Exploratory Study of Challenges of Enterprise Resource Planning System Selection

[1]Abd El-Fatah A.Hegazy, [2]Mahmoud El-Battah, [3]Mona Kadry

[1,3]College of Computer Science, Arab Academy for Science, Technology & Maritime Transport, Cairo, Egypt

[2]College of Computer Science, Modern University For Technology & Information, Cairo, Egypt

ahegazy@aast.edu, elbattah@cs.mti.edu.eg, monakadry@hotmail.com

Abstract

An enterprise resource planning is a critical investment that can significantly affect future competitiveness and performance of any organization. At the present time, many companies are reaping the expected benefits of applying ERP systems; however ERP has many failures and setbacks around the world. One of the major reasons for ERP failure is the improper selection of the ERP package system. ERP system selection is a complex multiple-criteria decision-making (MCDM) problem. This paper sheds the light on the challenges and problems that face the process of ERP software package selection.

Keywords: *ERP, MRP, MCDM, AHP, ANP, ANN, Fuzzy Sets.*

1. Introduction

1.1 The ERP Concept

Enterprise Resource Planning (ERP) has its origins in the concepts associated with Manufacturing Resource Planning (MRP) packages and their antecedents from the 1970s, Materials Requirement Planning packages. Technological opportunities, demands for innovation, and changes in global markets force organizations to be more outward looking, market-oriented and knowledge driven with a flexible infrastructure. This development affects organizations' business practices and procedures to remain in a competitive environment. At this point, information technology plays an important role in increasing the competitiveness of organizations.

Enterprise resource planning (ERP) systems were introduced into companies to solve various organizational problems and to provide an integrated frame as an information technology. ERP modules provide standardization of almost all the business processes and functions of an organization regardless of its line of business [1]. However, applying ERP system is very expensive and requires a lot of time too, so selecting the right ERP system that meets the business functions is very important and is intolerant if improper ERP system is wrongly chosen.

Convincing reasons for a new ERP system may include:

1.The use of multiple points of input with duplicated effort in the existing system.
2. The inability of the existing system to support organizational needs.
3. The requirement of extensive resources for maintenance and support.
4. The consideration of an enterprise to reengineer its business process.
5. The growth of the enterprise and subsequent incompatibility of several information systems.
6. The inability of employees to respond easily to questions or information requested by key customers or suppliers.

ERP benefits can be classified into five groups as follows:

- Operational, relating to cost reduction, cycle time reduction, productivity improvement, quality improvement, and customer services improvement.
- Managerial, relating to better resource management, improved decision making and planning, and performance improvement.
- Strategic, concerning supporting business growth, supporting business alliance, building business innovations, building cost leadership, generating product differentiation, and building external linkages.
- IT infrastructure, involving building business flexibility, IT cost reduction, and increased IT infrastructure capability.
- Organizational, relating to supporting organizational changes, facilitating business learning, empowering, and building common visions.

1.2 Challenges to Further Expansion

The commercial growth of ERP is globally remarkable. Most very large organizations world-wide have already adopted ERP, and increasingly small- and medium-sized enterprises too are finding it cost effective and a competitive necessity to follow suit. However, this global success is facing many challenges. Some implementers of ERP have failed to achieve the expected benefits while others have abandoned ERP implementations or reduced their scale. In large part, these disappointments have been attributed to the great size and complexity of the packages and the associated problems in customization and organizational change.

From real-life examples, while companies such as Cisco Systems, Eastman Kodak, and Tektronix have reaped the expected benefits of ERP systems, many businesses are discovering that their ERP implementation is a nightmare. For example, FoxMeyer Drug, a $5 billion pharmaceutical company, filed for bankruptcy. FoxMeyer argued that major problems were generated by a failed ERP system, which created excess shipments resulting from incorrect orders and costing FoxMeyer millions of dollars. Dell Computer spent tens of millions of dollars on an ERP system only to scrap it because the system was too rigid for their expanding global operations. Recent ERP failures also include Boeing, Dow Chemical, Mobil Europe, Applied Materials, Hershey, and Kellogg's. Others have noted that ERP implementers outside Europe and North America can also experience problems arising from what have been called "cultural misfits". These cultural misfits relate to the inability of the

global packages, in spite of their enormous functional flexibility, to readily address specific functional needs associated with the local laws and local practices [2].

Therefore, it's very important to find out all the problems and challenges facing ERP systems as it can directly lead to the failure of the ERP system or the misfit between the business process and the modules offered by the ERP package. Failure of ERP system can have dramatic consequences on the organization if it tries to roll back the applied ERP system. Figure (1) shows some challenges that face ERP systems**.**

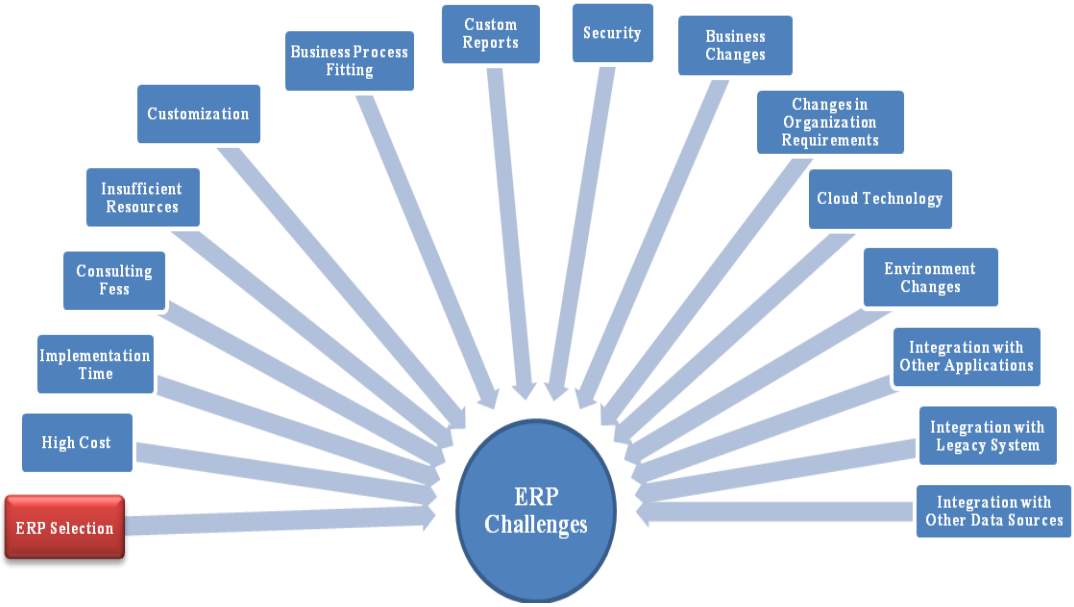

Figure (1) Challenges of ERP Systems

1.3 ERP Selection Challenge

In the light of the mentioned experience of ERP implementation, ERP system selection is considered as a critical problem that faces any organization that has taken the decision to go for the ERP technology. The selection of ERP package includes important decisions regarding budgets, timeframes, goals that will affect the entire project. Choosing the right ERP software package that best meets the organizational needs and processes is crucial to ensure minimal modification and successful implementation and use. A better fit between software vendor and user organization is beneficially associated with packaged software implementation success. This relationship provides maximizing the compatibility of organizations with their vendors. The other important issue is vendor support with extended technical assistance, emergency maintenance, updates and special user training [3].On the other hand, selecting the wrong ERP software package may cause a misfit between the ERP package and the organizational goals or business processes. Obviously, choosing an ERP software package and vendor and implementing and maintaining this system is a very important process since this decision will affect the organization positively or negatively.

1.4 Study Objectives

The paper aims to:

- Perform an exploratory study of the nature of the ERP selection process.
- Find out the associated problems and obstacles related to the selection process in order to make the proper selection of ERP system package.
- Provide a preliminary analytical study to be as a road-map for a next study that proposes a comprehensive framework for ERP system selection process.

1.5 Paper Organization

The organization of the paper is as follows. First, a literature survey demonstrates several methods that have been used before to solve problems of the MCDM type. Then, a real life case study of ERP system selection by one of the largest Egyptian garments factories is analyzed. The last section discusses the collected observations during the ERP selection process.

2. Literature Review

An ERP software selection is considered to be one of the multi-criteria decision making (MCDM) problems[4].The next section reviews some methods that have been used to solve the category of MCDM problems especially ERP selection.

2.1 ERP Software Selection Methods

In ERP Selection, AHP/ANP methods have been used. Wei, Chien, and Wang [5] studied on AHP based ERP selection. Ravi, Shankar, and Tiwari [6] developed ANP model for ERP software selection problem. In recent studies, one can observe that fuzzy sets have been used together with AHP/ANP methods for ERP Software selection. A study was made by Ayag and Ozdemir [7] where a fuzzy ANP was adopted. Another studies in have adopted AHP/ANP and artificial neural Networks to be used together. For example, Stam, Minghe, and Haines [8] made use of ANN in calculation of dual comparison matrix values in AHP. First, Hopfield network was introduced and this trained network was used in the calculation of comparison data whose absolute values were unknown. The trained network by the help of simulation techniques, proved to be affective in the solution of multi-purpose decision problems depended on vague or fuzzy data especially when data was uncertain and fuzzy. In their relevant study, Hu and Tsai [9] studied the case where the data for the comparison matrix was partly missing and they have proposed to find the missing data by way of back propagation method. The multi-layer back propagation they have proposed estimates the missing data and enables the usage of AHP.Kuo, Chi, and Kao [10] developed fuzzy AHP structure for the selection problem. They also studied the interrelations between factors and store performance by ANN model.

Matsuda [11] dealt with the problem in case of missing or no information when the decision is made with ANP based ANN model and tested the validity of his model with simulation. Mikhailov [12] studied on the determination of group priority in AHP method. He mentioned that the usage of his fuzzy based optimization method in reducing the group

decisions to a single one and priorities to a single value is more appropriate than the usage of geometric mean method. In his study, a fuzzy approach has been implemented to solve the problem in the case of missing information of the group members.

3. Research Methodology

This research has been conducted using the case study approach. In this investigation of ERP package selection process, the case study method is used for exploration, for description, and for the testing of theory. The study sites have been garments factories located in Egypt that have taken the decision to go for the ERP technology in an attempt to improve the production process of the factory or to replace its inefficient legacy system.

The first case study has been conducted with "Hassnien El-Galy" factory for Garments located in El-Mansoura. The factory is one of the largest Egyptian exporters of garments products and is trying to take a better place in the global market with its Turkish competitors. The outstanding note is that the Turkish garments manufacturers were the early adopters of applying ERP systems in order to enhance the overall garments production process.

3.1 Establish Attribute Hierarchy

The first stage of the research was to collect the attributes used for evaluating the ERP software packages. Both quantitative and qualitative attributes that can satisfy the routine operation under the strategies and goals of the company should be involved.
The aspects that companies usually consider when selecting ERP project include:

1. The strategy of system to meet the business strategy and goals.
2. The ability of system to support the business process.
3. The technical requirements on which the system operates.
4. The ability of vendor to support the system implementation and maintenance.
5. The methodologies of business processes change and project management.

Thus, after organizing the factors addressed in prior studies, the attributes can be classified into three categories, as follows:

- Project factors: Attributes involved in project management, such as total cost, time of implementation, benefits, and risks.
- Software system factors: Features of the software and system, including strategic fitness and the function of ERP.
- Vendor factors: Attributes that relate to vendors, such as ability and reputation.

Fig. 2 depicts the attribute hierarchy for selecting the ERP projects.

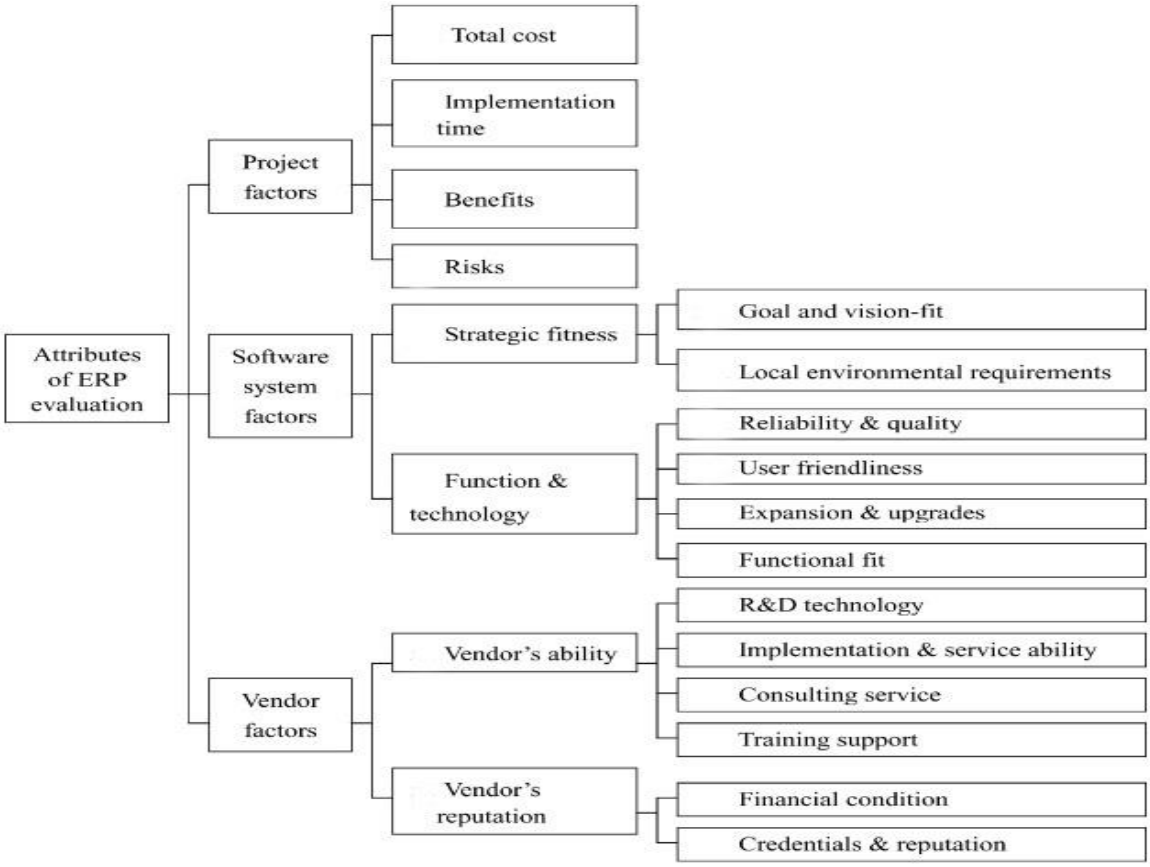

Figure (2) ERP Evaluation Attribute Hierarchy

3.2 Hold Interview Meetings

Several interview meetings have been held with the top-management and various department managers of the factory in order to get a clear image about the strategy and goals of the factory. The outcome of the interviews is a translation of the organization's mission, vision and strategy into a comprehensive set of performance measures for the ERP package evaluation.

The interviews defined the strategy and the goals of the factory from the following perspectives:

- Financial perspective: An interview has been held with the top-management and the manager of the cost management department of the factory to determine the budget cap to be assigned for the ERP system.
- Customer perspective: How the ERP system is going to support the customer relationship management?
- Internal business processes perspective: Several meetings involved many department managers like the production manager, sales manger, purchases manager, total quality manager and quality assurance manager. The outcome of the meetings was seriously important to explore what's required from the ERP system to support the

different business processes of the factory and what are the special requirements and customizations that relate to the garments industry?

- Learning and growth perspective: Human resources module should support recruitment management, personnel information and tracking, organizational structuring ,job position and salary profile career development, training and performance management, compensation management, budgeting and cost control, history/personnel reporting.

The interviews have involved questionnaire for the importance of attributes with respect to the strategy and goals of the factory. The questionnaires aimed at determining the degrees of preference among the attributes used for ERP evaluation. The meanings of the attributes were explained in detail to every one in project team so that every one would understand the same thing when they read the questionnaire. Table (1) describes how the questionnaire results have been recorded.

Table (1) Questionnaire for the importance of main attributes with respect to the goal

Attribute	Weakly important	Fairly important	Very strongly important	Absolutely important
Total Cost				✓
Functional Fit				✓
R & D Technology		✓		

3.3 Screening ERP Packages

The next step is to determine the candidate ERP packages that are qualified according to the attributes hierarchy made at the first. The filtering process of ERP packages is based on the data and information collected from professional reports about the performance of the ERP packages. Table (2) shows some of the screening questions used for filtering and screening the ERP packages.

Information about 20 ERP vendors and systems was initially collected. Unfavorable alternatives were eliminated by asking a few questions, which were formulated by the specifications. After preliminary screening, four ERP vendors remained under consideration.

Table (2) Screening Questions

Item	Question
Vendor Size	1. Does the vendor's size suit our company?
Complexity	1. Is the ERP system too complex, or it is a good fit? 2. Does it fit our requirements, or it is overqualified?
Cost vs. Budget	1. What is the total cost of the project? 2. Can we accept the difference between the cost and budget?
Vendor's Domain	1. What is the provider's target domain and market? 2. Does it match our business needs?
Flexibility	1. Is the technology flexible and durable?
Covering Requirements	1. Does the system and its modules cover all our requirements?
System Requirements	1. What database and hardware can be supported by the system?
Information Technology	1. Does the vendor provide other information systems, such as SCM, MES, DW and CRM? 2. Does the vendor widely integrate its system with other partners' information systems?
Implementation Technology	1. What is the implementation methodology? 2. Is it feasible and simple?
Service Maintenance	1. Who supports upgrade and maintenance? The software supplier or the reseller? 2. Does the vendor have any local service point or a branch company?
Consulting Service	1. Does the vendor provide consulting services? 2. Does it cooperate with another consulting company?
Financial Consideration	1. How did the vendor perform financially over the past two years? 2. What is its current financial forecast? 3. Does it have any venture investment or warning signs?

4. Discussion

The questionnaires were the source of the qualitative evaluation for the ERP packages based on the attributes and the weight of their importance relative to the main goal. On the other hand, the professional reports provided the objective point of view about ERP packages evaluation, in other words they gave the quantitative measurements for the ERP package evaluation.

The challenge that faces the project team assigned to take the decision of the ERP package selection is how to integrate between the objective data and information collected from the professional technical reports with the subjective opinions of various managers of the factory's departments.

Another challenge is the variety and sometimes contradiction among the subjective opinions of the managers due to the different personal point of views and preferences of each manager. For example, the cost manager has provided us with his opinion about the cost of the system and gave the "Absolutely Important" rank to the "Total Cost" attribute which means that the cost of the ERP package is a key factor for evaluation and hence selection. The quality assurance manager had also a comment concerning the "Functional Fit" attribute to have "Absolutely Important" weight when selecting the ERP package, so another key attribute is defined. When the project team was evaluating SAP R/3 ERP software package, it was the most expensive software package among the other alternatives, however it offers the best functional fit between the business process of the factory and the ERP package. Now, a conflict came up due to the different opinions of the cost manager and the total quality manager. Another example showing that the subjective opinions may contradict with the objective data and information collected from the professional reports; one of the managers may prefer 'Oracle ERP Business Suite' for personal reasons that are totally subjective and unmeasurable. However, many technical professional reports have mentioned that Oracle hasn't yet customized its ERP packages to fit the customizations and special requirements of the manufacturing environments like the garments industry. Therefore, another conflict exists between subjective opinions and the objective comments of the technical or professional reports.

5. Conclusion

Application of the traditional scoring methods such as AHP and ANP alone is not satisfactory to make the right ERP software package selection. The traditional methods are based only on quantitative methods for evaluation. Those methods can not integrate the subjective opinions of the managers with the objective analytical reports that evaluate ERP packages. Depending only on either the subjective opinions or the objective professional reports can be misleading for the project team and as a result leads to make the improper selection of ERP software package.

"CombinedQualitative andQuantitative Evaluation" approach for ERP software package selection should be adopted in order to make the right selection. Therefore, one of the artificial intelligence techniques such as fuzzy logic or neural networks should be combined with the traditional scoring methods in order to discover the fuzziness of the selection process and solve the conflicts that occur among the different subjective opinions and objective analytical reports.

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- El-Msairy Factory (El-Mahla El Kobra).

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