Determinants and Consequences of Implementation Enterprise Resource Planning System on Financial performance

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Abstract

Being competitive in business environment and necessity of setting integration organizations need to create unity within and inside of the organization and evolution of technology in the midst of organization and extensive change in the field of information systems are the main factors in enterprise resource planning systems. Enterprise resource planning system is a comprehensive system that tries to integrate all functions and departments in an organization (centralized and decentralized) using a single computer system. On the other hand, the process of implementation of enterprise resource planning system not only requires large amounts of time and money, but also the successful implementation of this system will disrupt the corporate culture, Creates an expensive educational needs and can lead to loss of productivity. Therefore, it is important identifying the critical factors which are effective on success or being failure of the process implementation of enterprise resource planning. This study followed the effect of three factors: top management support, perspective business and exoorganization expert sing the success of the ERP system and also examine the impact of this system on the company's financial performance. Active population survey companies in the automotive parts in the period 2004 to 2008. To test this hypothesis in a multi-stage sampling of 167 patients were selected from seven companies. The study of Amos and SPSS software for statistical analysis using data obtained from the community. Finally, using structural equations to examine and test the hypothesis paid. Generally research results conform positive relationship between contingency factors and ERP success and positive relationship between ERP success and financial performance.

Keywords: Top Management Support, Business Perspective, Specialty Of External Factors, Enterprise Resource Planning, Financial Performance.
1- Introduction

An enterprise resource planning (ERP) system is generally defined as a packaged business software system which facilitates an enterprise to manage the efficient and effective use of resources (materials, finance, human resources, etc.) by maintaining a total integrated solution for the organization’s information-processing needs, through a process-oriented view uniformed across the firm (Nah et al., 2007). Most ERP adopters believe that systems would enhance operations in terms of speed and value, and therefore reduce wasteful costs. ERP systems allow the integration of operations, divisions of businesses in terms of information exchange and flow, and the integration of business functions as unlike as operations, accounting, finance, human resources, marketing, sales, customer information and even the supply chain (Dezdar and Ainin, 2011c). All of these benefits point to improved business profit margins.

Enterprise systems (ES) that are also called enterprise resource planning systems are of important business information technologies that have emerged in recent decade. While enterprise systems of two different industries are not the same, the basic concept of enterprise systems is mainly concentrated on standardization, synchronization and optimized performance. Enterprise resources planning systems are alternatives for material resource planning (MRP) and integrated accounting systems including payroll, general ledger and bill issuance. The advantages of enterprise systems are very important: processes and information coordination, reduction of transportation costs and time span and improving responding to customers’ needs (Davenport, 2000; Elarbi, 2001).

By business environment being comparative, the necessity to develop integration into the enterprises and between enterprises and significant revolution in the field of information systems technology have been the main factors forming enterprise resources planning systems. Enterprise resources planning systems is an inclusive system that integrates all duties and sectors existing in an enterprise (centralized and
none centralized) using a single computer system, such that special needs of those sections are satisfied.

Although many studies are conducted about the advantages of enterprise resources planning systems, a few investigations are done for adoption and execution of such enterprise systems. The results of many investigations show that execution of an enterprise resources planning systems project lasts more than two years and requires great investment and great costs. On the other hand, the process of implementing enterprise resources planning systems not only require huge time and money, but also successful execution of this system may be disturbed by enterprise culture, create high cost educational needs and it leads to productivity degradation. Therefore, identification of impacting factors on the success or failure of enterprise resources planning systems implementation process is very important. So, the main issue in present research is investigating key factors in success or failure of this process. Many factors that have positive impact on the success of IT systems have been identified. Also, in present research, we will investigate the impact of enterprise resources planning systems on the performance of enterprise.

2- Theoretical literature and Hypotheses

In present research, we will investigate three key factors obtained from Ifendo’s study (2008) on the success of ERP systems:

2-1: Measuring the success of enterprise resources planning system

IS sector on the model of Thong et al (1996) is different from the success of enterprise resources planning execution. Indeed, the success of enterprise resources planning refers to utilization of these systems in order to achieve organizational goals (Thong et al, 1996; Gable et al, 2003). This definition does not contain the success in implementing these systems from technical point of view that includes cost index of implementation, project management metrics and time estimation (Martin, 1998; Markus and Tanis, 2000; Yu, 1998). Although some of researchers have claimed about the values, advantages and or the success of enterprise resources planning systems based on financial indexes or organizational performance comparison
(Poston and Grabski, 2001; Nicolaou, 2004), the present research does not measure the success of enterprise resources planning systems using financial parameters, but it measures the financial indexes following the project relating to the impact of executing enterprise resources planning.

In identification of the importance of dependent variables’ definition and success criteria of information system, Delone and McLean presented an attractive categorization and model as a framework for organizing the concept of IS success. They presented 6 important criteria for IS success as follows: quality of system, quality of information, usage, users’ satisfaction, individual impact and organizational impact. This model (D&M model) benefits from excellent processes and requirements. Six dimensions suggested by this model have internal relation relative to independent variable. These 6 dimensions are defined as follows (Delone and McLean, 1992):

1- Quality of system: a criterion for information processing system
2- Quality of information: a criterion for information system output
3- Usage: rate of using information system output by the receiver
4- User’s satisfaction: the respond of user regarding using information system output
5- Individual impact: a criterion for the impact of information on the behavior of receiver
6- Organizational impact: a criterion for the impact of information on organizational performance

Delone and McLean (2003) revising their basic model using experimental studies developed updated model of information system success. In their new model, they added services quality to quality criterion.

Ifinedo and Nahar (2006) suggested a model for evaluation of the success of enterprise resources planning system including workgroup impact. They state that each model for evaluating the enterprise resources planning systems success must
include the dimension relating to workgroup, because these systems are adopted in order to enhance inter sector operations (Davenport, 2000). Here, workgroup refers to sub units and or operational sectors of an organization.

2-2: Top management’s support and ERPS
Top management support refers to the extent in which, top managers of an enterprise provide guidelines, authorities and required resources during implementation and after obtaining IT systems, particularly enterprise resources planning systems. It is reasonable that when top managers support an IT project, other members of that enterprise consider those movements as positive and follow them. On the contrary, lack of support by top managers of an IT system would lead to a bad event for that software. Regarding enterprise resources planning systems, large part of available theoretical literature identify top management support as main factor for success of enterprise resources planning projects (Davenport, 2000; Bingi et al, 1999; Somers and Nelson, 2004). In fact, top management support is suitable for the success of whole system in the stage after applying (Ifinedo, 2006). When integrated support and commitment of top management is clear for different activities and sectors of enterprise, the possibility of successful execution of enterprise resources planning systems would be high. According to Bingi et al (1999), the success of a big project such as implementing an enterprise resources planning system is fully dependent on the stable and high commitment of top managers. When this commitment penetrates into other levels of enterprise, commitment of whole enterprise is achieved.

Top managers must guide, cooperate in processes, support all independent organs of enterprise and guarantee of enterprise members are satisfied with the changes they made (Davenport, 2000). When level of support and commitment of top managers seems high, the likelihood of system’s success would go high as well. Accordingly, the following hypothesis is proposed:

_H1: there is a positive and significant relationship between top management support and success of enterprise resources planning._
2-3: Business perspective and ERPS

Business perspective is a general concept relating to the general goal of enterprise that ideally reflects the expectations and values of main shareholders of a commercial enterprise (Johnson and Scholes, 1999). In this research, two concepts are used: organizational goals and mission from strategic management literature for illustrating business perspective that states the organizations apply enterprise resources planning system in order to achieve organizational goals (business perspective). The main reason for applying enterprise resources planning is obtaining competitive advantage, improving customer services that are indicators of organizational goals. Unfortunately, it seems that all organizations are not able to describe detailed strategy of applying IT relative to their general business perspective (Keen, 1993; Deloitte Consulting, 2000). While some of organizations are able to align the goals of adopting enterprise resources planning systems to their business goals, other ones cannot establish such a relation and they engage in this activity without a clear and defendable reason (Keen, 1993; Davenport, 2000). The researchers assert that enterprise resources planning is just more than an IT system for companies. It is important that the organizations have a clear understanding on how applying enterprise resources planning would support their business perspective (Markus and Tanis, 2000). The sooner the companies achieve such an understanding, the better for them (Keen, 1993; Davenport, 2000). The companies that intend to apply enterprise resources planning must be aware of their strategic goals before beginning the job (Davenport, 2000). Therefore, likelihood of success for IT systems such as enterprise resources planning system that has no association with general goals of organization is very low. On the other words, failure rate for enterprise resources planning project in organizations that are not able to understand the support made by enterprise resources planning for organizational goals and mission is very high. Consequently, when an organization is able to analyze the relationship between implementation of enterprise resources planning system and its business perspective, its successful rate and a positive output for system, compared to where the system is applied without
any reasonable reason, would be higher. Accordingly, the following hypothesis is proposed:

\[ H2: \text{there is a positive and significant relationship between business perspective and success of enterprise resources planning.} \]

2-4: Specialty of external factors and ERPS

External specialty refers to the extent that intermediate institutes such as vendors and consultants, present the knowledge, training, maintenance and other technical supports to the organization that applies enterprise resources planning. In present research, the vendors and consultants are grouped under the title of external skill, because the studies of Sadra et al (2003) concerning the impact of knowledge management on the success of enterprise resources planning indicate that used items overlap for each structure or factor, so other researchers merged these two groups. It must be noted that some of vendors present consultation services too (Pesten and Grisky, 2001). The vendors and consultants are necessary for the operations of enterprise resources planning since many organizations that apply enterprise resources planning system, don’t have required individuals and skills for implementing these systems (Markus and Tanis, 2000; Danport, 2000). Competent suppliers of enterprise resources planning systems don’t train their customers only during implementation course, but they apply their valuable experiences for guiding and directing and nurturing user organization (Wang and Chen, 2006). During the process of implementing enterprise resources planning system, the organizations don’t expect only the knowledge to be transmitted and support to be conducted, but they are willing to have valid and trustworthy partners (Gefen, 2004; Ko et al, 2005; Westrup and Knight, 2007). Yet, different studies indicate that when external skill level is high, likelihood of success for adopted IT system would be more. In this respect, Sadra et al (2003) found that external specialty is related to the success of planning. Generally, the impact of enterprise resources planning system on the employees, subsidiary units and whole of organization would be positive if the vendors and consultants possess high quality (Gefen and Ridings, 2002; Gefen, 2004;
Ko et al, 2005); on the contrary, when the quality of external experts is low, the organization and its employees would not receive required support. Accordingly, the following hypothesis is proposed:

**H3: There is a positive and significant relationship between the quality of external factors’ specialty and the success of enterprise resources planning.**

**2-5: Impact of enterprise resources planning on performance**

Although it is more than a decade that the complete ERP systems are used, there are shortcomings on researches relating to the impact of ERP on organizational performance. Based on the observations of Bender (1986) and PratiPati and Mensa (1997), there are some problems in the way of computing ERP commercial value. This is mainly due to the incapability of researchers in evaluation of advantages, the advantages that are naturally qualitative and therefore not calculable. DekiVeeJari and Sarinen (1995), PratiPati and Mensa, Till Kootist and Rogers (2005), Gelderman (1998) found that calculating the impact of information systems on organizational performance is very complicated and difficult.

Ko and UliBersion (2004) believe that despite being aware of inability of researches in evaluating the impacts of ERP, many organizations continue implementing it. These two researchers believe that despite the attempts of all researchers, no acceptable and complete results are achieved. Based on the findings of Rass (2002), conducted studies either found no relationship between ERP and organizational performance, or they reported partial relationship. Dernan and McCall Rakendi (2003) state that there are a few scientific studies about the impact of ERP on organizational services. They add that ERP systems are inflexible and present the best commercial performance, yet they are complicated and expensive and require different set ups for different applications. Furthermore, ERP systems act in real time, have online batch processing capabilities and are intensely internet-centric. Husin et al believe that implementation of ERP systems requires more challenges and arrangements than previous information systems.
Experimental researches in the field of ERP (against researches relating to the viewpoints of users) and its impacts on organizations include the studies of Poston and Grabsky (2000), Hunton, Lipin Cutwork (2003) and Nicolaou (2004). All three mentioned researches use similar method. Samples of government companies implemented ERP were obtained from Lexis Nexis Academic database. Then, financial performance of ERP implemented companies was compared to that of ordinary companies. For this purpose, Compustat components were used. Studies performed by Poston and Grabsky (2000), Hunton et al (2003) and Nicolaou (2004) although applied similar methods, but different and opposite results were obtained. Hunton et al, Nicolaou and Poston, Grabsky (2001) suggested more studies must be conducted in the field of the impacts of ERP on organizational performance; particularly in order to verify his research and its results, Nicolaou called other researchers. Based on their observations, ERP systems increase decision making process, improve costs and operations control and facilitate investment information transmission. The complicated nature of ERP systems implementation, significant organizational, cultural and human changes, high costs of systems personalization and problems resulting from implementation, causes the users each time make revisions on implementing ERP. According to conducted studies, ERP systems severely influence different types of organizations. Besides, ERP systems are very costly and complicated. Yet, works that were done in this regard show opposite results.

2-6: Enterprise resources planning system and financial performance
Despite using advanced ERP systems in recent decade, insufficient studies are conducted concerning the impact of ERP on organizational performance. Experimental studies on the impact of ERP on organizational performance include: Poston and Grabski (2000), Hunton, Lippincott and Reck (2003) and Nicolaou (2004). In these studies, similar methodologies are applied. Financial performance of
companies adopting ERP is compared to financial performance of some companies that don’t use ERP.

In present research, two indexes are used for measuring financial performance: return on asset (ROA), return on equity (ROE). ROA: it reflects the efficiency of companies in using the assets with financial supply policy being fixed. Total ROA = net income before tax divided by average asset. ROE: shows the return on equity of ordinary shareholders and it is an important financial index for investors. ROE = net income (profit) before tax divided by average stockholders’ equity. Based on above statements:

**H4: there is a positive and significant relationship between executing enterprise resources planning and financial performance of organization.**

**3- Research methodology**

Research domain of this study includes the issues relating to the execution and success of enterprise resources planning system and its impact on financial performance. Place domain of present research is the automobile industry companies. Time domain of present research includes 5 years, interval from 2003 to 2008.

The statistical population of this research is composed of stock exchange companies that are acting in automobile industry, have used enterprise resources planning system during 2003 to 2008.

In this research, we used multi stage sampling. At first, from among research statistical population (28 companies acting in automobile industry of which 9 companies have implemented ERP system) 7 companies were randomly selected. Analysis unit in these companies are employees, managers and experts who are related to enterprise resources planning systems and relative to the number of employees in each company, required number of individuals were selected. Through this method, sample size is 162 individuals.

In the second section, financial performances of the whole companies' statistical population are under studying.
In present research, Chronbach’s alpha was calculated using SPSS software. After distributing 30 questionnaires as pretest, we calculated alpha by using SPSS software. Calculated alpha related to each variable and total alpha is presented in table 1.

Table 1: Calculated Chronbach’s Alpha of questionnaires.

<table>
<thead>
<tr>
<th>Order</th>
<th>Name of variable</th>
<th>Chronbach’s alpha</th>
<th>Number of samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supporting top managers</td>
<td>0.86</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Business perspective</td>
<td>0.96</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>specialty of external agents</td>
<td>0.87</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>ERP success</td>
<td>0.85</td>
<td>30</td>
</tr>
</tbody>
</table>

As Nonali states, if Chronbach’s alpha is more than 0.7, the questionnaire possesses perpetuity. Of course, Cherchil, Setaran and Slater, consider 0.6 alpha as the basis for perpetuity (Ziaeddin, 2000).

4- Analysis and Results

For determining nominal validity of questionnaire, we benefited from the viewpoints of researchers and experts regarding the correctness and clearness of questionnaire questions including advisor and supervisor and they verified the validity of questionnaire. Also, Ifindo (2008) assest that the questionnaire is desirably valid. The information relating to the gender of employees shows that 83.9% of this population is male and 16.1% of them are female. It means that main portion of population is consisted of men.

Managers, supervisors and employees contain 13.4%, 28.7% and 57.9% of sample respectively. The highest abundance relates to the employees that consist 57.9% of sample population and managers with 13.4% have the lowest abundance in sample. Information relating to the contribution of respondents indicate that 13.7% of samples are the employees who work in Iran Khodro Company, 15.1% work in Saipa Diesel Company, 15.8% work in Iran Khodro Diesel Company, 13.7% work in Saipa Company, 12.3% work in Zamiad Company, 16.4% work in Pars Khodro Company and 13% are the employees who work in production group of Iran part makers.
In order to analyze the questionnaires and use structural equation model for testing the hypotheses particularly the 4\textsuperscript{th} hypothesis that investigates the relationship between ERP success and financial performance of company, we corresponded financial performance of company obtained from two variables, i.e. ROI & ROE to the responses of employees of that company where related person is working in and then we used autonation for determining estimation method, then using indexes obtained from analysis done by AMOS software, we tested acceptability of developed model and finally we estimated model parameters description of which is presented below.

After investigating the assumed model and obtaining the date related to variables, AMOS software gives final model. This final model that forms large part of analysis is presented in figure 1.

Figure 1: Model of impact of ERP success factors on financial performance

As it can be seen in above figure, in this model, all causative structural relationships between observed variables or indicators and latent variables are indicated. Above model of structural equation is composed of three measurement models and 1 structural model. Measurement model is a part of structural model that defines measurement method of a latent variable using two or more observed variable. Structural model indicates that how latent variables influence each other.
Generally, in present research, we used RMR, GFI, AGFI, RMSEA, NFI, NNFI AND CFI criteria for evaluating fitting suitability of whole model. The number relating to each indicator is presented in table 5. The result demonstrates that the proposed model is supported by empirical data.

<table>
<thead>
<tr>
<th>Value index</th>
<th>index</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.046</td>
<td>Root Mean Square Residual (RMR)</td>
</tr>
<tr>
<td>0.95</td>
<td>Goodness of Fit Index (GFI)</td>
</tr>
<tr>
<td>0.87</td>
<td>Adjusted Goodness of Fit Index (AGFI)</td>
</tr>
<tr>
<td>0.077</td>
<td>Root Mean Square Error of Approximation (RMSEA)</td>
</tr>
<tr>
<td>0.98</td>
<td>Normed Fit Index (NFI)</td>
</tr>
<tr>
<td>0.99</td>
<td>CFI (Comparative Fit Index)</td>
</tr>
</tbody>
</table>

After outlining the structural equation model and performing arithmetic operations in the 95 percent obtained the following results:

1. Of 5 sub-scale quality of system, information quality, the individual effect, work group effect and the organizational with respect the values of the standard estimates for the parameters, scale of system Quality with a scale factor of 0/6 has the highest correlation with ERP success rate and therefore the highest weight also in the calculation of the hidden variables are required; scale of information quality and the scale factor of 0/57, a factor of 0/55 and a factor of 0/49 at the next level are important. At the end of the scale of organizational effect factor of 0/13 is lower correlation with ERP success rate and so less weight in defining has this hidden variable.

2. of 2 scale sub-scale ROI and ROE with respect to the values of the standard estimates for the parameters, ROI scale factor of 0/98 has the highest correlation with the level of financial performance and therefore the highest weight also has in the calculation of this hidden variable; versus ROE scale factor versus 0/85 is correlation with levels of financial performance and less weight in the same way in defining has a hidden variable.
3. Considering the first hypothesis, it was claimed, the evidence of support the senior managers have direct effect on ERP success, the results tend to confirm this effect. It means that the independent variable evidence of support of top managers has direct effect on the dependent variable of ERP success.

Results of regression analysis, shows that the evidence of support of senior managers justifies %90 of changes of variable ERP success, that is higher than average. This result is consistent with results obtained from the correlation test.

4. Considering the second hypothesis, it was claimed, the evidence in the business perspective makes a direct effect on the ERP success, the results tend to confirm this effect. Evidence of the independent variable on the dependent variable and business prospective of success will directly affect. It means that independent variable of the evidence in the business perspective make a direct effect on dependent variable of ERP success.

Results of regression analysis, shows that the evidence of support of senior managers justifies 7 percent of changes of the ERP success variable, that this is low.

5. Considering the third hypothesis, it was claimed, the evidence of specialty of external factors makes a direct effect on the ERP success, and the results tend to confirm this effect. It means that independent variable of evidence of specialty of external factors makes a direct effect on dependent variable of the ERP success.

Results of regression analysis, shows that the evidence specialty of external factors justifies 19 (percent) of changes of the ERP success that is low. This result is consistent with the correlation test results are obtained.

6. Since the hypothesis 4, it was claimed, evidence of the ERP success makes a direct effect on financial performance, and the results have confirmed this
effect. It means that ERP success make a direct effect on the financial performance of the dependent variable.

Results of regression analysis, shows that evidence of the ERP success justifies the %93 (percent) of changes of the financial performance variable. This result is on the contrary to of findings Etezadi (2008).

5- Discussion and Suggestion
Considering results researching following suggestions offered generally for organizations and for managers and in charges of Planning systems resources of Organization.

Results showed senior managers support has the sustainable impact on the success rate of organizational resource planning systems, it is very important. So to increase the probability (chance) of having an ERP success system (acquisition) in which meet the expectations of all employees, work groups or departments, and organization? Their commitment and support to senior managers must be showed in the implementation steps and stages of ERP project. Provide support in the implementation and adoption of an approach is illegal (Nandhakvmar and others, 2005) isnot enough later in life-cycle the ERP systems. To ensure higher levels of ERP success management must continuously support the system and notice to all sector affected on this system.

Company managers should have clear positions about the value of the ERP system that they want to be in front of the mission organization and operational objectives. The research results show that in the organization that goals are well established, success of system will be higher.

Managers who want to increase the success of ERP systems, they should be aware that the involvement of providers (vendors and consultants), high quality service will help in the implementation process and later, in the long term success of this system. Although senior management's support and awareness are important factors of how ERP acceptance help on achievement business
perspective, but the role of expertise of outside suppliers of these systems can overcome deficiencies in both the contingency factor.

The study can help to understand the financial effect of ERP systems on organizations. The survey results point to scientific studies as well as commercial and administrative point of view is important. From a scientific perspective, this framework adds the knowledge in the area of information technology and ERP systems and the results of this study will contribute to subsequent studies in this field. Also view of executives and business results of this study will help to improve decision-making process and the expectations of the ERP system at the time of purchase this system.

The survey results indicate a positive effect of the ERP systems on the financial performance of companies. Thus, these studies suggest that companies can use to improve the performance of the system and help their own organization. Because these systems resulted in a faster and more efficient transactions in organization and facilitate integrated planning processes, on time planning production and responding to customers.

7- Suggestions for future research

1. As Nykvlay (2004) argues, the benefits of implementing ERP systems generally are divided into visible and invisible benefits. This research examines the effect of ERP on the visible aspects of the financial performance of organizations. Recommended in future research is focus on other visible components (reduced inventory and fewer employees) and invisible (a stable decision-making, improved processes, and improve services...).

2. In this research three contingency factors such as strategic and technical have surveyed. Recommend, in the future research, other contingency factors such as organizational structure and culture upon the success of the ERP system should be examined.
Future research could also compare and contrast the effect of three contingency factors on the success of ERP system along with their effect on the success of ERP systems.
References


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