

Critical Success Factors in Implementation of Enterprise Resource Planning Systems: A Case of Golrang Company in Iran

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Abstract: Enterprise resource planning (ERP) systems coordinate the activities, decisions, and knowledge of organizations. Despite the extensive implementation of ERP systems, the research in this area is, like other fields of information technology (IT), relatively recent. The purpose of this research was to identify critical success factors in implementation of ERP systems in an Iranian company (Golrang) using Esteves and Pastor's model. This model is based on four factors: organizational-strategic, organizational-tactical, technological-strategic, and technological-tactical. By examining the literature, several indices were identified for each of these factors. These factors were presented to a group of experts in a questionnaire so as to determine the importance of each factor. The sample consisted of 75 industrial experts in Golrang Company of whom 62 completed the questionnaire. The results showed that the ERP critical success factors do not equally affect successful implementation of ERP systems.

Keywords: Enterprise resource planning, organizational-strategic, organizational-tactical, technological-strategic, technological-tactical.

I. Introduction

Enterprise resource planning (ERP) is integrated software with different modules for various functional areas such as planning, manufacturing, sales, marketing, distribution, accounting, human resource management, project management, inventory management, service and maintenance, transportation, and e-commerce. These integrated, customized information technology (IT) systems facilitate the flow of information across all functional areas of an enterprise (Bakâset al., 2006). Increased competitiveness in the business environment, the need for inter- and intra-organizational integration in the context of the supply chain, and extensive developments in the field of IT are the main factors contributing to the implementation of ERP systems. These systems create management and operational integration within and between organizations and facilitate business processes, thus increasing the efficiency and effectiveness of organizations and preparing them for a competitive market (Verville & Halington, 2003).

ERP systems are the culmination of information systems in the present age. The capabilities of these systems have encouraged public and non-profit organizations to join business sectors in using these systems and improving customer services (Nah & Delgado, 2006).

ERP implementation projects are highly complex in nature and one of the first steps in these projects is to evaluate the extent to which organizations are prepared to implement ERP systems. Although ERP implementation can have many benefits for organizations, its rate of failure has been a major concern. It has been said that 32 percent of ERP projects fail to achieve the anticipated goals and three quarter of these projects have been found to be unsuccessful. In addition to that, about 90% of ERP implementations are over budget, while delivering only 72% of promised benefit (Basoglu et al., 2007).

Researchers have made various attempts to prevent such costly failures. Some researchers have provided valuable insights and approaches for ERP implementation in organizations, and some others have identified different factors that affect the success or failure of ERP projects (Klaus et al., 2007).

It is important for organizations to evaluate the feasibility of implementing ERP systems before taking any such measures so that projects are carried out based on existing realities, capacities, and constraints. Golrang is one of the biggest Iranian companies which produces detergents and cosmetics and it is trying to implement an ERP system. Obviously the company needs to assess its readiness to successfully implement such a project and identify the factors that can minimize the chances of failure (Jacobs & Weston, 2007). At the international level, studies have been conducted to provide frameworks for ERP implementation readiness, which aim to identify possible problems and challenges in establishment of ERP systems and draw on past successful experiences to solve these problems. To identify the strengths and weaknesses of an organization, its dimensions must be well understood (Jadhav & Sonar 2009). Thus, this research aims to identify the factors that affect the ERP implementation process using Esteves and Pastor's model. This model is based on four factors: organizational-strategic, organizational-tactical, technological-strategic, and technological-tactical. This approach allows for identifying potential problems and risks in ERP implementation. The main question is whether all of these factors have equal effect on successful implementation of ERP systems.

II. Methodology

The present research is a descriptive survey. Data were collected through a review of the literature as well as a questionnaire. The questionnaire was developed for qualitative analysis of information and identification of factors that affect successful ERP implementation in Golrang Company. The validity of the instrument was verified by a panel of experts and its reliability was measured to be high using Cronbach's alpha (0.77). The population consisted of all the experts involved in ERP implementation in the company (N = 62), all of whom participated in the research. Data were analyzed using descriptive statistics as well as Friedman and Wilcoxon tests.

III. Findings

Main Factors

The non-parametric Friedman test is most appropriate for examining the effect of the variables. Here the question is, which factors have a greater effect on ERP implementation? In other words, critical success factors in ERP implementation are ranked based on their effect.

Table 1. The results of Friedman test

Factors	Mean	Test Statistic			
		N	Chi-squared	df	Sig.
Technological-Strategic	3.32	62	33.70	3	0.00
Technological-Tactical	2.26				
Organizational-Tactical	2.24				
Organizational-Strategic	2.18				

Chi-squared is 32.70, indicating that the null hypothesis is rejected at 95% confidence level. That is, critical success factors have significantly different effects on ERP implementation. The table above also shows the ranking of these factors. The results of Wilcoxon signed-rank test for pairwise comparisons are provided below. The data shows that technological-strategic factors have the greatest effect on ERP implementation.

Table 2. Results of Wilcoxon test

Comparison	TO – SO	TC – SO	TC – TO	SC – SO	SC – TO	TC – SC
Test Statistic	-0.38	-1.14	-1.08	-4.54	-5.20	-5.73
p-value	0.707	0.254	0.278	0.000	0.000	0.000

Table 3. Summary of the results

Factors	Rank
Technological-Strategic	1
Technological-Tactical	2
Organizational-Tactical	2
Organizational-Strategic	2

Organizational-Strategic Factors

Friedman test was used to compare the effects of organizational-strategic factors.

Table 4. The results of Friedman test for organizational-strategic factors

Factor	Proxy	Mean	Rank
Sustained management support	SO1	8.23	1
Clear understanding of strategic goals, IT, and ERP	SO2	7.40	2
Trust between partners	SO10	6.63	2,3
Adequate project champion role	SO8	5.88	3,4
Good project scope management	SO4	5.86	3,4,5
Adequate project team composition	SO6	5.60	5,6
User involvement and participation	SO9	4.17	6,7
Comprehensive business process reengineering	SO7	3.97	7
Effective organizational change management	SO3	3.86	8
Teamwork culture in the organization	SO5	3.40	9
Test Statistics			
N	Chi-squared	df	Sig.
62	170.74	9	0.00

Chi-squared is 170.74, indicating that the null hypothesis is rejected at the 95% confidence level. Therefore, organizational-strategic factors have significantly different effects on ERP implementation. The

ranking of these factors are also provided in the table above. The results of Wilcoxon test for pairwise comparisons are provided in Table 5.

Table 5. The results of Wilcoxon test

Comparison	SO1 – SO2	SO2 – SO10	SO2 – SO8	SO8 – SO10	SO4 – SO10
Test Statistic	-3.89	-1.51	-3.01	-1.62	-1.57
p-value	0.000	0.132	0.003	0.106	0.116
Comparison	SO6 – SO10	SO4 – SO8	SO6 – SO8	SO8 – SO9	SO4 – SO6
Test Statistic	-2.22	-0.07	-0.42	-2.58	-0.46
p-value	0.026	0.945	0.674	0.010	0.649
Comparison	SO4 – SO9	SO6 – SO9	SO7 – SO6	SO3 – SO6	SO5 – SO6
Test Statistic	-2.98	-2.87	-3.36	-2.80	-3.61
p-value	0.003	0.004	0.001	0.005	0.000
Comparison	SO7 – SO9	SO9 – SO3	SO7 – SO3	SO7 – SO5	SO5 – SO3
Test Statistic	-1.89	-1.69	-0.33	-2.14	-2.01
p-value	0.059	0.091	0.740	0.032	0.045

Organizational-Tactical Factors

Friedman test was used to compare the effects of organizational-tactical factors.

Table 6. The results of Friedman test for organizational-tactical factors

Factor	Proxy	Mean	Rank
Formalized project plan/schedule	TO3	6.90	1
Strong communications inwards and outwards	TO2	6.80	1
Strong project management	TO8	6.68	1
Preventive trouble-shooting	TO5	4.63	2
Development of performance evaluation indicators	TO9	4.58	2
Appropriate usage of consultants	TO1	4.47	2,3
Empowered decision-makers	TO7	4.20	2,3
Dedicated staff and consultants	TO6	3.70	3
Adequate training program	TO4	3.04	4
Test Statistics			
N	Chi-squared	df	Sig.
62	146.16	8	0.00

Chi-squared is 146.16, indicated that the null hypothesis is rejected at the 95% confidence level. Thus, organizational-tactical factors have significantly different effects on ERP implementation. The above table provides the ranking of organizational-tactical factors as well. The results of Wilcoxon test for pairwise comparisons are provided in Table 7.

Table 7. The results of Wilcoxon test

Comparison	TO2 – TO3	TO3 – TO8	TO3 – TO8	TO2 – TO8	TO2 – TO5
Test Statistic	-0.75	-0.68	-5.04	0.00	-4.48
p-value	0.452	0.497	0.000	1.000	0.000
Comparison	TO5 – TO8	TO5 – TO9	TO1 – TO5	TO5 – TO7	TO5 – TO6
Test Statistic	-4.15	-1.13	-1.27	-1.44	-2.94
p-value	0.000	0.258	0.204	0.149	0.003
Comparison	TO1 – TO9	TO7 – TO9	TO6 – TO9	TO1 – TO7	TO1 – TO6
Test Statistic	-1.57	-1.35	-2.49	-0.20	-1.27
p-value	0.116	0.177	0.013	0.842	0.205
Comparison	TO1 – TO4	TO6 – TO7	TO4 – TO7	TO4 – TO6	
Test Statistic	-2.84	-0.79	-3.33	-3.04	
p-value	0.005	0.429	0.001	0.002	

Technological-Strategic Factors

Friedman test was used to compare the effects of technological-strategic factors.

Table 8. The results of Friedman test for technological-strategic factors

Factor	Proxy	Mean	Rank
Adequate software and hardware infrastructure	TS1	3.14	1
Adequate ERP implementation strategy	TS4	3.14	1,2
Avoid customization	TS2	2.18	3
Adequate ERP version	TS3	1.75	4
Test Statistics			
N	Chi-squared	df	Sig.
62	51.61	3	0.00

Chi-squared is 51.61, indicating that the null hypothesis is rejected at the 95% confidence level. Thus, technological-strategic factors have significantly different effects on ERP implementation. The above tale shows the ranking of technological-strategic factors as well. The results of Wilcoxon test for pairwise comparisons are provided in Table 9.

Table 9. The results of Wilcoxon test

Comparison	TS1 – TS4	TS2 – TS4	TS3 – TS4	TS1 – TS2	TS3 – TS1	TS3 – TS2
Test Statistic	-1.93	-4.67	-5.42	-2.30	-4.25	-2.29
p-value	0.053	0.000	0.000	0.022	0.000	0.022

Technological-Tactical Factors

Friedman test was used to compare the effects of technological-strategic factors.

Table 10. The results of Friedman test for technological-tactical factors

Factor	Proxy	Mean	Rank
Adequate infrastructure and interfaces	TT1	2.44	1
Adequate data migration process	TT3	1.95	1,2,3
Legacy systems knowledge	TT2	1.60	3
Test Statistics			
N	Chi-squared	df	Sig.
62	23.44	2	0.00

Chi-squared is 23.44, indicating that the null hypothesis is rejected at the 95% confidence level. Thus, technological-tactical factors have significantly different effects on ERP implementation. The above tale shows the ranking of technological-tactical factors as well. The results of Wilcoxon test for pairwise comparisons are provided in Table 11.

Table 11. The results of Wilcoxon test

Comparison	TT1 – TT3	TT1 – TT2	TT2 – TT3
Test Statistic	-1.88	-3.42	-1.76
p-value	0.061	0.001	0.078

IV. Discussion

The results showed that the effects of the critical success factors on ERP implementation are significantly different. The following figure shows the mean rank of each set of factors, with technological-strategic factors having the greatest effect on ERP implementation.

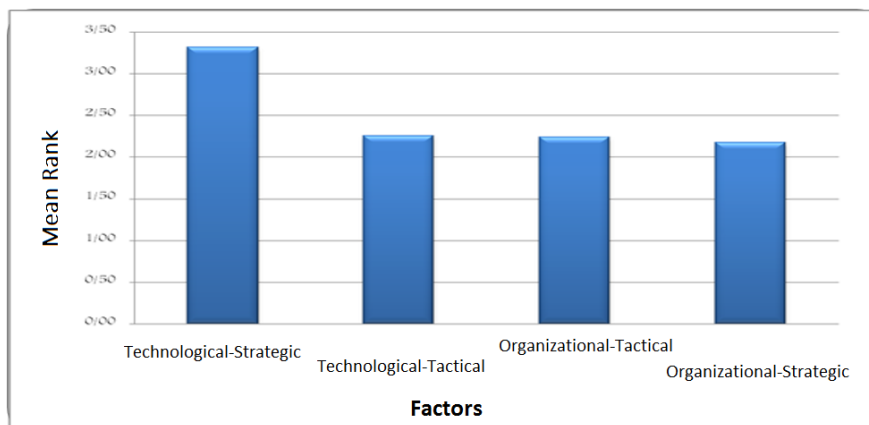


Figure 1. Mean rank of critical success factors in ERP implementation

The results showed that organizational-strategic factors have significantly different effects on ERP implementation. The ranking of these factors are shown in the following table.

Table 12. Ranking of organizational-strategic factors

Factor	Rank
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Sustained management support	1
Clear understanding of strategic goals, IT, and ERP	2
Trust between partners	2,3
Adequate project champion role	3,4
Good project scope management	3,4,5
Adequate project team composition	5,6
User involvement and participation	6,7
Comprehensive business process reengineering	7
Effective organizational change management	8
Teamwork culture in the organization	9

The results also showed that organizational-tactical factors have significantly different effects on ERP implementation. The ranking of these factors are shown in the following table.

Table 13. Ranking of organizational-tactical factors

Factor	Rank
Formalized project plan/schedule	1
Strong communications inwards and outwards	1
Strong project management	1
Preventive trouble-shooting	2
Development of performance evaluation indicators	2
Appropriate usage of consultants	2,3
Empowered decision-makers	2,3
Dedicated staff and consultants	3
Adequate training program	4

The results showed that technological-strategic factors have significantly different effects on ERP implementation. The ranking of these factors are shown in the following table.

Table 14. Ranking of technological-strategic factors

Factor	Rank
Adequate software and hardware infrastructure	1
Adequate ERP implementation strategy	1,2
Avoid customization	3
Adequate ERP version	4

Finally, the results showed that technological-tactical factors have significantly different effects on ERP implementation. The ranking of these factors are shown in the following table.

Table 15. Ranking of technological-tactical factors

Factor	Rank
Adequate infrastructure and interfaces	1
Adequate data migration process	1,2
Legacy systems knowledge	3

V. Conclusion

There has been extensive research on enterprise resource planning (ERP), dealing with the basics, theory, and concepts of ERP and ERP implementation. However, there is a need for further research on adoption and localization of ERP systems, especially by research-based organizations. We hope that the results of this research can be useful for such organizations in successful implementation of ERP systems. Iranian organizations have recently been showing increasing interest in ERP systems. As ERP implementation is a risky initiative, this research aimed to provide a framework for assessing ERP implementation readiness in research-based organizations. The framework proposed by Pastor and Esteves (1999) is based on four sets of factors (Henderson and Venkatraman, 1999). The first set of factors is organizational-strategic, involving long-term strategies and missions of the organization in the area of business and information technology. The second set of factors is organizational-tactical, involving factors related to implementation projects and readiness assessment. The third set of factors is technological-strategic, involving factors that are mostly long-term technological factors. The fourth set of factors are technological-tactical, involving short-term technological factors. To ensure the effectiveness of these factors for organizations' readiness for ERP implementation, experts in the field of ERP were consulted and appropriate instrument and statistical tests were used to examine the effect of ERP critical success factors on readiness for ERP implementation (Yang et al., 1999).

The results showed that all the four sets of factors affect readiness for ERP implementation, but technological-strategic factors are the most influential factors. Overall, strategic and long-term factors were more effective

than tactical and short-term ones. In each set of factors there were components that were more effective than others. Therefore, it is recommended for managers to pay attention to these factors and consider them in their readiness assessment before initiating ERP implementation projects, especially with regard to technological-strategic factors (Davenport, 2000). Obviously, this framework only contains basic critical factors of organizational readiness in the first stage of the lifecycle of the ERP system. However, no measure of organizational readiness for ERP implementation is a robust predictor of the system's success in the long-term, since successful ERP implementation depends on various short-, medium-, and long-term factors that must be considered during the implementation process (Herdon & Rózsa, 2008). In this research, an attempt was made to assess and compare critical success factors in ERP implementation, and the results provide an adequate guide for organizations seeking to initiate ERP projects.

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References

- [1]. Bakås, O., Romsdal, A., & Alfnes, E. (2007). Holistic ERP Selection Methodology. In Proceedings of the 14th International EurOMA Conference: Managing Operations in an Expanding Europe, Ankara, Turkey.
- [2]. Basoglu, N., Daim, T., & Kerimaoglu, O. (2007). Organizational adoption of enterprise re-source planning systems: A conceptual framework. *The Journal of High Technology Management Research*, 18, 73-97.
- [3]. Davenport, T. H. (2000). *Mission Critical: Realizing the Promise of Enterprise Systems*. Boston, MA: Harvard Business School Press.
- [4]. Dong, J., Yang, S., Chung, L., Alencar, P., & Cowan, D. (1999). A COTS architectural component specification stencil for selection and reasoning. *MPEC '05 Proceedings of the Second International Workshop on Models and Processes for the Evaluation of Off-the-Shelf Components*, pp. 1-4.
- [5]. Henderson, J.C., & Venkatraman, N. (1999). Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal*, 38, 472-484.
- [6]. Herdon, M., & Rózsa, T. (2008). Support tools for ERP selection. *Proceedings of the International Conference BIOATLAS, Romania*.
- [7]. Jacobs, R., & Weston Jr., F. C. T. (2007). Enterprise resource planning (ERP)—A brief history. *Journal of Operations Management*, 25, 357-363.
- [8]. Jadhav, A. S., & Sonar, R. M. (2009). Evaluating and selecting software packages: A review. *Information and Software Technology*, 51, 555-563.
- [9]. Klaus, T., Wingreen, S., Blanton, J. E. (2007). Examining user resistance and management strategies in enterprise system implementations. *SIGMIS CPR '07 Proceedings of the 2007 ACM SIGMIS CPR conference on Computer personnel research: The global in-formation technology workforce*, pp. 55-62.
- [10]. Nah, F.F.H., & Delgado, S. (2006). Critical success factors for enterprise resource planning implementation and upgrade. *Journal of Computer Information Systems*, 46, 99-113.
- [11]. Verville, J., & Halington, A. (2003). A Six Stage Model of the Buying Process for ERP Software. *Industrial Marketing Management*, 32, 585-594.