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# The Selection Process of Enterprise Resource Planning (ERP) Systems

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## Abstract

The significant number of ERP systems installations worldwide during the last decade represents a major paradigm shift in organizational and information systems management. A large number of enterprises are currently extending their base ERP systems or are in the process of acquiring and implementing core ERP modules. Failure to do so successfully can be extremely costly as demonstrated by a number of reported failure cases. The paper aims at providing a framework for the selection process of ERP systems, which can be useful for both identifying critical issues for further research and assisting managers considering ERP projects.

## Introduction

Enterprises, due to increasing competitive pressures, need reliable, relevant, up-to-date, enterprise-wide or even cross-enterprise information in order to reduce cycle times and costs and to improve product and service quality. ERP integrated modular packages were developed to fulfill this need. Although traditional functional terminology is still used to describe their modules, ERP software incorporates best business practices and when implemented successfully, it can support integrated cross-functional processes and allow an enterprise-wide view of business information.

Despite a slowdown of ERP packages' sales in 1999, the trend towards ERP and extended ERP systems is well established (Bray, 1999). According to Merrill Lynch, a large number of enterprises, 40% of those with revenues exceeding \$1 billion, have already implemented base ERP systems (Caldwell and Stein, 1998).

Not all of ERP implementations are entirely successful. In fact, about half of ERP implementations fail to meet expectations, mostly due to underestimation of the effort involved in change management (Appleton, 1997). The cost of an implementation failure can be very high, even disastrous, as demonstrated by the well known bankruptcy case of FoxMeyer Drugs, the fourth largest pharmaceutical distributor in the US. In other cases, a famous example being the Dell Computer Corp., the implementation stopped before completion.

An important issue concerning managers is the appropriateness of ERP software to meet organization's needs. The purpose of this paper is to provide a research framework of the critical issues involved in ERP systems

selection process, which can assist managers considering their ERP projects and stimulate further research in ERP acquisition issues.

## A Framework for ERP Systems Selection

In developing a framework of ERP systems (ERPS) selection, two important issues should be considered:

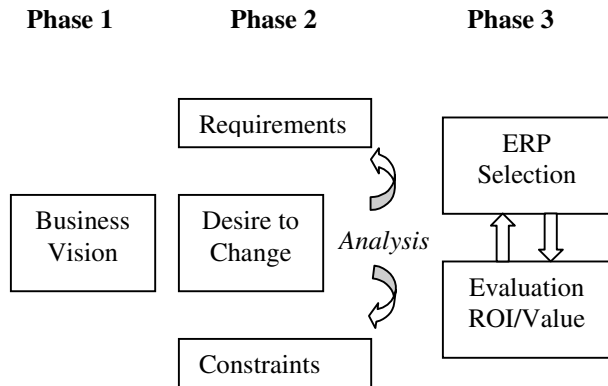
Firstly, given the organizational, technological and behavioral impact of ERP, a broad perspective of the ERP systems adoption/implementation process is needed. Technological, business and organizational contexts should be studied in a unified way, which encourages the examination of interrelated key success factors.

Secondly, certain issues specific to these systems have to be taken into account, such as the unsuitability, most of the time, of ERP software modifications to meet institutionalized business operations and the extent of business processes re-engineering required prior to the implementation of the software. In traditional IS development theory, the software has to fit in to certain business processes, probably adopting and reproducing organizational inefficiencies. In ERP systems implementation the reverse course is usually effective. Due to complexity of the system, enterprises prefer to adapt their business processes to software's in-built best business practices. Modification of the standard ERP configuration options to fit business processes is costly, risky, time consuming and difficult (Davenport, 1996).

A framework of ERPS selection process is depicted in Fig. 1. As it is always the case with IS development and implementation, some iteration is assumed (Avison and Fitzgerald, 1995, p.35) and thus, the procedure is not purely sequential. The proposed model consists of three phases: The first phase considers the business vision as a starting point for ERP initiation/acquisition. The second phase consists of the detailed examination and definition of business needs, and of the various constraints. Before proceeding, the desire and commitment to change by all people in the organization, needs to be evaluated; it is a significant force required to fill the gap between business needs and constraints. The third phase considers the selection of modules of the core system that support critical business practices and of any additional applications the enterprise may need in view of the requirements analysis performed in the previous phase. Certain criteria for vendor, product, and implementation partner selection are examined. This phase also includes

the estimation of the cost of the investment required for purchasing, implementing and maintaining the proposed system throughout its life-cycle.

Figure 1. A framework for ERP selection



### Phase 1: Business vision

Effective IT/IS project implementation requires a clear business vision, which clarifies the organization’s direction, the goals, and the business model behind the implementation of the project (Holland and Light, 1999). Enterprises, are transforming their IT infrastructure in order to meet changing conditions in business worldwide and to take advantage of new developments in IT and communications. Therefore, business processes should be aligned to IT strategy and accordingly, ERP systems must fit in to this strategy. It has been argued that the first step in IT enabled process re-engineering is to develop the business vision and process objectives (Davenport and Short, 1990).

### Phase 2: Business Requirements vs. Constraints and the Desire to Change

This phase consists of an important business exercise in change management. The decision concerning the adoption of an ERP system has to be made according to both the current and the future status of the enterprise, which is constrained by various technological, organizational and financial inefficiencies (Table 1). The project team, consisting of users, managers and consultants should develop a detailed critical ERP functionality and enhancements requirements matrix, followed by a list regarding the organizational and technological changes required for the successful implementation of the system.

#### Business Requirements

At this stage, both current and future business needs, arising mainly from external competitive pressures, have to be balanced against various technological, work and organizational constraints. Companies engaging in e-commerce or supply chains operate in a sophisticated

business and technological environment and they can be heavily computer-intensive. In such cases, the effectiveness of ERPS, which span beyond traditional organizational boundaries, require collaboration between partners, coordination of decisions, as well as accurate and real-time information flow in a network of enterprises.

There is a great likelihood that the examination of needs and constraints will reveal that for a successful ERP system implementation, a radical change in business processes, towards simplification and efficiency, must take place. Such is the case, for example, when developing systems with a customer perspective or adopting best practices from industry (Avison and Fitzgerald, 1995, p. 387). Therefore, a critical factor that should be considered at this stage is the desire and the commitment to continuous change not only by top management but also by the steering committee, the systems’ users and by all members of the project’s implementation team. It is also likely that ERP acquisition will have to be postponed or rejected in view of the high risks involved.

Table 1. Requirements vs. Constraints

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|--|
| <p><b>Requirements</b></p> <ul style="list-style-type: none"> <li>• Operational Efficiency</li> <li>• Supply Chain Optimization</li> <li>• E-commerce</li> <li>• Other</li> </ul> <p><b>Constraints</b></p> <ul style="list-style-type: none"> <li>• Technical             <ul style="list-style-type: none"> <li>○ Legacy systems</li> <li>○ IT architecture</li> </ul> </li> <li>• Organizational             <ul style="list-style-type: none"> <li>○ Business processes</li> <li>○ Management structure</li> <li>○ Leadership</li> <li>○ Commitment</li> <li>○ Communication</li> <li>○ Training</li> </ul> </li> <li>• Financial             <ul style="list-style-type: none"> <li>○ Budget limitations</li> </ul> </li> <li>• Time constraints</li> </ul> |
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#### Constraints

Constraints are classified in 5 categories: Technical, Organizational, Human, Financial and Time constraints.

Technical constraints: Costs incurring from using multiple hardware and software platforms could be significantly reduced if there was a common IT architecture, including software and hardware platform, networking and communications, and applications development. Scalability and flexibility of the IT

infrastructure is critical in order to support additional applications and systems and it should be assured before proceeding to the ERP procurement process.

**Organizational constraints:** These include, among others, the degree of the decentralization, the management structure, the style of leadership, the rigidity of business processes, and the company’s culture. Resistance to change, prestige, job security feelings and departmental politics are also involved (Bancroft et al, 1998, p.131). It should be noted that, judging from a number of publicized cases, organizational factors seem to be more important than the technological ones for successful implementation of ERP systems (Stefanou, 1999).

**Human resources constraints:** A cross functional implementation team consisting of both business and IT/IS people and of internal personnel and external consultants can be very effective in implementing ERP software. However, the lack of experienced external consultants and trained and educated employees in ERP philosophy represents a serious constraint that could jeopardize the implementation project.

**Financial and time constraints:** Any project of the scale of ERP systems implementation should have adequate financial resources. A lot of hidden costs, such as the period of training required and unanticipated fees of external consultants, may prove to be a barrier to successful implementation. One final constraint is the time allowed for the selection and implementation process. Unrealistic time frames and deadlines may add unnecessary pressure and lead to project failure.

### Phase 3: ERP Systems Selection/Evaluation

This phase consists of the selection and evaluation of the appropriate vendor, product and supporting services to fulfill business needs (Table 2).

Table 2. ERP Selection

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| <ul style="list-style-type: none"> <li>• Core modules selection</li> <li>• Extensions (e.g. SCM) acquisition method             <ul style="list-style-type: none"> <li>○ From same ERP vendor</li> <li>○ From third party</li> <li>○ From third party cooperating with ERP vendor</li> <li>○ Built-in-house</li> <li>○ Outsourced</li> </ul> </li> <li>• Vendors selection</li> <li>• Consultants selection</li> </ul> |
|--|

Although every one of the established ERP packages offers a broad functionality, they certainly exhibit individual strengths and weaknesses compared with

individual business requirements. Certain packages are regarded as having an exceptional functionality in some of their modules, as is the case, for example, with PeopleSoft’s Human Resources module. Other vendors are regarded as specializing in certain industries, supporting industry-specific best practices, as for example SAP in Chemicals and Pharmaceuticals, Oracle in Energy and Telecommunications and Baan in Aerospace and Defense industries (Aberdeen Group, 1997).

The availability and functionality of additional applications to support current and future business needs such as SCM or CRM is an important factor in ERP software selection. It should be also examined if the packages under consideration support a certain business practice or operation, which is considered critical, such as make-to-order or make-to-stock manufacturing. Certain characteristics, such as multilanguage and multicurrency capabilities can be the key drivers for selection of an ERP system (Bancroft et al, 1998, p.191). Among other factors considered in selecting an ERP system is the availability of experts in the system, the partnering company that will assist in the implementation, the training courses available by the vendor or third parties and vendor’s financial position and pricing models (Table 3).

Table 3. ERP Product/Vendor Selection

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|--|
| <ul style="list-style-type: none"> <li>• Requirements fulfilment</li> <li>• Functionality of ERP system’s critical core modules</li> <li>• Industry-specific solutions offered</li> <li>• Extended applications availability/compatibility</li> <li>• Critical business processes supported by ERP system</li> <li>• External experts availability in ERP system</li> <li>• Implementation partner availability/expertise</li> <li>• Training offered by vendor or third party</li> <li>• Vendor’s financial position</li> <li>• Pricing models offered</li> </ul> |
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### *All-in-one vs. Best-of-breed ERP Software*

Enterprises searching for competitive advantage have the option of acquiring an all-in-one or a best-of-breed ERP system. Additional applications can be acquired from the same vendor the ERP system was bought, from another vendor closely collaborating with the first, from a third party vendor, built-in-house or outsourced. Table 4 summarizes the advantages of best-to-breed and all-in-one approaches.

### *ERP Systems Evaluation /Justification*

Any IT/IS investment of such magnitude as ERP acquisition/implementation need to be evaluated and

justified in a number of ways. A key factor for the justification of the effectiveness of the proposed project is the identification of the extent it contributes to business strategy (Fitzgerald, 1998). Various performance indicators, techniques and approaches, such as ROI, value and balanced scorecards have been proposed for the evaluation of ERP software (see for example Rosemann and Wiese, 1999).

Table 4. All-in-one vs Best-of-Breed

|   |
|---|
| <p><b>All-in-one</b></p> <ul style="list-style-type: none"> <li>• Consistent integrated processes</li> <li>• Upgrades compatibility</li> <li>• Lower cost</li> <li>• Implementation simpler</li> <li>• Maintenance easier</li> </ul> <p><b>Best-of breed</b></p> <ul style="list-style-type: none"> <li>• Functionality enhanced</li> <li>• Flexibility</li> <li>• Possible competitive advantage</li> <li>• Extended applications (SCM, CRM, DSS, etc) widely tested</li> <li>• No dependence on one vendor</li> </ul> |
|---|

One difficulty of ERP evaluation is the intangible nature of both costs and benefits. Despite the difficulties, identification of various non-intangible costs and benefits is possible and should be made at the outset. For example, reductions in transaction systems and technical support personnel, cost savings resulting from better inventory management or value chain optimization, and savings from not upgrading legacy systems can be calculated. Other benefits, such as perceived customer satisfaction and benefits arising from rapid decision making are more difficult to be calculated, but nevertheless existent. However, describing benefits arising from transaction processing improvements is not sufficient to justify ERP package acquisition; for benefits to be realized, organizational change is required (Zylstra, 1999). Therefore, a detailed, in-depth investigation of the processes that should be changed in combination with the system and an assessment of the commitment of top level executives to change management should be the firm base on which to support the decision of acquisition or rejection of an ERP package.

**Conclusions**

A large variety of ERP core and extended modules and supporting services are being offered by established ERP vendors and third party companies. The decision to acquire an ERP system and the selection process is becoming increasingly complex in a changing and competitive environment. Enterprises pursuing systems integration should evaluate and select systems that

contribute to this goal without of course sacrificing the functionality of applications they believe are crucial for their business. Careful selection of vendors, products and services provided is necessary but the final decision has to be made considering the amount of organizational change required for the adoption and the implementation of the selected ERP system.

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