



The study of critical success factors in implementation of Enterprise Resource Planning (ERP)

Mohammad Mehdi Arab Khazaeli¹, Dr.Ahmad Vedadi² and Dr.Farideh Haghshenas Kashani³

1 Department of Management, Master of IT Management (MIT), Electronic Branch, Islamic Azad University, Geshm, Iran

2Department of Management, Phd in Public Management, Assistant Professor, Central Tehran Branch, Islamic Azad University, Tehran, Iran

3Department of Management, Phd in Business Management, Assistant Professor and Faculty Member, Central Tehran Branch, Islamic Azad University, Tehran, Iran

ABSTRACT

Enterprise resource planning (ERP) is a managerial solution based on information technology which objective is integration and information circulation among all organization sections such as financial, manufacturing, human resources, supply chain, and customers, management that makes the facilitation of planning and rapid and on-time response into customers. So, the present research has been compiled with studying the critical factors of success in implementing enterprise resource planning (ERP) of enterprise (firms) of Mazandaran province. The methodology is descriptive-survey and is conducted in field. Research statistical universe includes all managers, experts and specialists of IT systems and integration system in export enterprise of Mazandaran province (250 people) that 151 people were selected as sample based on Kokran formulation. Finally 132 questionnaires received. The realized questionnaire was used to evaluate the critical factors effective on implementing ERP from realized questionnaires. In order to test research hypothesis, Kolmogorov-Smirnov that unit-sample t-test, binomial test and Fridman test in SPSS software were used. Based on findings obtained of t-test, organizational culture ($t=6.99$, $p=0.001$), organizational structure ($t=4.54$, $p=0.001$), MA ($t=6.87$, $p=0.001$), project management ($t=5.75$, $p=0.001$) and project team ($t=6.17$, $p=0.001$) are critical factors of success in implementing ERP in enterprises in Mazandaran. Similarly, results of binomial test showed that advisors ($p=0.021$), experts ($p=0.000$), hardware ($p=0.000$), software ($p=0.000$), web and internet ($p=0.000$) are also critical factors of success in implementing ERP in enterprises in Mazandaran. But users ($p=0.082$) of success in implementing ERP in enterprises in Mazandaran. So, it's necessary that managers of enterprises of the province pay attention into aforementioned factors to attain objectives of integration of human resource and organization success.

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1. Introduction

By shortness in life cycle, organizations won't be able to spend much resource to produce new products in this competitive environment and with severe changes in technology and should think of optimal usage of resources. Based on this and for optimal usage of organization resources, manager's main problem isn't lack of information in organization. Nowadays, using information systems which is one of the technological results of IT in organizations is converted into a necessity and will promote organizations to use more of this new technology that depends on organization senior manager's thoughts and their recognition and understanding of importance of these systems in organization technology era, manufactures are under the pressure to offer products with higher quality and in accordance with special needs of every customer in shorter time. This, manufacturing enterprises seek new ways to sustain their competition in this environment. A way that

can reduce producing more interest from existing capabilities and reduce inventory in their flow. In most manufacturing centers, existing problems not only arise of lack of staff endeavor, but also lack of cooperation and coordination in using available resources in plants (people, information and tools) and consequently effective management in work. Undoubtedly in economic dimension, applying IT is one of the necessary rings to increase commercial efficiency in national economy.

In this respect, one of the important systems is enterprise resource planning or ERP. The organizational resource planning includes planning and management of all existing resources in organization and uses them comprehensively. ERP is a thinking, technology and system to manage different resources of organization more effectively that managing is done automatically and through integrating all processes and consequently raising the efficiency of organization and increase in customer's satisfaction (Finney and Corbett, 2006). ERP is a thinking, technology and

system for management with high efficiency on different resources in whole one organization this type of management is done through integrating activities to raise efficiency and productivity in organization and increase in customer's satisfaction and value. ERP shows all operational stages of a process in organization (Zargar, 1382). ERP prepares the possibility of planning according to condition of organization by making suitable information package and change in attitude and organizational culture with optimization of procedures and agility obtained of the prepared bed. So organization can take steps integratedly with regard to make competitive advantages, increase in income and realizing organizational objectives (Hesabres, 1383). Similarly, on other hand deploying and applying integrated information systems of ERP is an inevitable necessity for enterprises in a competitive environment and on the other hand often ERP projects fail or encounter weak success. Successful implementation of ERP enables enterprises to automate their own commercial flow in order to improve manufacturing distributing performances and activities and financial flows of every profession and job and make them desirable. On the other hand, cost and time, as well as extent of success of implementing ERP are very critical for enterprises. If ERP implementation encounters different failures, enterprises will lose occasions or undergo strategic errors. So that different statistics of failure of ERP projects are available that represent the difficulty of its installation and run in organization. For example, the statistics that has been posed by Standish research group (2002) in the ground of implementing ERP systems shows that %35 of ERP projects are stopped; %55 cost more than expected budget; less than %10 of ERP projects are implemented in accordance with prior scheduling; project costs are %178 more than approved budget; it last nearly %230 longer than schedule and finally are nearly 40 percent operationally. So, successful implementation of these systems is necessary for performance and survival of enterprise. Nowadays many managers of implementing ERP project, only pay attention to technical and financial aspects of project and ignore other aspects. So it's necessary that before implementing, indices related to implementing ERP are evaluated for better decision making about preparing organization to implement ERP (Davenport, 2000). Key factors of success are factors that are necessary for success of organization and attaining organizational mission (Ehie, 1992). Similarly numerous factors and methods contribute to success of implementing ERP systems and different classifications of these elements have been offered. Critical success factor includes a limited amount of domain, that a satisfactory competitive performance for people, section or organization is predictable, whereas finding satisfactory results in these domains. On other words success critical factors are characteristics, conditions or variable that can play an undeniable role in success of enterprise in competitive market if are kept, supported and managed suitably. So, if these factors do well in every organization, the organizational performance also will be suitable. Thus, organization should evaluate functions of these factors continuously and correct them when possible. Different researchers and scholars have introduced numerous factors for success of strategic alignment of IT and business in

organizations. These factors have offered different classifications. The conducted researches during 1992 and 2000 have been studied about critical factors of successful deployment of ERP and 11 factors of integrating working team of project of ERP, support of senior managers, perspective and plan of business, effective relations, project management, project leader, work desirable systems, culture and program of change management, business reengineering and decrease in customizing, software development, test and solving problems, supervision and evaluating the performance (Nah, 2001), or in another classification of deploying ERP is under the influence of two groups of environmental and organizational factors (Huang, 2001).

In the study of research conducted, Alizade (1385) in his research based on study of success critical factors in implementing ERP, their ranking showed that proportion of business systems and organization IT, goal and business plan of ERP project, acceptance and change management are of the most important critical factors. KonloSpatis (2013) in his research determined the factors related to financial and accounting advantages and costs of ERP that have influence on user's satisfaction. Joseph Bradley and Steven (2004) also have done a research about success critical factors in implementing ERP systems that examined and determined the factors in theoretical framework of classic management that introduce five main duty of management as planning, organizing, staffing, leadership, and control. Similarly, Komarand Gupta (2012), JaoJianto et al (2012), PaoploSerderia (2012), LeniKoh (2010) have studied and discussed about advantages and limitations of ERP in their research. Samers and Nilson (2003) their research based on study of success factor in implementing ERP projects, posed the factors of support of senior management, competence of project team, cooperation between sections and obvious objectives among the most important success factors. In a research that was conducted in 2001 by Denmark et al (2001), critical factors in successful implementing of ERP project include support of support of senior management, integrating project team, communications, project hero, business reengineering, program and culture of change management, supervision on performance plan of business, development and unwinding the software and suitable business and technological systems and information systems.

Similarly in the other classification, success critical factors of implementing ERP have been divided into four classes of organizational, personal, technical and operational critical factors. For example, we can refer to offered templates by Clarck (1994), Handerson and Neckatremann (1999), Loftman (2000), Fleir and Rainer (2002), Causeman and Michen (2002), Jouyer and Calika (2004) and Waries (2004). Generally it should be said that a successful implementation of a ERP project is difficult and complex, it is because deploying ERP makes wide changes in organization which needs a strict management to obtain the given advantages. In ERP system, unlike traditional systems of main focus on technical analysis and programming has been focused on designing business processes (Nazari and Baghaee, 1389).

So according to the significant and effective role that ERP systems have in office and directing organizations, specially

enterprises and prepares the grounds of their relation with other enterprises in an economic network to create electronic commerce and on one hand statistics show that in successful implementation of ERP system in organization, different factors have contributed that lack of sufficient attention into each of them can increase data and even project failure and because of exploiting abundant advantages of these systems and realizing export objectives and according to heavy costs of implementing ERP and unsuccessful experiences in implementing ERP, lack of attention into obstacles and challenges as well as critical factors of such systems not only cause profitability and improvement in condition, but also much financial damages for enterprises of Mazandaran province. This question was posed in researchers mind that what are success critical factors in implementing ERP in enterprises in Mazandaran in four organizational-technical-operational and personal dimensions?

Research methodology:

The present methodology is non-experimental, applied with respect to objective and descriptive-survey with respect to data collection that has been conducted in field form.

The statistical universe of this research includes all managers, experts and specialists of IT systems and ERP in export enterprises of Mazandaran province that is approved of commerce room of industries and mines of Sari department and commercial organization of Mazandaran (n=250) that 65 were managers and 185 were expert and specialist. According to universe volume and based on Kokran formula 151 people (39 managers and 112 expert and specialists) were selected as sample that among them, 132 questionnaires were received.

In order to evaluate critical factors effective in implementing ERP in this research, the realized questionnaire was used. This tool has 80 items. Likert 5-scale spectrum was used to answer; the least and most score

has been dedicated to completely disagree (1) and completely agree (5). This tool has four dimensions of organizational (organizational culture, organizational structure), operational factors/project management (senior manager, project manager, project team, staff), technical factors (hardware, software, network and Internet) and personal factors/man power (users, counselors, and experts). In order to determine the contextual validity of questionnaires of this research, several scholar professors in major of educational science and supervisor and adviser professors have been surveyed, that after recording their comment, the questionnaires were approved was used. This value was computed based on data obtained of questionnaire $\alpha = 0.96$ that represents the used questionnaire, have the necessary reliability.

Descriptive statistics and description of findings (average, standard deviation and frequency distribution tables) were used. In section of inferential statistics, kolmogrove-Smirnov test, unit-samplet-test, binomial test and Fridman test were used in spss software to test research hypothesis.

Research Findings

Descriptive findings

Based on this research findings, among 132 people who answered the questionnaire, 94 were male that equals %71.2 and 38 were female that equals %28.8 of aforementioned universe. Also a result of table 1 implies that 6 people (%4.6) of subjects of this research were 13 undergraduate. 69.2 percent had higher education. Similarly demographics imply that %19.7 of research subjects were managers and %80.3 were experts and specialists. According to information arising from demographic properties of subject, 52 people (40.6 percent) of subjects had less than 10 years of service record, about 37.5 percent had between 10 to 15 years, about 14 percent had between 16 to 20 years and 7.8 percent had more than 20 years of service record.

Table 1: distribution of demographic properties of the studied universe

variables	gender		Championship record				education				Position	
	male	female	Less than 10 years	11-15 years	16-20 years	More than 20 years	Under graduate	graduate	M.A and higher	M.A	manager	expert
Location												
Frequency	94	38	52	48	18	10	6	90	34	18	24	98
Percent	71.2	28.8	40.6	37.5	14.1	7.8	4.6	69.2	26.2	22.5	19.7	80.3

Inferential findings:

In this section, before conducting statistical test and due to default to use or not to use parametric test, kolmogrov Smirnov test was used that the results have been shown in table 2.

Network	Software	Hardware	Project team	Senior manager	staff	project manager	experts	advisors	users	Organization structure	Organization culture	Statistics standard
124	120	116	118	120	122	110	126	118	120	130	127	number
4.09	3.93	3.66	3.34	3.45	3.33	3.38	3.92	3.27	3.32	45.00	76.83	Average
0.75	0.80	0.744	0.61	0.73	0.75	0.69	0.80	0.97	0.91	7.36	12.63	Standard deviation
1.80	1.42	1.89	1.18	1.11	2.18	0.78	1.73	2.42	1.52	0.87	0.65	Z
0.003	0.03	0.02	0.10	0.17	0.00	0.58	0.01	0.00	0.02	0.42	0.78	Level of Significance

In this research unit-sample t-test was used in implementing ERP in enterprises of Mazandaran for effect organizational factors (culture and organizational structure). Based on

findings, organizational culture ($p=0.01$, $t=6.99$) and organizational structure ($p=0.01$, $t=4.54$) are among success critical factors in implementing ERP in enterprises of Mazandaran (table 3).

Table 3: result of unisample t-test for effect of organizational factors in implementing ERP in enterprises

Organization factors	average	Standard deviation	Expected mean	Computational t	Degree of freedom	Table t	Sig
Organization culture	3.34	0.54	3	6.99	126	2	0.001
Organization structure	3.21	0.52	3	4.54	128	2	0.001

Binomial test was used for effect of human factors in implementing ERP in enterprises of Mazandaran. Based on

it, users are not among success critical factors in implementing ERP in enterprises of Mazandaran ($p=0.082$) but advisors ($p=0.021$) and experts ($p=0.000$) are (table 4).

Table 4: results of binomial test about effect of human factors in implementing ERP in enterprises of Mazandaran

Human factors	groups	Expectation limit	number	Observed possibility	Sig	Test result
Users	Less than mean	≤ 3	50	0.42	0.082	Rejection H_0
	more than mean	> 3	70	0.58		
Advisors	Less than mean	≤ 3	72	0.61	0.021	Rejection H_0
	more than mean	> 3	46	0.39		
experts	Less than mean	≤ 3	28	0.22	0.000	Rejection H_0
	more than mean	> 3	98	0.78		

Also, with respect to effect of operational factors in implementing ERP in enterprises of Mazandaran (senior management, project manager, project team and staff), unit-sample t-test and binomial test were used. Result of unit-sample t-test showed that senior management ($p=0.001$,

$t=6.87$), project manager ($p=0.001$, $t=5.75$) and project team ($p=0.001$, $t=6.17$) are among success critical factors in implementing ERP in enterprises of Mazandaran (table 5). But based on binomial test organizational staff are not among success critical factors in implementing ERP in enterprises of Mazandaran ($p=0.651$) (table 6).

Table 5: result of unit-sample t-test in implementing ERP in enterprises of Mazandaran

Operational factors	average	Standard deviation	Expected mean	Computational t	Degree of freedom	Table t	Sig
Senior management	3.45	0.72	3	6.87	119	2	0.001
Project manager	3.38	0.69	3	5.75	109	2	0.001
Project team	3.34	0.61	3	6.17	117	2	0.001

Table 6: results of binomial test with respect to effect of organization staff in implementing ERP in enterprises of Mazandaran

operational factors	groups	Expectation limit	number	Observed possibility	Sig	Test result
Organization staff	Less than mean	≤ 3	64	0.52	0.651	H_0 doesn't reject
	more than mean	> 3	58	0.48		

Similarly, results of binomial test with respect to effect of technical factors (hardware, software, network and Internet) in implementing ERP in enterprises of Mazandaran showed

that factors of hardware ($p=0.000$), software ($p=0.000$), network and Internet ($p=0.000$) are among success critical factors in implementing ERP in enterprises of Mazandaran (table 7).

Table 7: results of binomial test with respect to effect of technical factors in implementing ERP in enterprises of Mazandaran

technical factors	groups	Expectation limit	number	Observed possibility	Sig	Test result
hardware	Less than mean	≤3	28	0.24	0.000	Rejection H ₀
	more than mean	>3	88	0.76		
Software	Less than mean	≤3	22	0.18	0.000	Rejection H ₀
	more than mean	>3	98	0.82		
Network and Internet	Less than mean	≤3	20	0.16	0.000	Rejection H ₀
	more than mean	>3	104	0.84		

Based on Fridman test, the main factors effective in implementing ERP in enterprises of Mazandaran include technical factors, man power, operational team and organizational factors, respectively that among technical

factors, internet, network and software are the most important factors. In man power, experts and advisors, in operational factors, organizational cultures have been the most important effective factors.

Table 8: priority of main and secondary factors in success of ERP in enterprises of Mazandaran based on Fridman test

No	Main factors with priority	Average of rank	Secondary factors with priority	Average of rank
1	Technical	3.53	Network and internet Software Hardware	2.38 2.04 1.59
2	Personal/man power	2.57	Specialists Advisors Users	2.42 1.79 1.78
3	Operational/project management	2.05	Senior manager Project team Project manager Staff	2.82 2.42 2.37 2.31
4	Organizational	1.84	Organizational culture Organizational structure	1.61 1.39

Discussion and conclusion

Planning of organizational resources is a system that all sections and duties of an organization that makes the bed of integrated information technology so that meets all needs of different sections of organization and places organization resources rapidly, strictly and with high quality under the control of managers of different levels of organization to use it in order to improve the process of planning and making decision. Systems of resources planning have prepared a new era of applying science and technology and optimized performance of activities in each enterprise by holding a vast spectrum of function and exploiting the best experiences. This system makes possible the resource management of organization in all levels and makes all processes of organization standard and mechanized, based on the process approach. So the present paper has been compiled with objective of studying success critical factors in implementing (ERP) of enterprises of Mazandaran.

In study of research findings and according to unit-sample t-test of organizational structure as organizational factor are among critical factors of success in implementing ERP in enterprises of Mazandaran. These results are consistent with the results of researches by Alen and Kern (2005), Nav et al (2002) and Summers and Clara Nilson (2003). Alen and Kern in their research under the title of “determining positional factors of success of ERP in state firms” found that managers of state section are directed by studying positional factors (organizational culture and structure, old technical structure, power and intra-organizational policy and communication) along with guideline and operational factors into easy implementation of ERP. Nov et al, also

have presented eleven factors included organizational culture as critical factors in successful implementing of ERP projects. ERP extends a process-looking viewpoint by clarifying people performance in procedures of organizational and ability in measuring the effect of people performance on processes. So people orientation and different sections of organization will be possible toward organizational objectives with special integrity. So, it is recommended that while implementing ERP systems, necessary attention must be paid into organizational culture. On the other hand, the ground to implement suitable culture and strong organizational structure in ERP.

Findings obtained of binomial test with respect to effect of human factors showed that users are not among success critical factors in implementing ERP in enterprises of Mazandaran but advisors, and experts are regarded as success critical factors. The results are consistent with Kumar and Mashari (2003) and Bradly and Steves (2004). Kumar and Mashari in research entitled “obstacles available in implementing ERP systems in the framework of factors with survey of companies using ERP systems” showed that lack of skillful people in project, resistance of personal and staffs are factors of not applying ERP. Bradly and Steves have done a research about success critical factors in implementing ERP systems and considered effective to selected good project manager who have sufficient experience, employing experienced advisors in order to guide as well as quality and quantity of training users with success of project. So, it is recommended that while implementing ERP, necessary attention should be paid into factor of advisors and specialists. In the other words, it

should make the ground for suitable attendance of advisors in implementing ERP.

Similarly, unit-sample t-test and binomial test were used with respect to the amount of efficacy of operational factors on implementing ERP in enterprises of Mazandaran. But project manager and project team are among success critical factors in implementing ERP in enterprises of Mazandaran. But the result of binomial test showed that organization staffs aren't success critical factors. The present results are consistent with Shraghnia's findings (1385). Nazemi reported in "guideline attitude in development, deployment and applying ERP in industrial unit of Iran" that support of senior management and supplying sufficient budget and substantial planning are considered as substantial factors of successful implementation of ERP and also Alvanchi's finding entitled "evaluation of effective criteria in implementing ERP systems in manufacturing companies of Iran" is consistent. Basagloo and Dayem in a paper entitled "organizational adaptation of ERP in the shape of conceptual framework" emphasized that organization technology and project management on ERP system expresses the framework of adaptation of this system in organizations. Similarly, Eshraghnia in a research entitled "measuring the possibility of readiness to accept ERP in Iran" organize an experienced team of authority companies, IT group and experts related to organization; measure the possibility to accept ERP. But Kumar and Mashari in a research entitled "obstacle available in the way of implementing ERP systems in form of factors by survey of companies using ERP systems" convey that lack of skillful people in project, personals and staff's resistance are among factors of not applying ERP. It is recommended that while implementing ERP systems. Necessary attention must be paid into factors of senior management, project manager and project team. In the other words, make a ground for suitable attendance of senior management in implementing ERP.

Based on results of t-test, technical factors such as hardware, software, network and internet are among success critical factors in implementing ERP in enterprise of Mazandaran. The results are consistent with Alvanchi (1380), Erenweek et al (2006) and Alizadeh (1386) findings. Alvanchi in his research entitled "evaluating criteria effective in implementing ERP systems in manufacturing companies of Iran" has dealt with study of causes of not implementing ERP systems in large and medium-size manufacturing companies in Iran, considers companies belief to use hardware and software equipment's and information technology as the most important critical factors of applying this system. Ernweek et al, in an article entitled "A conceptual model for systems of ERP" considered software, customer attitude, change management and flow of processes as four main components of success in systems. It is recommended that while implementing ERP systems, necessary attention must be paid into hardware factor. On the other word, the ground must be made to implement the suitable bed of hardware, software, network and internet in ERP.

Result of Fridman test showed that technical, human, operational and organizational factors are the most important success critical factors are the most important success critical factors in implementing ERP in enterprises

of Mazandaran, respectively. Indeed, many managers don't accept ERP integrated system yet. Similarly, staffs resist. In Iran, even financial problems of industries have been considered as obstacles. So, in order to implement ERP system successfully, we should enjoy financial support of government odlarg pubic enterprises (Kazemi, 1389). Managers of public section can help easy implementation of ERP by studying positional factors (organizational culture and structure, old technical structure, intra organizational power and policy and communication) along with guideline and operational factors (Alen and Kern, 2005). Right understanding of four main factors of software, customer attitude, change management and flow of processes among them and whole integrity of these sections in necessary (Marnvik and Chung, 2006); Mazandaran complex should pay attention into success critical factors in the form of managerial duties, planning, organizing, staffing, leadership and control of ERP project (Bradly and Steves, 2004). In Iran not only resistance of some managers but also lack of intersectional and financial weakness of implementing system lead to unfamiliarity of owners and managers of manufacturing and commercial enterprises toward the importance and role of ERP system so they need training in this domain. Based on result, technical factor are considered as the most important priority of success critical factors of ERP.

So it is necessary that managers and authorities of enterprises of Mazandaran direct their attention into software, hardware and internet services and discussions related to technology, internet communication, communicative and telecommunicate infra structures and can make on environment to place the enterprise in the route of success. Similarly, they should use an informed and expert manpower along with capable and competent advisors and can take steps in the route of development and increase in profitability and productivity by directing senior managers and project managers along with organizational factors especially organizational culture that ix consistent with enterprise requirements. So organizations should move toward projects of information technology by understanding capabilities, resources, competitive tools, competitive environment and recognizing properties of networked society and despite of existence of much advantages derived from deploying information system, before starting each project, they should compile a clarified and defensible justifiable plan. While making decision to start the project, they should take steps to modify the movement pass immediately, by evaluation tools and performance management. Finally the amount of success should be measured. By implementing ERP, structure and processes of organizations are aimed so the organizations will be successful that have been shown suitable flexibility toward change in organizational structure and consistency of business processes with ERP system.

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