the purchasing decisions of suppliers (Woodruff, 1997). The major customers used SAP as their ERP package and it was absolutely essential to consider the integration with SAP as one of the main requirements in this project

In this paper, we present a case study that illustrates the ERP selection process and discusses the factors to select an ERP system. The next section of this paper discusses the current literature relating to ERP vendor selection. Then, we

illustrate the analysis used to obtain a recommendation of an ERP package. We show how an organization identified a set of selection process factors that influenced successful ERP implementation. The final section of this paper presents our conclusions.

ERP VENDOR SELECTION

The selection of an ERP system is the most important part of ERP system implementation. Given the uniqueness of individual organizations and their objectives, the selection process should be unique to their needs. The selection of ERP software is quite different from the selection of other Information Technology (IT) systems. Motiwalla and Thompson (2012) posited that the basic difference is in the system architecture as ERP system architecture is defined by vendors as opposed to generic IT system architectures that are designed to corporate strategies and expertise. Vendors promote their ERP systems by claiming that their ERP packages offer optimum features to their customers. ERP systems are multifunctional in scope and modular in structure (Mabert, Soni, & Venkataramanan, 2001) wherein an organization can implement a subset of modules and often possible to link to other legacy systems. Moreover, customizable software—such as ERP systems—are highly complex in nature and hence require a thorough analysis before selection (Sammon & Adam, 2004).

The selection process should use a set of criteria that include organizational requirements (Radut & Codreanu, 2012). Radut & Codreanu (2012) described a qualitative model with selection criteria that consisted of reliability, functionality, efficiency, usability, maintainability, and portability. They suggested functionality, technology, required expertise, flexibility, application scalability, costs, ease of implementation, and ease of use as specific factors in the selection process. Garg & Khurana (2013) proposed that the view of end users should be included when selecting an ERP package for an organization. Ratkevicius et al. (2012) considered eleven criteria including vendor reputation, system reliability, ease of integration with other systems, technology advances, scalability, upgrading ability, customization, ease of use, flexibility, modularity, and the total costs of the ERP implementation project. Hurbean (2009) emphasized that the selection process should take into account an organization's ability to help transform business processes in order to achieve the customer's objectives. Wei and Wang (2004) developed a methodology that considered both subjective and objective criteria in the selection of ERP software.

Mir and Pinnington (2014) empirically found that key performance indicators (KPIs) in relation to meeting the requirements of project stakeholders influence the success of projects. Boonstra (2006) observes that ERP implementation is best viewed as an organizational change project, rather than as a replacement or new technology. To this end, different types of stakeholders need to be identified, as does their interests and influence, and management needs to consider how to best balance the needs of competing stakeholders (Pan, Pan, & Lim, 2014).

The implementation of an ERP system brings with it considerable changes. By their very nature ERP systems reconfigure business processes and are transformational—rather than being merely incremental in nature. If organizations are to benefit from ERP implementation they also need to manage these changes. Bingi, Sharma, and Godia (1999) observe that:

> "An ERP package is so complex and vast that it takes several years and millions of dollars to roll it out. It also requires many far-flung outposts of a company to follow exactly the same business processes. In fact, implementing any integrated ERP solution is not as much a technological exercise but an 'organizational revolution.' Extensive preparation before implementation is the key to success. Implementations carried out without patience and careful planning will turn out to be corporate root canals, not competitive advantage. Several issues must be addressed when dealing with a vast ERP system, and the following sections discuss each of them in detail."

Top management commitment and communication is critical to successful ERP implementation. This commitment signals to employees that the changes that will occur with ERP implementation have a sound business logic and that management is committed not only to implementation but to the changes in business processes that such implementation will necessitate. Such commitment also "helps in streaming difficult decisions with regard to integration of business processes such as potential customization, future needs, etc." (Gutpta, 2000, p. 114).

At the outset, the benefits sought by adopting an ERP system need to be articulated, prioritized and action plans created to achieve those benefits (Davenport, Harris and Cantrell, 2004). Having clear goals and objectives should help employees see the potential benefits or ERP implementation as well as be able to gauge their progress toward achieving those goals. Somers and Nelson (2001) note that ERP installations risk "scope creep" if there is a lack of a clear plan and that goals tend to involve scope, time, and cost – but that these project characteristics are interrelated and competing. Davenport, Harris and Cantrell (2004) note that, "measuring the benefits obtained from [enterprise systems], and holding someone accountable for realization of the targeted benefits, significantly shortens the time to achieving them." (p. 25).

Resistance to change is a key barrier to the successful implementation of any change imitative. Such resistance adds additional costs and delays implementation (Pardo del Val and Fuentes, 2003). On a positive note, resistance to change can also be viewed as providing useful information about how to develop a successful change process. Understanding sources of resistance to change is critical to overcoming such resistance. Sheth (1981) identified two sources of resistance to innovation—perceived risks and habits. With regards to ERP, perceived risks may include anything that would be detrimental resulting from ERP implementation. Here, management can anticipate the possible risks and seeks to mitigate or address them; and also highlighting the likely benefits (Finney and Corbett, 2007). This is particularly important as ERP systems involve considerable organizational change and, therefore, will often be seen as having considerable risk. With regard to habits, these involve employees being tied to current ways of doing things. With regard to ERP, the change in business processes will inherently be threatening to employee habits. Hence, management's commitment to a new ERP system should also involve consideration of employee training. Employees need support to learn new systems and processes. In this regard, employees need to understand how their own actions impact others if they are to see the value in changing how they do things (Robey, Ross and Boudreau, 2002).

Research that extends on the technology acceptance model by Amoako-Gyampah and Salam (2004) provides useful insights into the power of change management, combined with other factors, on the intention to use an ERP system. Shared beliefs in the benefits of an ERP system were positively influenced by project communication and training on the system. Perceived usefulness of the ERP system was positively influenced by shared beliefs about the system's benefits and by the perceived ease of use. In turn, attitudes toward the ERP system were influence by other perceived usefulness and perceived ease of use. And, attitudes toward the ERP system positively influenced the intention to use the system or information that the system would generate. With regards to change management, this research highlights the importance of training and in project communication. By one estimate, without the proper training, 30 to 40% of frontline employees would be unable to handle the demands of a new ERP system (Koch, 1996).

An example of a particularly effective structure for managing ERP change is provided in a case study of NIBCO, where change management teams and technical teams overlay both a functional areas (sales, finance, and materials management/finance) and business process roles (Brown and Vessey, 2001). Such a structure overlaps the expertise needed from both technical and change management perspectives. Such a matrix structure is important as ERP implementations are more likely to be successful if users are involved in both the design and implementation of business processes and of the introduction of an ERP system (Fui-Hoon Nah, Lee-Shang Lau, & Kuang, 2001)

CASE STUDY: ERP SELECTION FOR MIDWEST ELECTRONIC CONTROLS.

Now, we present a case study to select an ERP system for Midwest Electronic Controls (MEC). The case study starts with introducing the company and its background. The IT status prior to the ERP implementation is illustrated with key technical details followed by a summarized view of the selection process. Technical, change management, and some general criteria that were considered during the selection process are illustrated next; followed by the recommendation process. We present the background of the company, the systems that are currently employed at the company, and the selection process and method.

Company background

MEC is an electronics manufacturing facility supplying microprocessor-based controls to various manufacturers worldwide. The company manufactures standard and programmable thermostats and zoning systems for heating,

ventilation, air-conditioning, and refrigeration industry. MEC employs over 650 people who utilize lean manufacturing techniques and total quality management. The company is committed to continuous process improvement in order to deliver value to its customers. The company's goal is to achieve efficient manufacturing processes.

Systems at MEC

Before the implementation of a new ERP system, MEC used Dataworks, an office and inventory procurement system. Since its inception in early 1990s, Dataworks had been a useful system. It was designed as a standalone manufacturing solution for mid-size companies and supported manufacturing functions with some specific modules related to finance, engineering change control and a common purchasing and sales module to keep track of the procurement operations. Dataworks was a UNIX based system integrated with a common universal database similar to Sybase. It provided a robust but a rigid closed loop system architecture which was not easily scalable unlike today's open-end architecture systems.

MEC faced many problems with their existing software. The legacy system was expensive to operate and difficult to maintain and develop. It did not provide accurate, consistent and accessible data necessary to make good decisions. The ageing system posed many problems during modernization attempts. The system did not facilitate communication between business sites. Inventory and stock problems were caused by lack of accurate tracking of work in progress transfers between sites. Communication with partners, suppliers and customers could not be established with the system. The old database architecture was impossible to expand and integrate with other systems challenging manufacturing in keeping track of engineering changes. The order entry and sales functions were tough to manage requiring double entries of data and thus being prone to errors. The purchasing module did not support modern inventory tracking and lean manufacturing principles. Moreover, many experts who know how to program the system had left the company, thereby creating problems with creating timely and effective updates to the system.

Information technology at MEC was diversified with different technologies used to support various business needs. Since MEC caters to the electronic market of HVAC industry, it had to support the demanding electronic industry standards with respect to manufacturing, bar-coding, testing and packaging requirements in addition to the requirements of the customer.

This challenging demand and disparate systems made IT at MEC complex to manage. The new IT professionals were experts in SQL server and C# technology making MEC a Microsoft shop. MEC used Microsoft technology to support their automated data collection at the manufacturing assembly lines for process certification and lean manufacturing functions. The company used the Bartector system, which works on Oracle and Microsoft technologies to keep track of the inventory on the shop floor. For bar coding labels, Midwest Electronic Controls uses Intermec systems. Printed Circuit Boards (PCBs) manufactured at MEC were tested and the programs for testing were written in Microsoft Visual Studio supported by SQL server.

ERP selection process and selection factors

The management selected a team comprised of technologists and change management experts. The team identified six vendors. Information about technologies and vendors were then identified. Two possible vendors were shortlisted during the pre-selection process. The technology, change management, and general factors that were identified in this section were used to evaluate the two vendors and the final recommendation.

Given the changes in business processes and employee behavior that are needed to implement a new ERP system, we now focus on the two main dimensions of ERP selection decision model that was used at MEC, namely technology and change management.

Technology

The criteria with respect to technology in the order of priority are:

- Customization efforts of software are costly but are essential in an ERP implementation so that MEC can input their own business processes.
- Ease of Implementation is necessary for two main reasons including choosing an ERP system that is easily implementable is important for MEC and choosing the ERP system that requires minor changes if there are infrastructure changes in MEC.
- Software maintenance program is of great importance by providing add-ons and patches as necessary.
- Real-time changes within the software should work within all modules to enable currency in information.
- Flexibility of software implementation to add modules as needed to support the needs of MEC over its lifetime is another essential factor.
- Systems requirements should consider the ERP software that is independent of hardware, operating system, database systems, and should align with the overall business strategy of MEC.
- Back-up System should be reliable with a fast restoration solution.
- Reporting for management and analysis features for business strategists should be available.
- Integration with other systems that exist within MEC should be feasible.
- The modules of the ERP system should be integrated to provide seamless data flow and operational transparency.
- Application Programming Interfaces (API), Electronic Data Integration (EDI), and other enterprise application integration (EAI) methods should be employed by the ERP system to facilitate information flow within the systems of MEC. Since some of their partners use SAP, MEC is looking forward to integration with SAP.
- Internet Integration should be supported to provide electronic commerce and EDI transactions.
- The software features required by MEC included accounting, control, finance, human resources, operations management, procurement, sales, and customer service.

Change management

Another key consideration when deciding on adopting an ERP system is the pace of implementation. Reaching a critical mass is necessary to reap the benefits of integration and improved information flows (Davenport, Harris and Cantrell, 2004). The extent to which such a critical mass can be reached in a timely manner is dependent on the degree of customization sought. In this regard, a key trade-off in selecting ERP systems is deciding on the scope of customization. Customization increases costs, implementation time, and the ability to benefit from ERP vendor upgrades (Somers and Nelson, 2001). For these reasons, top management "has the ultimate choice of changing the process to fit the system or the system to fit the process" (Somers and Nelson, 2001, p. 4). Generally, research finds that minimal customization tends to lead to better ERP implementation outcomes (Somers and Nelson, 2001). Finney and Corbett in an analysis of critical success factors on ERP implementation note that: "The concept of vanilla ERP means that organizations should be committed to the idea of implementing a 'vanilla' version of an ERP." (2007, p. 336). However, ERP systems, even if well chosen, can often only meet 70% of a company's needs (Bingi, Sharma, and Godia, 1999). On the other hand, when ERP systems are at "at odds with organizational practices and cultures" the odds of implementation failure are high (Leidner and Kayworth, 2006, p. 357). Hence, customizing in areas that are important is necessary; however, this increases costs. Hence, "Companies should keep their systems 'as is' as much as possible to reduce the costs of customization and future maintenance and upgrade expenses." (Bingi, Sharma and Godia, 1999).

General

Other than technical and change management criteria, the following factors were considered by MEC:

- Cost of technology, its implementation, and its maintenance is the most important factor to all organizations.
- Vendor's market share, reputation, number of consultants, number of installations performed, support infrastructure and demonstration of previous implementations are critical factors that show the commitment of the vendor to the product.

- Financing Options should be available.

Table 1. A sample comparison of the two MEC finalists

Vendor	Epicor	Glovia
Software	Epicor ERP	Glovia G2
Required Modules	Available	Available
Ease of Integration	Good	Good
Customization efforts	Expertise available	Expertise available
SAP Integration	Supported	Supported
Barcoding & labeling	Not fully supported	Fully supported
SQL Server Integration	Supported	Supported
Salesforce.com Integration	Not fully supported	Fully supported
Lean Manufacturing support	Not supported	Fully supported
EDI interfaces	Flexible	Better flexibility
Microsoft technology stack	Based MSFT tech stack	Not based on MSFT tech stack
Change Management	Fully Supported	Supported
Cost	Less bargaining power	Better bargaining power

Both Epicor and Glovia G2 offer change management options as part of their ERP systems. Epicor offers a suite of IT Service Management tools to help businesses reach their goals using best practices. One of these tools is Epicor ITSM Change Management. Epicor's change management model is based on General Electric's change acceleration process. The model has three inter-related components that Epicor describes is illustrated in Figure 1:

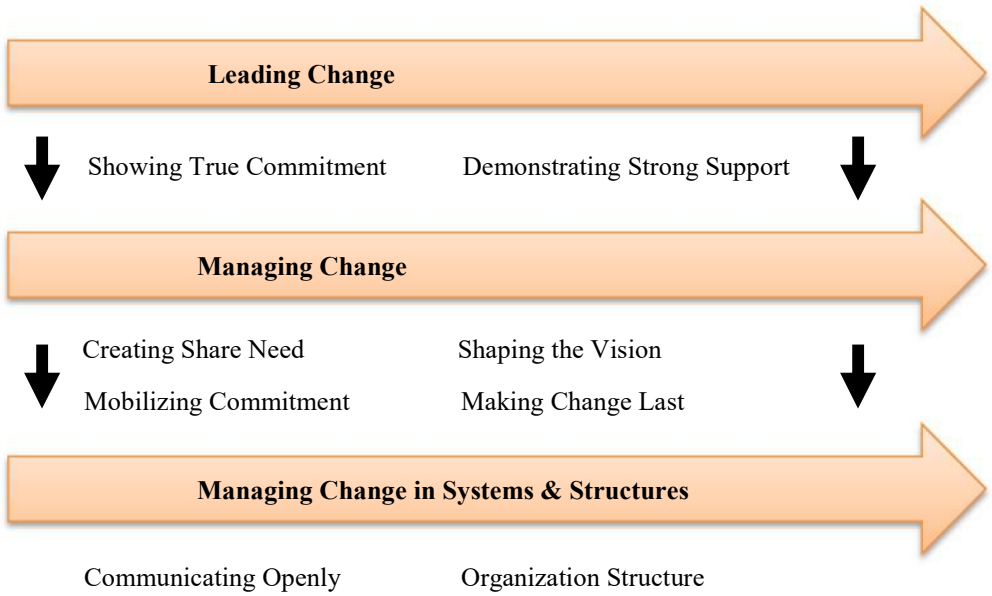

Figure 1. Change Management Model (Adapted from Epicor, 2016)

A key feature of the Epicor change model is the focus on stakeholders through the use of stakeholder analysis, stakeholder planning, and a responsibility matrix. This is consistent with Aladwani's (2001) observation that in order to overcome resistance to change one needs to identify and evaluate individual users and influential groups.

ERP package recommendation

Table 1 shows a sample of the two ERP packages that were considered at MEC. While evaluating the ERP packages, MEC focused on all of the factors mentioned in the previous section. In addition, MEC also concentrated on the requirements of their major customers. More weightage was given to the requirements of their major customers. All other factors were given equal weightage. Those customers used SAP as their ERP package and it was absolutely essential to consider the integration with SAP as one of the main requirements in this project. Ultimately, the Glovia G2 system was recommended at MEC.

Some of the major critical factors that lead to the selection of the Glovia G2 system are as follows:

- Glovia system was being used at a few of their customers in USA which would extend the recommended system in ordering and information flow processes.
- Since their main customers already integrated their Glovia system to SAP, the recommended system would enable MEC in their reporting and accounting system compliances with very minimal customization efforts.
- One of their customers would help MEC to bargain with Glovia for better pricing and contracting options.
- Glovia's automated EDI interfacing would make it easy for order entry and managing other ordering functions.
- Glovia's integrated ARMS systems which support bar-coding and labeling systems.
- MEC with its new Glovia experts would make customization efforts easier. MEC was confident that they would need less customization from financing and accounting functions that usually take the most amount of time and resources.
- Glovia's support in Lean Manufacturing would be an advantage.
- Glovia's wide spectrum of integration tools-from application adapters to XML to powerful enterprise-wide collaboration solutions would certainly meet the diverse integration needs of MEC's customers.
- Glovia's electronic Kanban provides important inventory control benefits that includes lean, minimal inventory levels, automatic generation of purchase orders, and an ability to work with multiple companies across multiple continents

CONCLUSIONS

MEC recommended Glovia ERP system as the preferred system and were influenced the fact that a few of their main customers have been able to successfully implement Glovia and integrate it to support their operations. MEC believed that this internal knowledge about the ERP package would help to reduce the implementation time drastically, followed by training from one of their customers to make sure all the employees and top management are up to speed with the new systems. They recognized that there is a need to have a detailed implementation plan to make sure that the ERP package is implemented within time and budget—without affecting the business operations adversely.

Managerial, technology, and economic considerations all play a vital role in the selection of a new system, as is evident from the case study at MEC. This case identifies the importance of requirements and future technology plans of major customers to be considered in the selection and purchase of new systems. In the selection of ERP systems, organizations can learn from the lessons that are found extensively in research literature. MEC had anticipated that change management was one of the big challenges in ERP implementation and they placed a substantial emphasis on this key managerial issue. They included end-user readiness, change resistance, ease of training, and inclusion of key project persons as important factors during the selection process. As ERP systems and related reserarch continues to mature, there will inevitably be other factors to be considered for an effective system in organizations.

A number of opportunities can be recognized for future research based on concerns found in this study. A key factor to selection of technology is to match available skills and expertise and increase operational efficiency. We

believe that selection of ERP or other systems warrant the inclusion of mobile applications, knowledge management, and emerging technologies. An in-depth study of such factors during the selection and implementation of systems is important in order to understand the impacts of ERP and other technology on firms.

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