

Challenges of implementing enterprise resource planning (ERP) system in Lavan oil refining company

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ABSTRACT

Enterprise Resource Planning (ERP) system is one of the most popular business management systems. It provides the benefits of real-time capacity and continuous business communication in large organizations. However, not all implemented ERPs have been successful. As ERP implementation affects all parts of the organization, including processes, people, and organizational culture, challenges arise in the organization. Recently, some companies have begun to replace their old systems with ERP systems in order to develop the management and administration of the company. This study aims at identifying the challenges of implementing ERP in Lavan Oil Refining Company. The statistical population includes 6 experts of the company. Interviews and previous studies were used to collect data. This is an exploratory research and AHP is used to rank the factors. According to the results, IT maturity has the highest weight and computer culture, business size, process reengineering, management commitment and planning occupy the next rank (from high to low), respectively.

Keywords: Enterprise Resource Planning (ERP), Critical Success Factors (CSF), Strategy, Technical Infrastructure, Culture, Human Resources, Business Processes

Introduction

The unpredictable growth of information and communication technology (ICT) in the past decades due to the development of several industries such as electronics, computers, telecommunications, etc., has had a tremendous impact on various aspects of organizational performance. At the same time, the operating environment of organizations has become more complex and therefore the need for different systems to establish integrated communication in different organizational components and facilitate the flow of information has increased significantly. These systems, collectively known as organizational systems, have provided a platform for managers to use appropriate and integrated information in making decisions at any place and time (Chun-Chin Wei-2005).

Enterprise Resource Planning systems (ERP) are widely used Information Technology (IT) solutions. They have drawn not only the attention of large organizations but also the attention of small and medium enterprises. It is not an easy task to implement ERP. There is a wide variety of ERP software available and it is a difficult task to determine the best system that meets the needs of the organization. In addition, the process of evaluating and selecting an ERP system might take much time.

Selection of the appropriate criteria that reflect the complete picture of the whole organization is of a great importance. The primary frameworks presented in previous studies only emphasize the cost criterion. The balanced scorecard method, in addition to considering financial criteria, extracts other criteria from the perspectives of internal processes customer, innovation and learning in order to measure the enterprise's performance. As a result, a more general view is provided to the manager. This framework also helps to establish proportionality in the number of criteria and prevents the increase of them (Cebeci, 2009).

In recent years, enterprises have considered the utilization of integrated organizational systems at the core of their programs. In this regard, integrated ERP systems have been the most important tool. ERP connects all parts of the enterprise through a stream of information, establishes the management of place, time and resources, and eliminates the need for using several software in different sectors that do not communicate effectively and synchronously with each other.

ERP systems as one of the most important applications of IT occupies a special position in organizations. The American Production and Inventory Control Association defines ERP as “an information system for effective planning and control of all resources needed to receive, produce, send, and respond to customer needs in manufacturing, distribution, and service companies”. ERP can be defined as the integrated software that includes components or modules for planning, production, sales, marketing, distribution, accounting, human resource management, project management, inventory management, service management and maintenance, transportation management, and e-commerce. The architecture and structure of ERP provides the integrity and comprehensiveness of information at the organization level and allows the flow of information among different parts of the organization (Jafarzadeh 2007).

Implementing ERP is essential for organizations, private and public companies to survive, compete and participate in global markets. The purchase, implementation and changes made by ERP impose a heavy cost on organizations. However, the lack of readiness to use, lack of attention to it, and the lack of a suitable, simple and comprehensive model are the reasons for the failure of ERP implementation. Therefore, in order to reduce the risks and increase the probability of successful implementation as well as to return on investment, the necessity of assessing the readiness of using ERP system is explained. Currently, there are few organizations that are seriously involved in the purchase and implementation of ERP systems. Only a few large and major organizations in Iran decide to use these systems. They are currently implementing ERP in their organizations. Most organizations are waiting to see the results of the implementation of ERP in other organizations and despite the start of the study phases, they are practically not involved in the implementation of the main project. Perhaps the success or failure of any of the projects in other enterprises can have a huge impact on the country's ERP market.

Due to complexity, high cost and compatibility risks, implementing an ERP system is a seriously difficult investment project. Companies have spent millions of dollars and a lot of working hours to set up ERP software. Therefore, careful selection of software and a product according to the needs of the organization reduces the time and cost of ERP implementation and leads to a successful implementation of the system (Yusuf et al. 2004). Evidence reveals the bitter reality that many organizations, despite spending a large portion of the human resources or time on ERP, have failed to implement or operate it effectively. In order to avoid wasting valuable organizational resources during the implementation and, more importantly, to protect the organization from the potential risks of implementing ERP, it is necessary to ensure the selection of an appropriate ERP software package before making any decision. ERP systems are the essential need of any enterprise to improve competitiveness. If it is implemented successfully, the enterprise will gain a competitive advantage in global markets (Davenport 1998).

The results of statistical research indicate that about 70% of ERP deployment projects in the world have failed. Looking at this statistic negatively, we find that ERP systems are risky projects. However, if it is looked differently, it can be said that more than 30% of ERP deployment projects in the world have been completely successful. This implies that if failure causes are carefully studied and the results are properly considered, it will be possible to have successful projects.

Various researches have been done about the evaluation of the readiness for implementing different management systems, for example models proposed by Razmi and some others.

Ansari and Rahmani Yoshanloui (2010) in an article entitled “Identifying and assessing the readiness to apply knowledge management” states that today, knowledge is the main source for individuals and the economy as a whole. The explosive growth rate of human knowledge is the most prominent factor that complicates and obscures the work of knowledge managers and employees in predicting strategies and macro directions of progress and development in organizations. Therefore, organizations have decided to identify effective factors, measure and provide the context for knowledge management in order to use their knowledge resources and the environment at the right time. Ansari and Rahmani Yoshanloui (2010)

assumed five factors of organizational culture, organizational structure, strategy and leadership, information technology and human resources to identify and examine the status of every factor in libraries in Tehran in order to apply knowledge management for noticing and improving the weak factors.

Multi-criteria decision theory is a good way to solve problems caused by numerous and sometimes contradictory factors and indicators. In an article entitled “Key factors for organizational success in implementing SCM / ERP systems to support decision making”, C. Stefano, while emphasizing the importance of choosing the right ERP, proposed a conceptual framework for evaluating ERP software. He believes that it is necessary to provide a model for correct and scientific decision making for all organizations in any field of activity. In this regard, the proposed algorithm must basically include appropriate criteria for decision making, and then the appropriate weights in accordance with the organization’s conditions should be calculated for very criterion and finally the opinion of the organization needs to be included. According to Stefano, a suitable model for decision making has the below features:

- All the requirements of the organization are functionally considered.
- It has the needed flexibility as to be used by all organizations.
- It is comprehensive so that it has high reliability for the decision made.
- It is executable.

In Iran, ERP is being focused on at the current time. Many public and private enterprises are going to implement and use ERP. Many government agencies are required to equip themselves with ERP system, in other words, there is a severe ERP fever in the country (Jafarzadeh 2007). Therefore, although any applied research on ERP can be useful for the country, since many organizations (for any reason) have decided to use ERP, it seems that readiness is an essential step in applying ERP.

There are several reasons for the need to deploy an ERP system in organizations. The survival of every organization depends on success in a competitive environment. In today’s competitive markets, the lifespan of organizations’ competitive advantages has decreased, so it is necessary to optimize processes quickly in order to achieve new competitive advantages. In order to increase the efficiency of the organization, the processes in all dimensions of the organization need to be recognized and planned. Moreover, the need for facilities such as concurrent costing, planning and simulation of purchase, planning and simulation of production, human resource planning, and financial resource planning are discussed to increase the efficiency of the enterprise. For this purpose, some tool is needed to quickly gather information from all dimensions of the organization and provide an accurate modeling based on the conditions of the whole organization. Rapid international changes have led governments to draw a strategic vision for their movements in order to gain a competitive advantage in the international arena. In fact, outlining the vision reflects the far future of a country and expresses the values, ideals and thoughts of the country’s policymakers.

Strategic and national decisions to develop an e-government, Iran 1400 vision plan and consequently strategic decisions in line with the plan, explanation of goals and general and executive policies in the Fifth Development Plan, explanation of the challenges and strategies to achieve the goals, communication requirements of the global market, standardization of operations, customer satisfaction, Iran’s interest in joining to WTO and accepting Iran as an observer member after dozens of rejections, Iran’s significant presence in international organizations and assemblies, and finally the emphasis of the fourth paragraph of the multi-sectoral document on the development of public awareness and the development of technology and research require enterprises to provide some preliminaries like the implementation of ERP.

Implementation of ERP, in addition to increasing product or efficiency and saving time or labor, leads to better control over labor due to less division of labor, information conversion, better organization of the staff, less need for formalities and controls to monitor the workflow among departments, staff’s job satisfaction due to their increased effectiveness in performing a particular set of tasks, and improved customer satisfaction due to better information and services. However, studies suggest that there is a positive two-way relationship among investment, information technology, ERP implementation, institutions returns, and human resource productivity.

IT increases the capacity of enterprises and, as a result, diversity of products, quality, and customer satisfaction will improve.

According to what mentioned above, this study is to investigate the factors that impact the success of ERP implementation and the required readiness to apply it in Lavan Oil Refining Company.

Method

This is an applied research in terms of objective and a descriptive survey in terms of data collection method. In the analytical model of the research, human resources, IT infrastructure, organizational culture, business processes, data, senior management commitment and organizational change management are considered as independent variables and organizational readiness as the dependent variable.

The statistical population includes 5 managers, 8 assistant directors, 13 heads of departments, and 4 senior experts of ICT department of Lavan Oil Refining Company; totally 30 individuals. Statistics of the organizational chart was obtained from the human resources unit of Lavan Oil Refining Company. Using the table, the total number of 30 participants were selected as the sample by simple random sampling.

Data collection

Data was collected by questionnaire. The questionnaire was developed using the literature, including articles about organizational readiness assessment for ERP implementation written by researchers such as Albert Sun et al. (2004), Razmi et al. (1994), Saremi and et al. (2010) and the other relevant questionnaires. It was attempted to validate the questionnaire through a preliminary test. To do this, the initial questionnaire was given to 6 managers and senior ICT experts. After collecting the questionnaires, vague and unrelated questions were identified, modified and re-edited, and due to the semi-openness of the initial questionnaire, the factors mentioned by the experts were included in the final questionnaire in order to check the validity and reliability of it.

Validity

The questionnaire was validated by the supervisors, consultants and knowledgeable people. Since it is a researcher-made questionnaire, it was necessary to check content and face validity.

Reliability

AHP method was used to determine the reliability of the test. This method is used to calculate the internal consistency of a measuring instrument that evaluate various properties.

Data analysis

Multi-criteria decision making (AHP) technique was used to analyze the data via EXPERT CHOICE 11 software.

Findings

Preferential judgment (paired comparisons)

Paired comparisons are run to compare different decision options based on every index and to judge the importance of the decision index. After designing the hierarchy of the decision problem, the decision maker must set a number of matrices to numerically measure the importance or the relative preference of indexes to each other and evaluate every decision option according to the indicators. This is done by paired comparisons of the decision elements and by assigning numerical points that indicate the preference or importance between the two elements. This is normally done by comparing the options of the i^{th} indicators to options of the j^{th} indicators. Table 1 displays how the indicators are valued relative to each other.

Table 1: Evaluation of indicators

Description	Comparison of i to j	Preferred value
Option or index i is as important as j or they are of the same preference.	Same importance	1
The option or index i is slightly important than j.	Slightly important	3
The option or index i is more important than j.	More important	5
Option or index i has much higher priority than j.	Very important	7
The option or index i is absolutely important than j and is not comparable to j.	Absolutely important	9
The intermediate values between the preferred values. For example, 8 indicates a value greater than 7 and lower than 9 for 1.		8,6,4,and 2

Relative weight calculations

Calculating the weight of “decision elements” relative to each other through a set of numerical calculations.

The next step in the hierarchical analysis process is to do the necessary calculations to determine the priority of each decision element using the data from pairwise comparisons matrices. The mathematical operations are summarized as the below:

The sum of the numbers in each column of the pairwise comparison matrix is calculated. Then, every element of each column is divided by the sum of the numbers in that column. Thus, the new matrix is obtained that is called the “normalized comparison matrix “. The average of the numbers in each row of the normalized comparison matrix is calculated that is the relative weight of the decision elements to the matrix rows.

The integration of the relative weights to rank the decision options is done at this step by multiplying the relative weight of each element by the weight of the higher elements to obtain the final weight of a single element. Thus, the final weight is obtained for each option.

Ranking of factors affecting ERP implementation

In this section, the factors affecting the implementation of ERP are reviewed and ranked using the Analytic Hierarchy Process (AHP). Table 2 displays the measures of supply chain risk.

Table 2: Factors affecting ERP implementation

Row	Factors affecting ERP implementation
1	IT maturity
2	Computer culture
3	Business size
4	Process reengineering
5	Management commitment
6	planning

Doing analysis via EXPERT CHOICE 11 software and ranking the factors affecting the implementation of ERP by the respondents, the output will be like the presentation in Table 3:

Table 3: Ranking of factors affecting ERP implementation

criteria	sub criteria	Weight	Ranking
factors affecting ERP implementation	IT maturity	.1480	3
	Computer culture	0.130	4
	Business size	0.038	5
	Process reengineering	0.039	6
	Management commitment	0.258	2
	planning	0.388	1

As seen, planning with the weight of 0.388 is in the first rank and process reengineering with the weight of 0.039 is in the sixth rank. The incompatibility coefficient was 0.30, which indicates the acceptable compatibility of comparisons in the factors influencing ERP implementation.

Effective components of ERP implementation

In this section, the components which are effective in the implementation of ERP are reviewed and ranked using the Analytic Hierarchy Process (AHP). Table 4 shows the effective components of ERP implementation.

Table 4: Effective components of ERP implementation

Row	Effective components of ERP implementation	Abbreviation
1	Development	M6
2	Adequate testing	M7
3	project team	M5
4	Consultants	M8
5	the budget	M3
6	Duty as a function	M9
7	Maintaining the territory	M10
8	Management support	M2
9	Planning	M1
10	Dealing with organizational diversity	M4

Doing analysis via EXPERT CHOICE 11 and the ranking of the components affecting the implementation of ERP by the respondents, the output will be like the presentation in Table 5:

Table 5: Ranking of the effective components of ERP implementation

Row	Effective components of ERP implementation	Weight	Rank
1	Development	065.0	6
2	Adequate testing	057.0	7
3	project team	100.0	4
4	Consultants	0.036	8
5	the budget	0.142	3
6	Duty as a function	025.0	9
7	Maintaining the territory	0.020	10
8	Management support	151.0	2
9	Planning	0/317	1
10	Dealing with organizational diversity	0/088	5

As seen, planning with the weight of 0.317 is in the first rank and maintaining the territory with the weight of 0.020 is in the last rank. The incompatibility coefficient is 0.06, which indicates the acceptable compatibility of comparisons in the components affecting ERP implementation. **Discussion and Conclusion**

The main goal of ERP is to increase productivity by developing business processes and reducing costs. ERP allows different departments with different needs to communicate with each other by sharing the same information in a single system. Accordingly, ERP increases the partnership and interaction among all business units of an enterprise. Evaluating and ranking types of ERP is necessary to implement it. Thus, the effective factors with higher importance are identified, on which more budget and time are spent. According to what has been said so far, the effective factors of ERP implementation include six criteria: IT maturity, computer culture, business size and process reengineering, management commitment and planning. Analysis by EXPERT CHOICE 11 software showed that the effective implementation factors of ERP, with an incompatibility coefficient of 0.03, have a different weight coefficient; planning with a significance of 0.388 occupies the first rank and process reengineering with the significance of 0.0399 takes the sixth rank.

Accordingly, it can be concluded that there is a significant difference in the effective factors of ERP implementation; planning is recognized as the most important factor, followed by the commitment of management and technology maturity in the second and third ranks, respectively. Mazaheri et al. (2011) proposed the same hypothesis. He used the process of hierarchical analysis and Parno law to prioritize the effective factors of ERP implementation. They declared planning as the most important factor. Ardakani et al. (2011) identified adequate funding as the most important factor in ERP implementation. Halicas and Lintocangas (2016) introduced funding as the most important factor.

According to what was stated, the components affecting the implementation of ERP included sub-criteria that were examined in detail. The sub-criteria were ranked using AHP hierarchical analysis technique in Chapter 4. The results of ranking each of the sub-criteria of supply chain risk levels were as follows:

Doing analysis via EXPERT CHOICE 11 and ranking the components affecting the implementation of ERP by the respondents, planning with the coefficient of 0.06 and the weight of 0.317 takes the first place and maintaining the territory with the weight of 0.020 occupies the last rank.

Due to the existence of uncertainties and the increase in the number of effective factors in ERP implementation as well as since the systems of Lavan Oil Refining Company become more complicated, it has been difficult for managers to achieve their goals. Each organization faces different levels of risks and hazards depending on the type of activity and the sensitivity of its assets. Therefore, the ERP process must be implemented and the problems and factors impacting ERP must be prevented. Accordingly, due to the significant differences in the effective factors of ERP implementation, the followings are suggested:

- ✓ The process of identifying the factors influencing ERP implementation is critical for the organization. It should be considered because new and unknown risks occur throughout every enterprise's life and the validity of any model or list is momentary. Therefore, the identification process must be performed in the company at regular intervals.
- ✓ Protection against adverse consequences of ERP implementation,
- ✓ Ensuring that the benefits of ERP adoption are achieved,
- ✓ Identifying risk and making conscious decisions;
- ✓ Predicting risk changes during ERP implementation management ;
- ✓ Identifying key aspects of the project,
- ✓ Focusing on a strategic approach in ERP implementation management,
- ✓ Identifying the time of ERP implementation,
- ✓ Estimating risks and examining their relationships,
- ✓ Assigning ownership of risks and providing appropriate responses,
- ✓ Estimating uncertainty level,
- ✓ Estimating the importance of the relationship among the different risks in ERP implementation,
- ✓ Designing responses and monitoring the status of ERP implementation ,

✓Controlling the execution steps.

Given that the levels of supply chain risks are not of equal importance, the followings are also suggested:

By properly identifying and deciding on demand factors such as recognizing market rules and being aware of the sudden influx or cancellation of orders, the company's performance is significantly improved. Senior managers of the organization can help better performance of ERP implementation by considering various economic, political, social factors and making appropriate decisions on long-term production planning. Improved ERP implementation and reduced demand risk will have a direct impact on companies' performance and increase net profit margins. In this regard, taking advantages of strategic thinking in today's complex and turbulent business environment is necessary and inevitable for survival and continuance of enterprises.

Suggestions

We studied only six types of ERP implementation. Therefore, the use of other effective models and factors of ERP implementation is suggested for future research to obtain more accurate results.

- This is a survey and it is suggested to do a correlational study and compare the results with the current research.

- It is suggested to use other ranking methods such as TOPSIS, SAV and ELECTRE in future research to obtain more accurate results.

- It is suggested to examine this issue in other industries for better study and their results should be compared.

- It is suggested to identify the obstacles that prevent the expansion of ERP implementation in different industries and to provide solutions to remove them.

- It is recommended to use non-linear weighting techniques. However, if there is a dependency in the criteria, other methods such as the network analysis process can be used.

Limitations

Due to the use of a questionnaire with multiple-choice questions, it is possible that the order of responses has influenced the choice of options.

The statistical population includes the experts in the implementation of ERP of Lavan Oil Refining Company. Therefore, the generalization of the results to other communities needs caution.

This study deals with cross sectional data and analysis. If the time and financial basis is eliminated, the data and analysis will be time-series and thus the findings will have a higher generalizability.

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