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Critical Success Factors of Enterprise Resource Planning Systems Implementation in Venezuela

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ABSTRACT

Enterprise Resource Planning (ERP) systems have transformed the way organisations go about the process of providing information systems. ERP promise to provide an off-the-shelf solution to the information needs of organizations. Despite this promise, implementation projects are plagued with much publicized failures and abandoned projects. Efforts to make ERP systems successful in organizations are facing challenges. The purpose of this study was to assess the degree of criticality of twenty critical success factors (CSFs) in ERP systems implementation, which were identified through a review of the literature. A survey was administered to managers, from seven Venezuelans corporations, who were identified as having a key role in ERP systems implementation in their firms. A factor analysis of these items identified three underlying dimensions. The findings results of this study should provide to Venezuelan management of firms implementing ERP systems a better understanding of the factors leading to successful ERP implementation projects.

Keywords

ERP, Critical Success Factors, Implementation, Venezuela.

INTRODUCTION

The Enterprise Resource Planning (ERP) system is an integrated set of programs that provides support for core organizational activities such as manufacturing and logistics, finance and accounting, sales and marketing, and human resources. An ERP system helps the different parts of the organization share data and knowledge, reduce costs, and improve management of business processes. In spite of their benefits, many ERP systems fail (Stratman and Roth, 1999). Implementing an ERP system is a major undertaking. About 90 percent of ERP implementations are late or over budget (Martin, 1998) and ERP systems implementation success rate is only about 33% (Zhang et al, 2003).

Over the past few years limited research has been conducted about ERP implementation issues, mainly case studies in individual organizations have been reported. A major problem with such ERP case studies is that very few implementation failures have been recorded in the literature, thus, the reasons why implementations fails are not known for practitioners and researchers, which motivates empirical studies to explore critical factors that affect ERP systems implementation. A recent summary of ERP literature states, "research of critical success factors (CSFs) in ERP implementation is rare and fragmented." (Nah, Lau, and Kuang, 2001). The idea of identifying CSFs as a basis for determining the information needs of managers was popularized by Rockart (1979). CSFs are those factors that are critical to the success of any organization, in the sense that, if objectives associated with the factors are not achieved, the organization will fail perhaps catastrophically (Rockart, 1979). In the context of ERP project implementation, CSFs represent the essential ingredients without which a project stands little chance of success. This study examines the CSFs for implementing enterprise resource planning systems in Venezuela. Managers from seven corporations, who were identified as having a key role in ERP systems implementation, were surveyed in order to empirically assess which CSFs are critical in leading a successful implementation of ERP systems in Venezuela. This paper is organized in four sections. First ERP related literatures are reviewed. The next section introduces the research methodology, followed by the presentation of the result. The paper ends with the conclusions and implications for future research and practice.

LITERATURE REVIEW

Implementing an ERP system is not an easy task. Implementing ERP systems cause dramatic changes that need to be carefully administrated to reap the advantages of an ERP solution (Al-Mudimigh, Zairi and Al-Mashari, 2001). In some well-documented cases, spectacular results have been achieved (Johnston, 2002). Failures, on the other hand, have a relatively high rates, it was reported that three quarters of the ERP projects were judged to be unsuccessful by the ERP implementing firms (Kyung and Young, 2002). What is more, failures are much less extensively documented. As a result, pitfalls to be avoided tend to be less well known. Venezuelan companies are just starting to use ERP systems. They started applying ERP concepts late in the 90s. Due to the complex and integrate nature of ERP and the large investment involved it is imperative for organizations to study experiences of others, and learn from theirs practices and success factors (Zairi et al, 2000). Identifying CSFs relevant to local companies is one way to increase the chances of a successful local implementation (Sum, Ang and Yeo, 1997).

A literature review was conducted to understand the CSFs in successful ERP implementation. The review covered numerous articles (Bingi, Sharma and Godla, 1999), (Esteves and Pastor, 2001), (Falkowski et al, 1998), (Holland, and Light, 1999), (Nah, Lau, and Kuang, 2001), (Rosario, 2000), (Stefanou, 1999), (Sumner, 1999), (Wee, 2000). The literature varies regarding which variables are required for implementation success, so there is not a general consensus as to which set of factors are the keys to success in ERP implementation. It as probably a combination of factors those are important in explaining ERP implementation success (Zhang et al, 2003). Although, from the review, twenty factors emerged as critical to the successful implementation of ERP systems. These twenty factors were obtained after careful analysis and grouping of related sub-factors, they are:

1. Top Management Support.
2. User Training.
3. Use of Consultants
4. User Participation.
5. Vendor Package Selection.
6. Use of Steering Committee.
7. Discipline and Standardization.
8. Minimal Customization.
9. Use of Vendor's Development Tools.
10. Best People Full Time.
11. Technical and Business Knowledge.
12. Implementation Approach.
13. Clear Goals, Focus and Scope
14. Business Process Reengineering.
15. Project Management.
16. Effective Communications
17. Presence of a Champion.
18. Interdepartmental Cooperation and Communication
19. Management of Expectations.
20. Vendor/Customer Partnership.

RESEARCH METHODOLOGY

Research methodology is very important as it can guide researchers on what steps need to be taken in order to meet the objectives of the research. In this study, the purpose was to ask the perceptions and experiences of companies using ERP systems in Venezuela and uses this information as the basis of data collection. The analysis has enabled the identification CSFs of ERP systems implementation in Venezuelan companies.

The target of this study was the organizations that have implemented ERP systems successfully. The key informant method was used for collecting information on a social setting by surveying (or interviewing) a selected number of participants. Seven firms were identified from the list provided by ERP vendors. We contacted the ERP project managers of each company in charge of ERP implementation. About of 100 questionnaires were sent to ERP project manager of each firm, who forwarded the questionnaires to his/her project team members in charge of individual process. A total of 72 questionnaires were returned, of which 69 were valid.

The questionnaire designed in this study consisted of two main parts: the background of the company and the CSFs. The first part was designed to determine fundamental issues, including size of the company, type of industry, location of the company, etc. The second part of the questionnaire consisted of twenty statements about the success factors of ERP systems implementation, derived from the previously stated literature review. The language used in the survey was Spanish.

Translation was rather easy because Venezuelans adopted original English terms for many technical and management concepts and especially to information systems and computing concepts.

Participants were requested to rate the importance of each CSFs using a five-point Likert scale, where a score of 5 indicated "extremely critical" and a score of 1 indicated "neither critical". This method was employed on the ground that a rating method avoids the problems of having to consider twenty CSFs simultaneously in order to rank them. The data collected was then analyzed by using the SPSS software. Based on the responses from the industries both, descriptive statistics, factor analysis (FA) and reliability test were carried out to identify the CSFs for the successful implementation of ERP systems and data validity respectively.

RESULTS

Ranking

The importance rating of the twenty items (CSFs) is listed in Table 1.

Rank	CSF	Mean	Std. Dev.
1	Top management support	4.80	0.62
2	Presence of a champion	4.75	0.85
3	Project management	4.64	0.92
4	Best people full time	4.58	0.60
5	Effective communications	4.51	0.85
6	Interdepartmental cooperation and communication	4.40	0.91
7	Management of expectations	4.36	1.02
8	Technical and business knowledge	4.33	1.21
9	User participation	4.22	0.82
10	Discipline and standardization	4.09	0.85
11	Vendor package selection	4.02	0.61
12	User training	4.01	1.12
13	Implementation approach	4.00	1.20
14	Clear goals, focus and scope	3.89	1.14
15	Use of consultants	3.75	0.85
16	Minimal customization	3.68	1.52
17	Vendor/customer partnership	3.15	0.52
18	Use of steering committee	2.95	0.63
19	Business process reengineering	2.84	0.55
20	Use of vendor's development tools	2.06	0.42

Table 1. Rankings of CSF's

The individual mean value of the Likert rating scale is the popular usage indicator for measuring an item's importance, without regard to the other items, so while higher the value, the more important the factor. The most items are rated above the 3.0 scale midpoint. The three most important factors, in order of declining importance, are: Top management support, presence of a champion and project management, with a mean value ranging from 4.80 to 4.64. Just as the literature argues for attention, these are items that concern the ERP implementation management (Johnston, 2002) Conversely, use of steering committee, business process reengineering and use of vendor's development tools, constitute the three items located at the bottom of the list with a mean value ranging from 2.95 to 2.06.

Factor Analysis

In an attempt to reduce the number of items (CSFs) and to understand the underlying structure of them, a factor analysis (FA) was performed.

FA is a data reduction technique that uses correlations between data variables. The underlying assumption of FA is that a number of factors exist to explain the correlations or inter-relationships among observed variables (Chatfield and Collins, 1992). For the present study, a FA was performed on all twenty variables using principal components extraction (Tabachnick and Fidell, 1989). The goal of this method is to extract maximum variance from the data set within each factor. It is basically used to reduce a large number of variables down to a smaller number of components. The measure of sampling adequacy for the twenty items was 0.87 indicating that the items were suitable for factoring (Kaiser, 1974).

A three-stage factor analysis was conducted with an orthogonal (varimax) rotation to obtain a stable factor structure (Rai et al., 1996). The varimax rotation was employed which resulted in easily interpretable factors. Under this three round factor analysis, were omitted the items according to the following two criteria:

- 1) No loading greater than 0.35, or
- 2) Loading greater than 0.35 on two or more factors (Kim and Mueller, 1978).

Table 2 shows the results of this analysis.

CSF	Mean	Factor Loading (Final Factor Structure)		
		F1	F2	F3
Top Management Support	4.80	0.608		
Presence of a Champion.	4.75	0.541		
Project Management	4.64	0.586		
Best People Full Time	4.58			0.741
Effective Communications	4.51		0.565	
Management of Expectations	4.40	0.420		
Interdepartmental cooperation and communication	4.36		0.452	
Technical and Business Knowledge	4.33			0.584
User Participation	4.22		0.562	
Discipline and Standardization	4.09			0.387
Vendor Package Selection	4.02			
User Training	4.01		0.510	
Implementation Approach	4.00	0.478		
Clear Goals, Focus and Scope	3.89	0.411		
Use of Consultants	3.75			0.573
Minimal Customization	3.68			
Vendor/Customer Partnership	3.15			
Use of Steering Committee	2.95			
Business Process Reengineering	2.84			
Use of Vendor's Development Tools	2.06			
Eigenvalue		7.56	2.54	1.20
Percentage of variance		58.50	14.36	8.65
Cumulative percentage of variance		58.50	72.86	81.51
Cronbach alpha coefficient		0.88	0.74	0.56

Table 2. Results of Factor Analysis

A first factor analysis was conducted and produced five factors. According to the two criteria, three items were dropped. A second factor analysis on the remaining 17 items resulted in four factors and the dropping of three items. Finally, a three-

factor structure was derived which kept a total of 14 items after three iterations. The minimum eigenvalue from a varimax rotation for which a factor was to be retained was set at 1.0 in order to satisfy the minimum eigenvalue criterion (Nunnally, 1978). Among these factors, factor one contains six items that deal with items related to implementation management, i.e. Top management support, presence of a champion, project management, management of expectations, implementation approach and clear goals, focus and scope. Thus, factor one was named as "ERP implementation management". Factor two holds four items that refer to factors related to users participation:

- 1) Effective communication,
- 2) Interdepartmental cooperation and communication,
- 3) User participations, and
- 4) User training.

As a result, factor two can be labeled as "users aptitudes and communication". Factor three includes four items that focus on the knowledge of business and ERP. They are: Best people full time, technical and business knowledge, use of consultants and discipline and standardization. Therefore, factor three is titled "technical knowledge". Note that Cronbach alpha coefficients were calculated to test the reliability of these CSFs and listed them in the last row of Table 2. The reliability of coefficients obtained range from 0.56 (factor three) to 0.88 (factor one). Srinivasan (1985) proposed that a coefficient of 0.7 or higher is acceptable, while a coefficient of 0.5 or higher is considered sufficient when dealing with exploratory research combined with invalidated data. Thus, the reliability coefficients in this study are deemed acceptable. Strength of factor analysis is that it provides a basis for data reduction. Rather than looking at all twenty items, now can be examined the ranking of three factors. This simplifies the rankings and clarifies the set of most important items. Rather than focusing upon individual items practitioners and researchers can focus upon the broad set of items represented by a single factors.

CONCLUSIONS

Despite the benefits that can be achieved with a successful ERP systems implementation, there is already evidence of failure in projects related with ERP systems implementation (Davenport, 1998). It is therefore important to find out what are the CSFs that drive ERP project success.

According to the respondents in this study, the six top CFSs for ERP systems implementation in Venezuelans firms are: Top management support, presence of a champion, project management, best people full time, effective communications and management of expectations.

This research has derived three composite CSFs (factors) in ERP systems implementation in Venezuela, they are: "ERP Implementation Management", "Users Aptitudes and Communication", and "Technical Knowledge".

Four of the six top items load primarily upon the "ERP Implementation Management" factor. The "ERP Implementation Management" factor is by far the most important factor. It is made up of items that are concerned with the management of ERP systems implementation project.

This research has some interesting findings. The results of ranking of ERP critical success factors are largely consistent with the literature review, though the relative ranking of some factors varies. In the literature, top management support, change management, presence of a champion and management of expectations are four most often cited critical factors.

Most of factors (12) were rated as critical (rating > 4). Only one factor, business process reengineering, which is cited in most articles reviewed as critical in ERP implementation success, was not rated as highly as the others (rating < 3.0). Hence, the perceptions of Venezuelans managers involved in ERP systems implementation projects, on ERP critical success factors are consistent with the findings reported in the literature.

There are a number of questions to be determined. For example, although this paper establishes the relative importance of CSFs in seven firms, it has not established why. Future studies could look at differences by size of firms, by industry type, by number of locations, by number of customers, etc.

Finally, it should be noted that all CSFs are based on previous research; the success items can be modified when further research is conducted. For instance, a discovery-oriented research through comprehensive interviews with several top-level managers in an attempt to identify new CSFs is an option.

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